

**GOVERNMENT OF THE ¹[Khyber Pakhtunkhwa]
ESTABLISHMENT DEPARTMENT**

NOTIFICATION

Dated Peshawar the 11.05.2007.

No.SO.E.II(ED)2(14)2007.---In exercise of the powers conferred by section 26 of the ²[Khyber Pakhtunkhwa] Civil Servant Act, 1973 (³[Khyber Pakhtunkhwa] Act XVIII of 1973), the Chief Minister of the ⁴[Khyber Pakhtunkhwa] is pleased to make the following rules, namely:

THE ⁵[Khyber Pakhtunkhwa] PROVINCIAL MANAGEMENT SERVICE RULES, 2007

1. Short title and commencement.---(1) These rules may be called the ⁶[Khyber Pakhtunkhwa] Provincial Management Service Rules, 2007.

(2) These rules shall come into force at once.

2. Definitions.---In these rules, unless the context otherwise requires, the following expressions shall have the meanings hereby respectively assigned to them, that is to say-

- (a) "appointing authority" means the appointing authority as specified in rule 5 of these rules;
- (b) "Commission" means the ⁷[Khyber Pakhtunkhwa] Public Service Commission;
- (c) "Department" means the Establishment and Administration Department;
- (d) "Departmental Examination" means the prescribed examination to be conducted by the Department for confirmation within probationary period or for promotion to higher post, as the case may be;
- (e) "Departmental Training" means any training prescribed by Government, the successful completion whereof is necessary for promotion to BS-18 and BS-19;
- (f) "Schedule" means the Schedule appended to these rules;
- (g) "Service" means the Provincial Management Service;
- (h) "Secretariat" means the ⁸[Khyber Pakhtunkhwa] Civil Secretariat as defined in rule 2(r) of the ⁹[Khyber Pakhtunkhwa] Government Rules of Business, 1985; and
- (i) "share" means the share specified for distribution between All Pakistan Unified Group and Provincial Officers as per Schedule-III.

3. Nomenclature of the posts.---The Service shall consist of the posts as specified in Schedule-I.

¹ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

² Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

³ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

⁴ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

⁵ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

⁶ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

⁷ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

⁸ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

⁹ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

4. Method of recruitment.---(1) The method of recruitment, minimum qualification, age limit and other matters related thereto for the Service shall be as given in Schedule-I.

(2) Fifty per cent of posts in BPS-17 shall be filled in by initial recruitment through Commission and remaining by promotion. Ten percent of Secretariat posts in BPS-17 to 19 shall be reserved for officers of technical departments on reciprocal basis. Government may reserve twenty per cent posts for leave, deputation and training etc in each pay scale.

(3) Posts specified in Schedule-II shall be filled in by Officers borne on Provincial Management Service and All Pakistan Unified Group in the ratio prescribed in Schedule-III.

¹⁰**[4-A. Training.**--- On appointment to the post borne on the service in BS-17, whether by initial recruitment or by promotion, every officer so appointed shall successfully complete one and a half year's mandatory training including one year training at the Provincial Services Academy as per Module specified in Schedule-IV and six months training attachment as specified in Schedule-V. The training will be followed by Departmental Examination to be conducted by the Provincial Services Academy as specified in Schedule-VI.

5. Appointing Authority.---The Chief Minister, ¹¹[Khyber Pakhtunkhwa] shall be the appointing authority for posts borne on the Provincial Management Service specified in Schedule-I.]

6. Saving.---In all other matters not expressly provided for in these rules, the members of the Service shall be governed by the ¹²[Khyber Pakhtunkhwa] Civil Servants (Appointment, Promotion and Transfer) Rules, 1989, and any other rules pertaining to terms and conditions of service made or deemed to have been made under the Khyber Pakhtunkhwa Civil Servants Act, 1973 (¹³[Khyber Pakhtunkhwa] Act No. XVIII of 1973).

7. Transitional:- The condition of graduation as laid down in para 2(a) and (b) of column-5 against serial No. 1 of Schedule-I shall not apply for a period of seven years from the date of coming into force of these rules to the existing incumbents for promotion against BS-17 posts.

8. Repeal.---The ¹⁴[Khyber Pakhtunkhwa] Provincial Civil Service (Secretariat/Executive Group) Rules, 1997 shall stand repealed after the retirement of existing incumbents of both the cadres. Separate seniority list of both the cadres shall be maintained under the existing rules and they shall be promoted at the ratio of 50: 50:

¹⁵[Provided that for the purpose of promotion of both the Secretariat Group and the Executive Group of the said service in different pay scales, -

- (i) the incumbents shall continue to be governed by the said service rules till the retirement of the last such incumbent; and
- (ii) the last incumbent of either Group shall rank senior to the first incumbent of the Provincial Management Service.]

SCHEDULE-I

10. Rule 4-A added vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

¹¹ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

¹² Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

¹³ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

¹⁴ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

15 . Amended vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

S.No.	Nomenclature of posts	Minimum qualification for appointment by Initial recruitment	Age limit for initial recruitment	Method of recruitment
1	2	3	4	5
1	PMS(BS-17) as per detail at Schedule-II	2 nd Division Bachelor Degree from a recognized University.	21-30 year	<p>1) Fifty per cent by initial recruitment on the recommendations of the Commission based on the result of competitive examination to be conducted by it in accordance with the provisions contained in ¹⁶Schedule - VII.</p> <p>2) Subject to rule 7, by promotion in the following manner:</p> <p>(a) twenty per cent from amongst Tehsildars, who are graduates, on the basis of seniority-cum-fitness, having five years service as Tehsildar and have passed the prescribed Departmental Examination; and</p> <p>(b) twenty per cent from amongst Superintendents /Private Secretaries on seniority-cum-fitness basis, who are graduate and have undergone a training course of 9-weeks at the Provincial Management Academy/Provincial Staff Training Institute. A joint seniority list of the Superintendents and Private Secretaries shall be maintained for the purpose of promotion on the basis of their continuous regular appointment to the respective posts.</p> <p>3) Ten per cent by selection on merit, on the basis of competitive examination, to be conducted by the Commission in</p>

16. The Word Schedule-IV replaced by Schedule VII vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

				accordance with the provisions contained in ¹⁷ Schedule-VII, from amongst persons holding substantive posts of Superintendents, Private Secretaries, Personal Assistants, Assistants, Senior Scale Stenographers, Stenographers, Data Entry Operators, Computer Operators, Senior and Junior Clerks who possess post graduate qualification from a recognized University and have atleast five years service under Government.
2.	PMS(BS-18) as per detail at Schedule-II	NIL	-	By promotion, on seniority-cum-fitness basis, from amongst the officers of PMS in BS-17 having at least five years service and have passed the prescribed Departmental Training or Departmental Examination.
3.	PMS(BS-19) as per detail at Schedule-II.	NIL	-	By promotion, on the basis of seniority-cum-fitness, from amongst PMS officers holding posts in BS-18 and having at least 12 years service against posts in BS-17 and above and have passed the prescribed Departmental Training/ Examinations.
4.	PMS(BS-20) as per detail at Schedule-II.	NIL	-	By promotion on the basis of selection-on-merit, from amongst PMS officers holding posts in BS-19 and having at least 17 years service against posts in BS-17 and above and have undergone Advance Training Course from NIPA or any other training course prescribed by Government.
5.	PMS(BS-21) as per detail at Schedule-II.	NIL	-	By promotion, on the basis of selection-on-merit from amongst PMS officers holding posts in BS-20 and having at least 22 years service against posts in BS-17 and above and have undergone Course from Pakistan Administrative Staff College/National Defence College or from any other training Institute prescribed by Government.

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17. The Word Schedule-IV replaced by Schedule VII vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

SCHEDULE-II

S.No.	Name of posts	Basic Scale	No. of posts	Total No.
1.	Chief Secretary	21/22	1	9
2.	Additional Chief Secretary.	21	2	
3.	Senior Member Board of Revenue.	21	1	
4.	Chairman Sarhad Development Authority	21	1	
5.	District Coordination Officer, City District.	21	1	
6.	Secretaries, Chairman Governor's Inspection Team/Provincial Inspection Team.	21	3	
7.	Secretaries (Settled/FATA)	20	32	74
8.	Member Board of Revenue-I & II	20	2	
9.	Member, Governor's Inspection Team	20	1	
10.	Member, Provincial Inspection Team	20	1	
11.	Director Staff Training Institute	20	1	
12.	Member Public Service Commission	20	1	
13.	Member Service Tribunal	20	2	
14.	District Coordination Officer.	20	23	
15.	Presiding officer Revenue Appellate Court	20	2	
16.	Vice Chairman Provincial Economy Commission	20	1	
17.	Project Director National Urban Development Project.	20	1	
18.	Director (Finance) Sarhad Development Authority.	20	1	
19.	Managing Director, Small Industries Development Board.	20	1	
20.	General Manager(Finance & Admn.) Forest Development Corporation.	20	1	
21.	Director General cum-Secretary Provincial Earthquake Rehabilitation & Reconstruction Authority.	20	1	
22.	Director General Special Development Unit.	20	1	
23.	Projector Coordinator Provincial Management Unit.	20	1	
24.	Director General Community Infrastructure Project.	20	1	
25.	Additional Secretary	19	34	75
26.	Chief of Section	19	5	
27.	Member, Governor Inspection Team.	19	1	
28.	Member, Provincial Inspection Team	19	1	
29.	Executive District Officer(Finance & Planning)	19	24	
30.	Deputy Director, Provincial Services Academy	19	1	
31.	Presiding Officer Revenue Appellate Court	19	3	
32.	Director General, Prosecution.	19	1	
33.	Director Food.	19	1	
34.	Director, Civil Defence.	19	1	
35.	Registrar, Cooperative Societies.	19	1	
36.	Secretary Provincial Election Commission	19	1	
37.	Deputy Relief Commissioner	19	1	
38.	Political Agents.	18	7	171
39.	Settlement officers.	18	2	
40.	Secretary Public Service Commission.	18	1	
41.	Secretary Board of Revenue.	18	2	
42.	Director Land Record.	18	2	
43.	Administrator Afghan Refugees Organization	18	2	
44.	Deputy Secretary.	18	71	
45.	Assistant Chief, Planning & Development	18	8	
46.	Director Anti Corruption Establishment.	18	1	
47.	Deputy Director Staff Training Institute	18	2	
48.	District Officer (Revenue & Estate)	18	24	
49.	Assistant Coordination Officer.	18	24	
50.	District Officer (Finance)	18	24	

S.No.	Name of posts	Basic Scale	No. of posts	Total No.
51.	Secretary Provincial Transport Authority.	18	1	
52.	Section Officer	17	200	478
53.	Assistant Political Agents.	17	25	
54.	Deputy District Officer (Revenue.)	17	50	
55.	Deputy District Officer (Judicial)	17	30	
56.	Human Resource Development Officer.	17	24	
57.	Secretary District Public Safety Commission	17	24	
58.	Deputy District Officer (Finance)	17	48	
59.	Tehsil Municipal Officer.	17	54	
60.	Secretary District Regional Transport Authority	17	24	
Total:				807

Note

- I. The share of other services of the Province in the Secretariat posts will be 10% in BPS-17 to BS-19 on reciprocal basis which mean that the officers of PMS will also be entitled for posting against equivalent posts @ 10% as reserved for the officers of other services in Secretariat.
- II. The Government may reserve 20% of posts in BS-17 and above for deputation/training/leave.
- iii. ¹⁸Government may resize the Schedule from time to time.

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SCHEDULE – III

The share for distribution between APUG & PMS Officers is as under:-

GRADE/BPS	APUG	PROVINCIAL OFFICERS.
B-21	65%	35%
B-20	60%	40%
B-19	50%	50%
B-18	40%	60%
B-17	25%	75%

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¹⁹Schedule IV

*Training Module for
Provincial Management Service, ²⁰[Khyber Pakhtunkhwa] officers*

(52 weeks Training including five weeks for study tours)

Module 1:	Public Administration	(Three weeks)
Module 2:	Public Administration in Islam	(Two weeks)
Module 3:	Human Rights	(Two weeks)
Module 4:	Secretariat - Office Management	(Six weeks)

18. Note III added vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

¹⁹ . Schedule IV added vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

²⁰ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

Module 5:	Financial Management & Planning	(Three weeks)
Module 6:	Development Economics	(Three weeks)
Module 7:	Project Management	(Three weeks)
Module 8:	Local Governments	(Six weeks)
Module 9:	FATAs administration	(Eight weeks)
Module 10:	E-Government	(Three weeks)
Module 11:	Revenue Administration	(Eight weeks)

Assignments

Note: The duration of modules only indicates the time given to them five lectures per day of one hour each, five days a week. Ofcourse lectures on different modules will be clubbed together to make a daily regimen so that participants' interest is maintained.

Module 1:	Public Administration	(Three weeks)
a)	Decision making.	
b)	Communication	
c)	Time & Stress management.	
d)	Group dynamics – Team building	
e)	Organizational leadership	
f)	Managerial skills	
g)	Concept of public administration in Islam.	
h)	The essential characteristics of public administration in Pakistan.	
i)	Administration of Justice.	
j)	Separation of judiciary from executive.	
k)	Concept of police – magistracy.	
l)	Responsibilities for law & order in the changed scenario	
m)	Administration & development.	
n)	Role of bureaucracy under changed circumstances.	
o)	Crises management	
p)	Public Policy	
q)	Personnel Management	
r)	Accountability	
s)	Administrative Law	
	a. Introduction, definition of Public Administration	
	b. Nature and functions of Administration: Quasi-legislative, Quasi-judicial and pure Administration	
	c. Judicial check on administrative actions	
	d. Rules of Natural Justice: Minimum procedural requirements to be followed by administrative authorities	

Module 2:	Public Administration in Islam	(two weeks)
1)	<i>Ruboobiat-e-Khudawandi</i>	
2)	<i>Risalat</i>	
3)	The rights and duties of a citizen in an Islamic State	
4)	Concept of <i>Adl</i> (Justice) in Islam	
5)	Moral Values in Islam	
6)	Concept of Administrative Accountability in Islam	
7)	<i>Taqwa</i>	
8)	Responsibility of Ruler in Islam	
9)	Case study of governance practices of the Prophet and the four caliphs	
10)	<i>Shariah</i> – Definition, Sources and Historical evaluation	
11)	<i>Huddud – taazerat</i>	
12)	Islamic Law of Evidence	
13)	Islamic Law of Inheritance	
14)	Islamic Legal Maxims	

Module 3:	Human Rights	(Two weeks)
1)	Fundamental Human Rights – An Islamic appraisal	

- 2) Human Rights – historical perspective
- 3) UN Charter and the Declaration of Human Rights
- 4) International Law with special reference to rights of:
 - (i) Prisoners of War
 - (ii) Refugees
 - (iii) Asylum Laws
- 5) Human rights and fundamental rights – comparative analysis
- 6) Provisions under Constitution of Pakistan
- 7) Rights of Women – A comparative view
- 8) Women Protection Act – analysis
- 9) Child bonded labour and human rights
- 10) Juvenile Laws
- 11) Jail Laws – An introduction

Module 4: Secretariat - Office Management (Six weeks)

- 1) Office Management – an Introduction
- 2) Organization & Method – significance in government business
- 3) Government of ²¹[Khyber Pakhtunkhwa] Organogram – various Administrative, regulatory setups
- 4) Coordination mechanisms between administrative authorities, Departments, attached Departments and autonomous, semi-autonomous bodies
- 5) Charter of duties of different government departments – devolved and non-devolved with special Introduction to regulatory Departments – Finance, P&D, Law and Establishment
- 6) Role of Executive, Legislature and Judiciary
- 7) Establishment laws
 - i) Government of India Act, 1935
 - ii) Constitution of Pakistan – Historical analysis and important provisions
 - iii) ²²[Khyber Pakhtunkhwa] Civil Servants Act, 1973
 - iv) ²³[Khyber Pakhtunkhwa] Rules of Business, 1985
 - v) (Appointment, Promotion and Transfer) Rules, 1989
 - vi) Removal from Service Ordinance, 2000
 - vii) Manual of Secretariat Instructions, Appeal and Conduct Rules
 - viii) Court cases – time limitations and procedure
 - ix) Revised Leave Rules, 1981
 - x) Policies – Recruitment, Postings / Transfers, Deputation, Surplus Pool
 - xi) Performance Evaluation Reports – Rules and policy
 - xii) Delegation of Powers Rules
 - xiii) Anti Corruption laws – NAB Ordinance
 - xiv) PATA regulations and *Sharie Nizam-e-Adal* Regulations
 - xv) Relevant Sections of CrPC, CPC & PPC, *Qanoon-e-Shahadat*
 - xvi) Local and Special Laws
 - xvii) Judgement writing
 - xviii) Medical Jurisprudence
 - xix) Official Secrets Act

Module 5: Financial Management & Planning (Three Weeks)

- 1) Financial Provisions of 1973 Constitution
- 2) The National Finance Commission Award
- 3) National Economic Council
- 4) Budget (preparation, implementation & accounting)
- 5) Provincial and federal budget
- 6) Revenue receipt, expenditure and chart of classification
- 7) Private versus public finance
- 8) why do we borrow & what is default and re-scheduling of loans
- 9) Role of IMF, ADB & World Bank and its impact on our economy
- 10) Financial disciplines overview

²¹ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

²² Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

²³ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

- 11) Public finance & accountability
- 12) General principles / rules for handling cash by government servants
- 13) Financial Rules
- 14) Delegation of financial powers
- 15) Control over expenditure
- 16) Maintenance and reconciliation of accounts
- 17) Audit and settlement of audit objections / paras
- 18) The Public Accounts Committee (PAC)
- 19) The Departmental Accounts Committee (DAC)
- 20) Role of Auditor General and Accountant General
- 21) The Net Hydel Profit – ²⁴[Khyber Pakhtunkhwa]’s case in light of Arbitration Award

Module 6: Development Economics (three weeks)

- 1) Fundamental economic concepts and key terms.
- 2) Fiscal policy and public sector borrowing.
- 3) Sustainable development with special reference to Pakistan.
- 4) Issues in development planning
- 5) Participatory development strategies and techniques
- 6) Human resource development.
- 7) Issues in international trade and finance
- 8) Gender and development
- 9) Systematic approaches and rural planning.

Module 7: Project Management (three weeks)

- 1) Plan, programme and projects
- 2) Identification and valuation of costs and benefits
- 3) Cost effectiveness analysis
- 4) Monitoring of evaluation of development projects
- 5) Impact analysis
- 6) Network analysis – PERT / CPM for project management
- 7) Project concept and project cycle
- 8) PC-II, PC-I, PC-IV
- 9) Importance of project appraisal

Module 8: Local Governments (six weeks)

- 1) Introduction
- 2) History and rationale of LG system internationally
- 3) Leading local government systems in the world
- 4) History and rationale of Local Government system in Pakistan
- 5) Comparison of the three LG systems in Pakistan
- 6) Local Government Ordinance, Rules of Business and Laws
- 7) Three tiers i.e. District, Tehsil and Union Council
- 8) Powers of the Provincial & District Governments under the LGO
- 9) The non-devolved & devolved Departments
- 10) Local Government Commission
- 11) The District Nazim and the District Council – election, powers and functions
- 12) The Tehsil and the Union Council – election, powers and functions
- 13) Functions – DCO, EDO, TMO and Secretary Union Council
- 14) District Nazim and DCO – comparison of functions and responsibilities
- 15) Police in the Local Government – CCCP , DPO
- 16) The District Public Safety Commission
- 17) Citizens’ Community Boards
- 18) Developmental Authorities

²⁴ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

- 19) The Provincial Finance Commission – Award to District Government
- 20) The relationship between province and districts – development schemes and law & order
- 21) Direct funding of development schemes by the Federal Government

Module 9: FATAs administration (eight weeks)

- 1) History and geography / topography of FATA
- 2) Constitutional Provisions regarding administration of FATA
- 3) FATA Administration – holistic view
- 4) Organogram and working of Civil Secretariat FATA and FDA
- 5) Frontier Crimes Regulations (FCR)
- 6) Maintenance of Law & Order
 - (a) Anti-narcotics and anti-smuggling
 - (b) Raids conducting
 - (c) Relationships of Political officers with Frontier Corps and other Law Enforcing Agencies
 - (d) Action against anti-social elements
- 7) Institution of Jirga
 - (a) Introduction
 - (b) Constitution and verdict of jirga
- 8) Appellate Courts
- 9) Powers of ADM/DM i.e. APA / PA
- 10) Selection, execution and monitoring of Development Schemes
 - (a) Capacity building of Political Offices as well as of the line Departments
 - (b) Methodology to ensure transparency
- 11) Role of elders / *maliks* / notables in tribal society
- 12) Tribal *Rivaj* (knowledge and practice)
- 13) Aptitude and personality of a Political Officer
- 14) Problems / Pressure Groups and their adept handling
 - (a) Intelligence Agencies
 - (b) Jurisdiction of High Court
 - (c) Media persons
 - (d) Political pressures / illegal approaches
- 15) Political development and social change – new challenges
- 16) Adult franchise and its effect on FATAs – non-Party election
- 17) Difference between FATAs, PATA and FRs
- 18) Relationships of Provl Govt and FATA – President's Order 1972

Module 10: E-Government (Three weeks)

- a) An introduction to Computer and Information Technology
- b) Office automation
 - i) MS Word
 - ii) MS Excel
 - iii) MS Power Point
 - iv) MS Access
- c) Introduction to cyberspace
 - i) The internet
 - ii) E-mail
- d) Introduction to computerization process
 - i) System Analysis
 - ii) System Design
 - iii) Management Information System (MIS)
- e) Model of paper-less office

Module 11: Revenue Administration (eight weeks)

- 1) Basic *Patwar* code with special reference to Land Revenue Manual
- 2) Revenue Officers in Districts and Tehsils - their functions / powers under Land Revenue Act, 1967
- 3) Settlement of land and consolidation of Settlement Manual
- 4) Measurement demarcation assessment and establishment of survey / *khusra* numbers with special reference to *Khatta / Khatoni* etc
- 5) Pre-emption Law
- 6) Transfer of land on mutation as per Land Revenue Act 1967
- 7) Transfer of land / property under Registration Act, 1908
- 8) Revenue Court structure / jurisdiction - Role of Board of Revenue ²⁵[Khyber Pakhtunkhwa]
- 9) Land reforms and Martial Law Regulations
- 10) Settlement and Rehabilitation of Evacuee property and its management
- 11) Revenue Laws
 - i) Land Revenue Act, 1967
 - ii) Registration Act, 1908
 - iii) Settlement Manual
 - iv) Patwar Code
 - v) Land Record Manual
 - vi) Pre-emption Act
 - vii) Family Laws
 - viii) Law of inheritance

Assignments:

- Monthly:** Participants to be given a topic out of the module(s) studied in the last month to carry out research and analysis in shape of a paper
- Quarterly:** Participants to be given a book and a topic for book review and mid-term paper respectively
- Term:** Participants to write a properly researched Term Paper on a topic given by the faculty
- Misc:**
- Four case studies on Establishment matters would be prepared and conducted by the faculty
 - Two case studies on financial and planning matters would be prepared and conducted by the faculty
 - Two case studies on FATAs and Local Governments would be prepared and conducted by the faculty
 - A public speaking exercise / presentation would be arranged thrice in the duration of the Course where each participant addresses the class on a given topic
 - One group discussion at the end of every module would be conducted by faculty focussing on participants' comprehension of the topics of the module
 - An open house forum would be conducted by faculty each month for participants to provide feedback on modules as well as training methodology
 - A questionnaire would be filled by participants assessing the teaching skills of the faculty / guest speakers. The report on that would be submitted to the Government
- Study Tours** One week each (five tours) to Punjab & Sindh

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²⁶Schedule V

²⁵ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

²⁶ Schedule V added vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

ATTACHMENT / UNDER TRAINING PROGRAMME FOR PROVINCIAL MANAGEMENT SERVICE
²⁷**[Khyber Pakhtunkhwa]**

(24 weeks)

Segment 1	Local Governments	3 weeks
Segment 2	Secretariat	3 weeks
Segment 3	FATAs	3 weeks
Segment 4	Revenue	7 weeks
Segment 5	Session Courts	3 weeks

Each segment would be followed by one week in the Provincial Services Academy for assessment purposes.

Segment 1 Local Governments (three weeks)

The UTs will be assigned to the following five groups of offices in Districts:

- (i) District Coordination;
- (ii) Agriculture;
- (iii) Education & Health;
- (iv) Finance & Planning; and
- (v) Works & Services

Objectives:

- (i) To acquaint the UT with general field work, office work of the DCO, protocol arrangements, public regulations, civil defence, disaster management and tehsil administrations;
- (ii) To educate the UT towards understanding the district budget making, planning and financial processes
- (iii) To expose the UT to District Education and Health establishments and community development initiatives, both private and public funded;
- (iv) To acquaint them with the agriculture sector including agriculture (extension), on-farm water management etc
- (v) To educate the UT towards the balance between infrastructure development and its impact on environment
- (vi) To inculcate proper attitude in the UT with regard to interaction with the general public

District Coordination

Matters related to Coordination, Human Resource Management, Tehsil Administration and Civil Defence

Agriculture

Matters related to Agriculture (Extension), livestock, On Farm Management, Soil Conservation, Soil Fertility, Fisheries and Forests

Education & Health

Matters related to Schools, Technical Education, Special Education, Public Health, Child and Women Health, Population Welfare

Finance & Planning

Matters related to Finance & budget, accounts, planning and development, investment promotion

(v) *Works & Services*

Matters related to District Roads and Buildings, Energy, Housing, Urban Planning

²⁷ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

Attachment with Planning & Development Department

Matters relating to:

- (i) Preparation of ADP
- (ii) Processing of Developmental Schemes
- (iii) PDWP, CDWP
- (iv) Foreign Aid
- (v) Technical Assistance
- (vi) Bureau of Statistics

Attachment with Home Department

- (i) Public order and security
- (ii) Administration of Justice / Public Prosecution
- (iii) Arms & Ammunitions
- (iv) Afghan Refugees
- (v) PATA
- (vi) Domicile / nationality certificates
- (vii) Crisis Management

Attachment with Law Department

- (i) Government legislation, Acts, Bills, Ordinances
- (ii) Advice to Government Departments
- (iii) Civil Law & procedure
- (iv) Advocate General office – appointment of AG, Government Pleaders, Special Councils
- (v) Vetting of laws and notifications

The focal point of all these activities would be the Additional Secretary Establishment of E&AD in consultation with the Additional Secretaries of each concerned Department. Each UT would be required to write two assignments containing critical and comprehensive views on working of each Department which will be evaluated by the PSA on return of the UT for one week at the end.

The focal point will then carry out one page assessment of each UT and forward the same to PSA Peshawar.

Segment 3 FATAs (three weeks)

In view of the limited duration of the attachment and keeping in view complexity and vastness of the functions in FATAs the attachment would include:

- (i) Governor's Secretariat Peshawar
- (ii) Civil Secretariat FATA
- (iii) FATA Development Authority; and
- (iv) Agencies & FRs;

Objectives:

- (i) To familiarize the UTs with the channels of decision and communication in respect of Tribal Areas;
- (ii) To acquaint the UTs with the diverse responsibilities, obligations and aspects of government activity with particular reference to FCR, *Maliki* system, *riwaj*, Role of Jirga in civil and criminal cases, Role of Political Agent and Assistant Political Agent;
- (iii) To expose the UT to the working of the Civil Secretariat FATA, its grasp on the law & order in FATA
- (iv) To provide useful learning experience in developmental works in FATAs through the FDA;
- (v) To acquaint the UT in the system of justice in FATA

Attachment with Governor's Secretariat

Matters relating to:

- (i) Governor's exercise of powers in cases relating to ²⁸[Khyber Pakhtunkhwa]
- (ii) Governor's exercise of powers in cases relating to FATAs and his role as Agent to the President
- (iii) *Jirgas* of tribal elders in Governor's House

Attachment with Civil Secretariat FATA

Matters relating to:

- (i) Law & Order
- (ii) Administration & Coordination
- (iii) Finances
- (iv) Health & Education setups in FATAs
- (v) Communications and Agriculture in FATAs
- (vi) Skill Development in FATAs

Attachment with FATA Development Authority

Matters relating to:

- (i) Preparation of ADP
- (ii) Processing of Developmental Schemes
- (iii) CDWP
- (iv) Foreign Aid
- (v) Technical Assistance
- (vi) Role of Army / FWO in execution of development schemes

Attachment in Political Agencies / FRs

- (i) FCR and its practical application
- (ii) *Jirga holding* and *Riwaj following*
- (iii) Collective responsibility concept and its application
- (iv) Law & order including relationship of various agencies including FC, Scouts and Khasadars
- (v) Development at Agency level
- (vi) System of justice
- (vii) Functions of Political Agent, APA, Tehsildar, Khasadar etc

Focal Point:

The focal point of all these activities would be the Additional Secretary Coordination and Administration, Civil Secretariat FATA in consultation with the FDA and Political Agents / DCOs of the Agencies and FRs concerned. Each UT would be required to write two assignments containing critical and comprehensive views on working of various organizations in FATA which will be evaluated by the PSA on return of the UT for one week at the end.

The focal point will then carry out one page assessment of each UT and forward the same to PSA Peshawar.

Segment 4 Revenue (Seven weeks)

The attachment includes both field work and Revenue Department attachment. It also includes disaster management. The broad fields of attachment are as under:

- (i) Revenue offices in Districts & Tehsils
- (ii) Revenue handling at the Board of Revenue
- (iii) Disaster Management and relief including compensation

²⁸ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

Objectives:

- (i) On ground training in settlement including preparation of revenue record
- (ii) UT to develop ability to independently inspect *Patwar's* work, Field *Kanoong's* work, Tehsil Office *Kanoong's* work etc
- (iii) To acquaint UT with adjudication of tenancy cases and partition cases
- (iv) To impart revenue field-training and hands on experience in preparing, monitoring and inspection of revenue documents and records
- (v) To enable the UT to understand the provincial disaster management strategy and the relief aspect of working of Revenue officials including damage assessment and compensation

Attachment with Board of Revenue

Matters relating to:

- (i) Revenue laws including Land Revenue Act 1967
- (ii) Revenue Courts structure including jurisdiction and role of Board of Revenue
- (iii) Adjudication of Appeals lying before the Senior Member
- (iv) Settlement and Rehabilitation of Evacuee property and its management

Attachment with District Officer Revenue

- (i) To introduce the UT to Revenue Settlement including preparation of revenue record
- (ii) To acquaint the UT with independent inspection of Patwari's work, Field Kanoong's work, Tehsil Office Kanoong's work etc
- (iii) To acquaint UT with adjudication of tenancy cases and partition cases
- (iv) To impart revenue field-training and hands on experience in preparing, monitoring and inspection of revenue documents and records
- (v) Measurement demarcation assessment and establishment of survey / *khusra* numbers with special reference to *khatta / khatoni*
- (vi) To introduce the UT to mode and procedure for transfer of land and property under Registration Act, 1908
- (vii) Acquisition of land under the Land Acquisition Act, 1894

Attachment with Provincial Relief Commissioner

- (i) Role of PRC in disaster management – disaster management strategy of the Provincial Government
- (ii) Damage assessment – life, property and crops – declaration of calamity hit areas
- (iii) Calculation of compensation and its dispensation to the affectees
- (iv) Role and support of federal government in disasters / crisis
- (v) Case study of the earthquake of Oct 2005

Focal Point:

The focal point of all these activities would be the Secretary Board of Revenue in consultation with the DORs of the Districts concerned and the Deputy Relief Commissioner ²⁹[Khyber Pakhtunkhwa]. Each UT would be required to write two assignments containing critical and comprehensive views on methodology and procedure of various revenue related functions which will be evaluated by the PSA on return of the UT for one week at the end.

²⁹ Subs. by Khyber Pakhtunkhwa Act No. IV of 2011.

The focal point will then carry out one page assessment of each UT and forward the same to PSA Peshawar.

Segment 5 Court affairs (three weeks)

- (iv) The attachment includes observance of court work at Sessions and subordinate levels.

Objectives:

To acquaint the Under Training officers with Court work and the delineation of judiciary from the executive.

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³⁰ **Schedule VI**
Departmental Examination

Last week of Training will also include written examination and finalization of marks based on the following outline:

Written Test (Modules plus UTship)	50 Marks
Various Assignments during Training	30 Marks
Reports / Exercises during UTship	20 Marks
Total	100 Marks

Note:

Passing marks	50 Marks
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³¹ **SCHEDULE - VII³²**

The Syllabus and standard for the Competitive Examination for the Provincial Management Service shall be as under :

1. The Examination shall include compulsory and optional subjects, and every candidate shall take all the compulsory subjects and opt for three of the optional subjects carrying 600 marks in all but not more than 200 marks from a single group.
2. A candidate shall answer the language papers in the language concerned. The question paper in Islamiat is to be answered in Urdu or English. All other papers must be answered in English. Violation of this instruction shall incur cancellation of the concerned paper(s) and consequently award of Zero.
3. The compulsory and optional subjects and maximum marks fixed for each subject shall be as below:

<u>COMPULSORY SUBJECTS</u>		
Sr. No.	Subjects	Maximum Marks
1	English (Précis & Composition)	100
2	English Essay	100
3	General Knowledge	

³⁰. Schedule VI added vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 12.11.2007

³¹. Schedule IV re-numbered as Schedule-VII vide Establishment Department Notification No. SOE-III. (E&AD)3-5/2007/(PMS) Dated 12.11.2007

³². Schedule VII revised vide Establishment Department Notification No. SOE-III(E&AD)3-5/2007/(PMS) Dated 24.11.2007

	(a) Current Affairs	100	
	(b) Every Science	100	300
	(c) Pakistan Affairs	100	
4	Islamiat		100
5	Viva Voce		300
	Total		900

The non-Muslim candidates will have the option to take Islamiat as a compulsory subject or otherwise Pakistan Affairs (General Knowledge Paper-III) will be treated of 200 marks and counted in lieu of Islamiat.

A candidate who fails to appear in any of the compulsory paper will not be allowed to appear in the remaining papers of the examination.

No candidate shall be summoned for Viva voce test unless he has obtained at least 33 percent marks in each optional paper, 40% in the each compulsory paper and 50% marks in the aggregate of the written portion of the Examination.

No candidate shall be considered to have qualified the examination unless he also obtains at least 40% marks in Viva voce. Failure in or absence from Viva Voce shall mean that the candidate has failed to qualify for appointment and his name will not be included in the merit list.

OPTIONAL SUBJECTS

The candidates are required to select optional subjects carrying a total of 600 marks, but not more than 200 marks from a single group (The grouping of optional subjects are as under):

Rules	Subjects (Code No.)	Subjects	Marks	
Note: Business Administration Cannot be opted in combination with Public Administration	5	Accountancy & Auditing	200	
	6		Economics	200
	7		Business Administration	100
	8		Public Administration	100
Group 1				
Group 2	9	Political Science	200	
	10	Agriculture	100	
	11	Forestry	100	
	12	Sociology	100	
	13	Journalism	100	
Group 3	14	Pure Mathematics	200	
	15	Applied Mathematics	200	
	16	Computer Science	100	
	17	Statistics	100	
Group 4	18	Physics	200	
	19	Geology	200	
	20	Geography	200	
	21	Chemistry	200	
	22	Botany	200	
	23	Zoology	200	
Group 5	24	Islamic History & Culture	200	
	25	History of Pakistan & India	200	
	26	British History	200	
	27	European History	200	
	28	History of the U.S.A.	100	

Note: International Law cannot be opted in combination with International Relations: Group 6	29	Law Constitutional Law Mercantile Law Muslim Law & Jurisprudence International Law International Relations	200
	30		100
	31		100
	32		100
	33		100
	34		100
Group 7	35	Philosophy Psychology including experimental Psychology	200
	36		200
Group 8	37	English Literature Persian Arabic Pushto Urdu	200
	38		200
	39		200
	40		100
	41		200

**Provincial Management Service Competitive Examination
(Guidelines of the Syllabus)**

N.B – The topics mentioned under each subject are only indicative and not exhaustive of the field covered by that subject. The candidate should study the whole subject with the help of relevant books.

1. ESSAY (COMPULSORY)

Total Marks – 100

Candidates will be required to write one or more essays in English. A wide choice of subjects will be given.

**2. ENGLISH (PRÉCIS & COMPOSITION)
Compulsory**

Total Marks – 100

The examination will be based upon a paper carrying 100 marks and will be geared to test the candidates' ability to handle grammatical structure, reading comprehension and analysis and précis writing and composition.

A candidate should be capable of:

- Using English correctly and efficiently as a vehicle of communication.
- Reading, comprehending and analyzing advanced texts

Grammar and Vocabulary

The candidate's ability to handle the structure of English will be tested by framing items based upon grammatical categories that usually create problems for foreign students. There shall be no prescribed course for this purpose.

Reading Comprehension and Analysis

Two unseen passages shall be given with a fixed reading time and multiple choice questions would be placed at the end to be answered. The passage for comprehension shall be fairly technical. The passages would be selected from writings on economic, social, cultural subjects and international affairs.

Précis Writing

The candidates will be required to present an acceptable précis of a given passage. The unseen passage will be selected from current, economic, social, cultural and international affairs.

3. GENERAL KNOWLEDGE

Total Marks – 300

Paper I

Every Day Science (Compulsory)

Marks – 100

1. Introduction

Nature of Science: Brief History of Science with special reference to contribution of Muslims in the evolution and development of science. Impact of Science on society

2. The Physical Sciences

- (a) Constituents and Structure:- Universe, Galaxy, Solar system, Sun, Earth, Minerals
- (b) Processes of Nature:- Solar and Lunar Eclipses; Day and Night and their variation;
- (c) Energy :- Sources and resources of Energy, Energy conservation;
- (i) Ceramics, Plastics, Semiconductors;
- (ii) Radio, Television, Telephones, Camera, Laser, Microscope
- (iii) Computers, Satellites;
- (iv) Antibiotics, Vaccines, Fertilizers, Pesticides

3. Biological Sciences

- (i) The basis of life – the cell, chromosomes, genes, nucleic acids
- (ii) The building blocks – proteins, hormones and other nutrients. Concept of balanced diet. Metabolism
- (iii) Survey of Plant and Animal Kingdom – a brief survey of plant and animal kingdom to pinpoint similarities and diversities in nature
- (iv) The Human body – a brief account of human Physiology and Human behaviour

Paper II**Current Affairs (Compulsory)**

Marks – 100

Candidates will be expected to display such general knowledge of History, Geography and Politics as is necessary to interpret current affairs

- 1. Pakistan's relations with its neighbours
- 2. Pakistan's relations with Middle Eastern, African and Far Eastern Countries
- 3. Pakistan's relations with big powers
- 4. International Economic Issues and Pakistan
- 5. Pakistan's role in regional and international organizations
- 6. Nuclear politics in South Asia
- 7. Structure of Pakistan's economy, economic planning and development strategies
- 8. central issues and problems in the Educational Systems
- 9. Issues in Pakistan Politics
- 10. Superpowers and the issues of World Order
- 11. Major Contemporary Crisis
- 12. Major Economic, Social and Political issues of the world as reflected and discussed in periodicals and newspapers

Paper III**Pakistan Affairs (Compulsory)**

Marks – 100

- 1. Evolution and growth of Muslim society in the Sub-continent
- 2. Ideology of Pakistan – Definition and elucidation, historical aspects: Muslim rule in the sub-continent, its downfall and efforts of Renaissance. Movements for reforms – Sheikh Ahmad Sarhindi, Shah Waliullah, Aligarh, Deoband, Nadwah, Anjuman Hamiat-e-Islam and other Educational institutions – Sind Madrassah and Islamia College Peshawar. Ideology of Pakistan in the light of speeches and sayings of Allama Iqbal and Quaid-e-Azam.
- 3. Pakistan Movement – historical developments, important events, role of various individuals, communities and groups.
- 4. Political Developments in Pakistan since 1947 and efforts for promulgation of Islamic system
- 5. Land and People of Pakistan – Geography, Society, Natural resources, Agriculture, Industry, Education with reference to characteristics, trends and problems

4. ISLAMIAT (COMPULSORY)

Total marks – 100

1. Basic problems of human life and their solutions, various sources of knowledge – revelation (Wahy) as source of knowledge and solution of human problems. Divinity and Supremacy of wahy
2. Need of Religion and its role in human life, Islam and other religions
3. Islam: Its concepts and meanings, Deen and Mazhab, Islamic concepts of universe and humanity, place of Humanity in Islam, man as Vicegerent of Allah, Chief Characteristics of Islamic Ideology
4. Fundamental beliefs and practices of Islam
 - (a) Tauheed (Unity of Allah), Risalat (Finality of Prophet hood), Akhirat (Day of Judgment)
 - (b) Salat, Soum, Zakat, Hajj, Jihad
5. Islamic way of life
 - (i) Sources of Shariah: The Quran, Sunnah, Ijma (Consensus), Qiyas and Ijtihad (Reasoning)
 - (ii) Social system in Islam: Responsibilities and mutual relationship of members of family, separate role of man and woman in an Islamic social setup, concept of women's freedom in Islam, responsibilities of man and woman in character-building of new generation
 - (iii) Morality in Islam: Concept of morality, relationship of morality and Faith, Islamic principles and methods of character building, Moral values in Islam
 - (iv) Islamic political system: - Legislative system, Judicial system
 - (v) Muslim ummah: Role and objectives of Muslim Ummah
6. Quranic Ayat and their translation

Following last 10 surrahs of the Holy Quran and their translations:-

 1. Surrah Al-Feel
 2. Surrah Al-Quresh
 3. Surrah Al-Mamoon
 4. Surrah Al-Kausar
 5. Surrah Al-Kafaroon
 6. Surrah Al-Nasr
 7. Surrah Al-Lahhab
 8. Surrah Al-Akhlas
 9. Surrah Al-Falak
 10. Surrah An-Nas

5. ACCOUNTANCY AND AUDITING

Total Marks – 200

Paper I

Marks – 100

Accounting: Principles of accounting and their applications to all types of Business Organizations – Banking, Insurance, Investment, Trading and Industrial Concerns, Accounting for non-profit Organizations, Work-Sheet, Financial Statements, Financial Reporting, Financial Analysis And Budgeting, Depreciation, Partnership

Note:- Accounting for Executors, Trustees Of Deceased Persons, Liquidators, Receivers, Official Agencies, Assignees etc; and accounting for Multinational Corporation will not be included

Paper II

Marks – 100

Cost Accounting: Principles of cost accounting, relationship of Cost Accounting To Financial Accounting, Cost Accounting as a tool of management – use of cost information, Cost Flow, Cost Elements, Costs Classification, Process Cost And Job – Order Cost Accounting, Costing For Joint and by-products, Standard Cost Accounting, reconciliation of Financial Accounts with Cost Accounts

Auditing: Principles of Auditing, The Accounting System, Its importance to Independent Audit, Internal Control, Internal Audit, Rights and Duties of Auditors, Professional liabilities of an Auditor, Application of Auditing Principles and Techniques to all types of Trading, Commercial, Industrial, Banking, Insurance and Investment undertakings. Audit programme, Special Audit Investigation of actual or suspected Frauds, Limitations Of Audit, Audit Report, Certificates and Opinion as required under Companies Act, Securities Exchange Authority Rules, Auditing and EDP Systems

Income Tax: Principles for Computing total income and total world income for the purposes of Income Tax, Self Assessment.

Specialized knowledge of Income Tax will not be expected. Candidates will be required to have a sound grasp of the provisions of Section 10 of the Income Tax Act and a working knowledge – only of Sections 9(1), 15, 16(1), 17(1), 19(1),(2),(a), 30(1) & (2), 31(1) 11 No. Schedule (Item No. 66 & 71 to 75) 39(1) & (a) 49, 69 (4) 12 (11). 1st Schedule 53(1), 55(1), 56, 61, 59(1), 60, 62, 68, 12(2) and the connected rules of the Income Tax Ordinance 1979 as amended to date.

Business Organization and Finance: Nature and scope of Business Organization, Forms of Business Organization – Sole Proprietorship, Partnership, Joint Stock Company, Cooperative Society, Company Promotion and Management, Insurance, Business Combinations, Principles Of Business Finance – Short Term, Intermediate Terms and Long Term Financing, Expansion and Contraction, Ratio Analysis – Sources and Flow Statement, Role of Financial Institutions

6. AGRICULTURE

Total Marks – 100

- (a) Natural Resources (Land, Water, Biological, Environmental, Solar and Energy) as bases for agricultural production. Agriculture as integrated system of components like Crops, Livestock, Fisheries, Forestry, Range Management, Socio-Economics etc. Role of research and newer technologies in current and future agriculture in Pakistan.
- (b) Elements of climate and their relationship with crop growth, Factors of soil, Soil formation and development of Soil profile, Soil texture and structure and their management, Soil fertility and fertilizer requirement of various soils and crops, Role of organic matter in soil, Water requirement of crops and water use efficiency, Cropping pattern and crop relations, Systems and types of farming; Nature, formation and reclamation of salt affected and water-logged soil, Soil erosion and conservation
- (c) Physiology of growth and development, growth curves, growth regions, RGR, NAR and LAR in relation to biomass production, Seed growth and assimilate partitioning, Harvest Index, Photoperiodic and thermo periodic responses of crop plants, photorespiration, Nitrogen fixation, Nitrogen cycle, factors affecting biological N-fixation
- (d) The modern concept of genetics, gene and gene function, application of genetics for the improvement of crops
- (e) Modern concept of Horticulture industry, Plant propagation, Major management and breeding problems in fruits and vegetables
- (f) Pests and diseases in agricultural crops, Principles and methods of pest and disease control, Pesticides – their application and action. Modern concept and principles of insect pest management
- (g) Role of agriculture in the national economy. Agriculture mechanization. Land tenure and Land reforms. Population problems of rural Pakistan. Major issues in agriculture and agricultural development in Pakistan.

7. APPLIED MATHEMATICS

Total Marks – 200

Paper I

Marks – 100

Candidates will be asked to attempt any two questions from Section A and any three questions from Section B

Section A

Vector Analysis: Vector algebra, scalar and vector product of two or more vectors, function of a scalar variable, Gradient, divergence and curl, Expansion formulae, curvilinear coordinates. Expansion for gradient, divergence and curl in orthogonal curvilinear coordinates, line, surface and volume integrals, Green's, Stoke's and Gauss's theorems

Statistics: Composition and resolution of forces, Parallel forces and couples, Equilibrium and a system of coplanar forces, centre of mass and centre of gravity of a system of particles and rigid bodies, Friction, principle of virtual work and its applications, equilibrium of forces in three dimensions

Section B

Dynamics: Tangential, normal, radial and transverse components of velocity and acceleration, rectilinear motion with constant and variable acceleration, Simple Harmonic Motion, Work, Power and Energy,

Conservative forces and principles of energy, principles of linear and angular momentum, Motion of a projectile, ranges on horizontal and inclined planes, Parabola of safety, Motion under central forces, Apse and apsidal distances, Planetary orbits, Kepler's law, Moments and products of inertia of particles and rigid bodies, kinetic energy and angular momentum of a rigid body, Motion of rigid bodies, Compound pendulum, Impulsive motion, collision of two spheres and coefficient of restitution.

Part II

Marks – 100

Candidates will be asked to attempt any two questions from Section A, one question from Section B and two questions from Section C.

Section A

Differential Equations: Linear differential equations with constant and variable coefficients, Non-linear equations, Systems of equations, Variations of parameters and the power series method.

Formation of partial differential equations, Types of integrals of partial differential equations, Partial differential equations of first order, Partial differential equations with constant coefficients, Monge's method, Classification of partial differential equations of second order, Laplace's equation and its boundary value problems, standard solution of wave equation and equation of heat induction.

Section B

Tensor: Definition of tensors as invariant quantities. Coordinate transformations, Contra variant and covariant laws of transformation of the components of tensors, addition and multiplication of tensors, contracts and inner product of tensors, The Kronecker delta and Levi-Civita symbol, the metric tensor in Cartesian, polar and other coordinates, covariant derivatives and the Christoffel symbols., The gradient, divergence and curl operators in tensor notation.

Section C

Elements of Numeric Analysis: Solution of non-linear equations, use of $x = g(x)$ form, Newton Raphson method, Solution of system of linear equations, Jacobi and Gauss-Seidel method, Numerical Integration, Trapezoidal and Simpson's re?? Regula Falsi and iterative method for solving non-linear equation with convergence, Linear and Lagrange interpolation, graphical solution of linear programming problems.

8. ARABIC

Total Marks – 200

Paper I

Marks – 100

1. The Pre-Islamic Arabic Literature
2. The Quran, its language, contents and style, its influence on the subsequent literature
3. Quranic semantics and etymology with special reference to Ibn Manzoor's Lisan al'Arab and Raghib al-Asfahani's Mufradat fi Gharib al-Quran
4. Literary history and literary criticism – literary movements, classical background, socio-cultural influences and modern trends, origin and development of modern literary genres, including drama, novel, short story, essay
5. Contribution of Arabs in the fields of science, philosophy and linguistics with special reference to views of Ibn Khaldun, Al Bairuni, al-Jahiz, Ibn Maskawaih, Ibn Maja, Al-Kasai and Sebawaih
6. A short introduction to Pakistan Arabic literature in the fields of prose and poetry
7. The contemporary Arabic literature in Egypt, Lebanon and Iraq with special emphasis on the literature of al-Mahjer and its outstanding representatives such as Jabran Khalil Jabran, Ilia Abu Mehdi, Mekhail Naeema and Umer Abu Risha
8. A short Essay in Arabic

This paper will require first hand reading of the texts prescribed and will be designed to test the candidates' critical ability

Paper II

Marks – 100

Poetry

1. Imarul Qais: His Maullaqah – "Qifaa Nabki mim Zakraa Habibin Wa Manzih" (complete)
2. Zohar Bin Abi Sulma: His Maullaqah – "A Min Umma Afaa Dimnatun Lam Takalami" (complete)
3. Hassan Bin Tabit: The following five Qasa'id from his Daiwan: "Lillahi Darru Kaaba ----- Nadamtuhum"
4. Labeed: Aftiddiyaru Mahalluha Wa Maqammuha Mahmud Timur: Story "Ammi Mutawalli"
5. Taufiq AL-Hakim : Dramas: Sirrul Muhtahiraa from his Book "Masra-Hiyaatu Jufiqal Hakim"
6. Dr. Raza M.N Ehsan Elahie: Nafais al-Adab , [PUBA (Hon) Course]
7. Dr Jalal-al-Khayyat and others: Jarikh-ul-Abad-il-Arabi-il-Hadith
8. Dr Taha Hussain: Hadith al-Arabia
9. Isa an-Na'uri: Adab al-Mahjer
10. George Saidah: Adabuna wal-Udaba fi Adab al-Mahjer
11. Dr De Boer: The history of philosophy in Islam

Note: Candidates will be required to answer some questions carrying not less than 25 % marks in Arabic also.

9. BOTANY

Total Marks – 200

Paper I

Marks – 100

1. Thallophytes
 - a. Phycology: Origin, evolution, distribution and classification with reference to range, structure, life history, ecology and economic importance of the main groups of algae
 - b. Mycology and Plant Pathology Structure, development reproduction, classification, phylogeny, physiology and economic importance of the main groups of fungi, Diseases of economic importance and general principles of their control
2. Bryology: Evolution of gametophytes and Sporophytes
3. Pteridophyta and Gymnosperms: General structure, life history and evolutionary tendencies, Ontogeny and structure of seed
4. Anatomy and Embryology: Primary and secondary issues, Meristems, tissue differentiation, normal and abnormal secondary growth, anatomy of leaf, stem and root, micro and megasporogenesis, pollination mechanism, fertilization, development of embryo and endosperm, seed dispersal
5. Taxonomy of Angiosperms: Systems of classification, Rules of botanical nomenclature, Concepts of speciation, introduction to modern trends in plant taxonomy, Bio-systematics, chemotaxonomy and numerical taxonomy

Paper II

Marks – 100

1. Plant physiology: Plant water relations, osmotic quantities, absorptions, transpiration, role of essential mineral elements, their uptake and distribution, growth and development, plant hormones, photoperiodism, vernalization, Dormancy and Seed germination. Biochemistry of carbohydrates, proteins and fats with reference to plants. Enzymes, plant pigments, photophosphorelation, path of carbon in photosynthesis, oxidative phosphorelation (respiration), nitrogen and fat metabolism
2. Ecology: Influence of climatic, edaphic and biotic factors on plant growth, Sampling techniques, Major formations in relation to climatic zones, Concepts of ecosystems and their productivity, Ecological energetics, efficiency, pyramids, food chains and trophic levels
3. salinity and water logging in Pakistan, causes, reclamation, soil erosion, methods of control and conservation, pollution and conservation of natural resources
4. Cytology: Detailed study of ultra structure of cell. Mitosis and meiosis. Significance of meiosis
5. Genetics:
 - (a) Mendalian Genetics, Linkage, Crossing over, sex linked genes, lethals, balanced lethals, mutation, polyploidy
 - (b) Biochemical Genetics: Bi-chemical nature of hereditary material, genetic code, Fine Structure of gene, transduction and transformation
6. Evolution: Theories of evolution, Neo-Darwinism, Neo-Lamarckism, Adaptive Mutations

10. BRITISH HISTORY

Total Marks – 200

British History – The history of the British Isles and of the British Empire and Commonwealth

Paper I

Marks - 100

From 1688 to 1850**Paper II**

Marks – 100

From 1850 to the present day

Note: - Credit will be given in both the papers, not only for precise presentation of facts, but also for sound critical judgment.

11. BUSINESS ADMINISTRATION

Total Marks – 100

Candidates will be asked to attempt total Five questions. They will attempt at least one question (out of two) from each part. Short note within the question (without choice) can also be given

Part I

Management

1. Nature and scope of Management – Different Schools of thought
2. Planning – Planning process, planning tools, Change Management
3. Organization – Type of Organization, Theory of Organization, Group dynamics, staffing
4. Actuating – Leading, approaches to Leadership – Coordinating, communicating, motivating
5. Controlling – Budgetary control, Budgetary process

Part II

Principles of Marketing

1. An overview of Marketing
2. Marketing's role in Society and inside a Firm
3. Environment of Marketing
4. Strategic Planning and Marketing
5. Marketing Mix i.e. product, Pricing, place (Distribution, Channels), Wholesaling, Retailing, Sales Promotion (Advertising, Public Relations)
6. Global Marketing

Part III

Financial Management

1. Nature and scope of Financial Management
2. interpretation of Financial Statement – Ratio Analysis, Trend Analysis – Common Size Analysis
3. Time Value of Money – Concept of TVM, Net Present Value, Pay Back Period, Internal rate of return
4. Working Capital Management – Cash Management, Receivable Management, Inventory Management
5. Portfolio Management – Types of Investment, Financial Securities, Diversification Of Risk
6. Accounting – Accounting cycles, preparation of Financial Statements, Balance Sheet, Income Statement

12. CHEMISTRY

Total Marks – 200

Paper I

Marks – 100

1. Atomic structure – Quantum theory, Schrodinger equation, Particle in box, hydrogen atom, hydrogen molecule ion, hydrogen molecule, Theories of hydrogen and metallic bonding

2. Electrochemistry – Ionic equilibria, theory of strong electrolytes, Debye-Huckel theory of activity coefficients, galvanic cells, membrane equilibria and fuel cells. Theories of Acids and Bases, glass electrode, measurement of pH, electrolysis, over voltage and corrosion
3. Thermodynamics – First law of Thermodynamics, internal energy, enthalpy functions, thermochemistry, Entropy and second law of thermodynamics. Free energy and chemical equilibrium
4. Chemistry of the following Elements – Oxygen, Carbon, Chlorine, Silicon, Nitrogen, Phosphorus
5. Metallurgy of the following Elements - Copper, Aluminum, Iron and Silver
6. Inorganic Chemical Industries – Sulphuric Acid, Fixation of Nitrogen, Chemical Fertilizers, Semi-conductivity devices, Cement, Glass and Ceramics
7. Chemistry of transition Elements – General characteristics of the group based on the electronic configuration of elements, complex compounds, nature of coordinate bond, historical development, applications of Valence Bond, molecular orbital and Crystal Field theories to explain the structures of the Complex Compounds
8. Pollution – water, air

Paper II

Marks – 100

1. Theory of chemical bonding – Elements of Valence bond and molecular orbital theories (idea of bonding, non-bonding and anti-bonding orbitals), Sigma and Pi bonds. Hybridization, Shape of molecules
2. Chemical kinetics – Rate law and its determination Order of reaction, Experimental methods, Temperature Dependence of rate constants, study of mechanism of a few selected reactions (1st and 2nd under reaction only)
3. Surface chemistry and catalysis – Physical adsorption and chemisorptions, surface area determination, homogeneous and heterogeneous catalysis, acid-base and enzyme catalysis
4. Physical organic chemistry – elements of organic reaction mechanism, optical and geometric isomerism, conformational analysis, resonance. H-Bond and its effects on the properties of organic compound
5. Organic halogen Compounds – Types and synthetic application. Grignard reagents.
6. Chemistry of Carbonyl compounds – Types of Carbonyl compounds, preparation and reactions of Aldehydes and ketones
7. Aromatic chemistry – structure of Benzene with particular reference to mechanism of Electrophilic Substitution reactions
8. Organic Nitrogen compounds – Diazonium salts and their synthetic applications, preparation and reaction of aromatic amino compounds, introduction of the study of Dyes with particular reference to Azodyes
9. Chemistry of natural products – Elementary study of Carbohydrates, oils and fats, alkaloids and vitamins
10. Industrial organic Chemistry – Organic polymers, fermentation processes including preparation of anti-biotics, petro-chemical industry

13. COMPUTER SCIENCE

Total Marks – 100

Candidates will be asked to attempt total five questions. They will attempt at least one question from each section. Each question will carry 20 marks.

Section A

Computer Architecture: Introduction to modern machine Architecture, Storage Hierarchy, Main / Virtual / Cache / Secondary memory, CPU, ALU, Peripheral communication, designing of instruction set, stored programme concept, introduction to parallel computing, SIMD / MIMD

Operating system: Functions / Types of operating systems, Processes, Interprocesses, Communication / Synchronization / Coordination, Process Scheduling Policies, Visual Memory Management Techniques, Paging / Segmentation, File Management Systems

Computer Networks: LAN / WAN / MAN, communication channels, internetworking, internet, network layer structure, ISO Internet Protocol, OSI / TCP / IP reference model

Section B

Structured and Object Oriented Programming

Basics of C/C++ environment, memory concepts, operators, control structures, selection structures, Array & functions / methods, classes & data abstractions, inheritance and polymorphism

Data Structures and Algorithms

Pseudo language, functions, iteration, recursion, time / complexity analysis, stacks queue, hashing, linked list, searching, sequential, binary, sorting algorithms, graphic algorithms, tree algorithms, trees, ADTs, implementation using structured / object oriented languages

Software Engineering

Introduction to software engineering, software life cycle, software design methodologies, structured / object oriented, software documentation and management, introduction to CASE tools

Section C

Database Management

Data, Models, E R Models, Relational Database concepts, SQL normalization, Database Design

Web Programming

HTML, CGI, PERL, JAVA, Applet / Script, WWW, Web based interface design

Computer Graphics

Fundamentals of input, display and hard copy devices, scan conversion of geometric primitives, 2D and 3D geometric transformations, clipping and windowing, scene modeling and animation, algorithms for visible and surface determination

14. CONSTITUTIONAL LAW

Total Marks – 100

Constitutional law – Principles of constitutional law with special reference to United Kingdom, United States of America, France, former Union of Soviet Socialist Republic, Pakistan and India

15. ECONOMICS

Total Marks – 100

Paper I

Marks – 100

1. Micro Economics: Consumer Behaviour, Determination of market demand and supply, theory of the Firm, producer's equilibrium pricing of the factors of production
2. Macro Economics: Basic economic concepts, National Income Accounting, consumption function and multiplier, determination of equilibrium level of income and output, inflation
3. Money and banking: Functions of money, Quantity Theory of money, the Fisher and Cambridge Formulations, systems of note issue, credit creation, functions and central banks, instruments of credit control, Theory of Liquidity Preference
4. Public Financing: Government expenditure, sources of government revenue, types of taxes, incidence of different taxes, public debt, objectives, methods of repayment, deficit financing

- International Trade: Theory of comparative cost, arguments for protection, balance of payments, international liquidity, international money and banking institutions

Paper II

Marks – 100

Pakistan's Economy

- Definition and measurement of development, characteristics of under development, rethinking on the concept of development, Growth vs. Redistributive Justice, absolute and relative poverty, basic needs approach
- Planning experience of Pakistan: A critical evaluation of the strategy of economic planning
- Agricultural development in Pakistan: Changes in agriculture policies over plan periods, major monetary and fiscal measures to promote agricultural development, Green Revolution strategy and its implications for growth and redistribution, Land Reforms and changes in the tenure system 1950 – 1980, Cooperative Farming
- Industrial development in Pakistan: Early industrialization strategy, creation of Financial and Development Institutions, major monetary and fiscal measures to promote industrial development, changing role of public sector over the plan periods, evaluation of nationalization policy, concentration of industrial income and wealth
- Role of foreign trade and aid in economic development. Trends of Pakistan's Balance of Payments, changes in direction of trade, trends in Pakistan's major exports and imports, causes of significant changes in the trends, the role of migration and remittances in Pakistan's economy, costs and benefits of Foreign Aid
- Privatization, denationalization and deregulation, conceptual and operational aspects, international comparisons

16. ENGLISH LITERATURE

Total Marks – 200

Paper I

Marks – 100

Detailed study of a literary age (19th Century)

The paper will cover the study of English literature from 1798 to 1900 with special reference to the works of W. Blake, Wordsworth, Shelly, Keats, Byron, Charles Lamb, Dickens, Tennyson, Robert Browning, Hardy, George Elliot, J.S. Mill, Ruskin and Oscar Wilde.

Evidence of first hand reading will be required. The paper will be designed to test not only the candidates' knowledge of the prescribed authors but also their understanding of the main literary trends during the period. Questions having a bearing on the social and cultural background of the Period also be included.

Part II

Marks – 100

The paper will require first hand knowledge of the text prescribed as well as general awareness of the authors' major works and will be designed to test the candidates' critical ability

- | | | |
|-----------|--------------------------|--|
| 1 | Shakespeare | Hamlet |
| 2 | Swift | Gulliver's Travels |
| 3 | Jane Austin | Pride and Prejudice |
| 4 | Shaw | Pygmalion |
| 5 | Yeats | The Second Coming, Sailing to Byzantium, Among School Children |
| 6 | T.S. Eliot | The Waste Land |
| 7 | D.H. Lawrence | Sons & Lovers |
| 8 | Earnest Hemingway | Old Man & The Sea |
| 9 | Samuel Backet | Waiting for Godot |
| 10 | Robert Frost | The Pasture, Revelation, The Tuft of Flowers, After Apple Picking, Mending Wall, The Road Not Taken, An Old Man's Winter Night, Birches, Fire and Ice, Stopping by Woods, West-running Brook, Desert Places |

17. EUROPEAN HISTORY

Total Marks – 200

(1789 – 1914)**Paper I**

Marks – 100

1. French Revolution: Background, Old Regime, Philosophers, Estate General, National Assembly, England's reaction, parties in the Legislative Assembly, the fall of Monarchy, European coalition against France and the war, the second and the third partition of Poland, the Terror and the end of Terror, France and Europe 1793 – 95
2. Napoleon Bonaparte: The rise of Napoleon to power, Napoleon as emperor, statesman and warrior, Napoleon and Europe, the continental system, the fall of Napoleon, England's role in the catastrophe of Napoleon
3. Vienna Settlement and concept of Europe: Treaty of Chaumont, First treaty of Paris, Second treaty of Paris, Treaty of Vienna, Holy Alliance, Quadruple Alliance, Congress system and failure of congress system, British leadership.
4. England 1814 – 1833: Effects of War Period, Constitutional Development, Progress in Industry, Agriculture & Culture
5. Europe 1815 to 1848: The forces of continuity and reaction, Metternich system, the force of change and progress, Nationalism, Democracy, Liberalism, Socialism, Revolution in France 1830, Revolution in France in 1848 and the sequence of revolutions in Europe
6. The Eastern Question 1820 to 1878: Background, the Greek Revolt 1820 to independence 1832, the Crimean War 1853 to 1856 and Peace Treaty of Paris, Pan Slavism, the Russo-Turkish War 1877, the treaty of San Stefano, the Congress and the Treaty of Berlin 1878
7. Risorgimento and the Union of Italy: Revolutionary movements in Italy, Mazzini, Cavour and other architects of Italian unification, Napoleon III and Italian unity, foreign policy of Italy after unification to 1914
8. Unification of Germany: Background, Napoleon and Germany, Rise of Prussia, Zollverein, Revolution of 1848 and Germany, Rise of Bismarck and his role as architect of German unity, wars with Denmark, Austria and France, Domestic and foreign policy of Bismarck from 1870 to 1890, foreign policy of Germany from 1890 to 1914
9. The growth of colonization and of Overseas Empire 1815 – 92: Different forms of colonization, British colonial policy and expansion, French colonial policy and expansion, the French in North Africa, Suez Canal, Anglo French control in Egypt, Russia in the Caucasus and Turkistan, Anglo Russian results of colonial development
10. England 1893 to 1910: Social and constitutional reforms, material progress, social thought and culture
11. Road to the First World War: Alliances and counter alliances, Drickaiserbund, Austro German alliance 1879, Triple Alliance 1882, the formation of Dual Alliance 1891-93, Anglo-Japanese alliance, French British and Russo British Entente, their crisis – Algeciras, Bosnia, Agadir, German Navy, Baghdad Railway, Balkan Crisis, the cause of First World War

(1914 – 1960)**Paper II**

Marks – 100

1. First World War: Events – USA's entry into the War, Wilson's 14 points, the choice of the Turks, War in the Middle East, Britain's Middle East policy during the War, Balfour Declaration, defeat of Germany, Austria and Turkey, effects of the war
2. Peace treaties: The Treaty of Versailles, the Big Four, the basis of the Treaty, the Treaty of Versailles and the US. The Treaties of St. Germaine and Trianon, the Treaty of Serres, the Treaty of Lausanne
3. The League of Nations: The Covenant, the League between the two Wars, causes of failure
4. Marxism and the Soviet Union: The Russian Revolution 1917, Lenin, the Third International 1919, civil war in Russia, Trotsky. The constitution of USSR. Stalin, First Five Year Plan, purges, the Russian foreign policy between the two Wars

5. Italy and Fascism: Effects of the War on Italy, Mussolini's rise to power, Fascist party and principles, Italy's foreign policy between the two Wars
6. Germany and Nazism: Germany from the Versailles Treaty to Hitler, origins of Nazism, Mein Kampf, Hitler's rise to power, domestic policy of Hitler, the totalitarian state, Hitler's foreign policy
7. France between the two Wars: Defects of the French Constitution, collapse of the Third Republic, foreign policy of France between the Wars
8. England between the two Wars: Disadvantages of Parliamentary government, Cabinet Government in England, Depression of 1929 and England, stability of the British Commonwealth, foreign policy of England between the Wars
9. The Second World War: Causes, the events, Atlantic Charter, Tehran, Yalta and Postdam conferences, the allied victory, effects of the War
10. The UNO: Origin, the charter of the UNO, UNO as peace keeping force
11. The political state of Europe 1945-50: The new balance of power in Europe, Russian domination of Eastern Europe, decisions on Germany's future, economic collapse of western Europe and recovery, Marshal Plan, Cold War, the blockade of Berlin, NATO
12. The rise of Russia as a great power: The effects of the War on Russia, the fruit of victory, Warsaw Pact, Russia's efforts to spread its influence in Eastern Europe, Asia, Africa and Latin America 1945 – 1960
13. France after the Second World War: Fourth French Republic, French colonial policy after Second World War, Algeria, Indochina, De Gaulle's domestic and foreign policy
14. England after the Second World War: The rise of the Labour Party, economic policy of the Labour Party's government, England's colonial policy after the Second World War, decline of England as world power, British Commonwealth, England and the common market, England and the Middle East 1945-1960
15. Europe and Common Market: The origin and evolution of the European common market upto 1960

18. FORESTRY

Total Marks – 100

1. Ecology and general silviculture
2. Forest statistics, Mensuration and research methods
3. Forest Management and Economics
4. Water Shed management
5. Range management
6. Forests surveying and Engineering
7. Forest policy, law and protection
8. Forest biology, wildlife and natural park management

19. GEOGRAPHY

Total Marks – 200

Paper I

Physical and General Geography

Marks – 100

1. Elements of weather and climate: Insulation and Atmospheric Temperature, Global Radiation and Heat Balance, Atmospheric Pressure and winds, Humidity And Precipitation, Air Masses, fronts and atmospheric disturbances, classification of climate and climatic regions
2. Landforms: Major landforms, Rocks – origin, formation and classification. Internal structure of the Earth, earthquakes and volcanicity, weathering, mass wasting, erosion and deposition, cycle of erosion, landforms produced by underground and ground water, wind and glacier
3. Oceans: Continental margins and the sea floor, Distribution of Temperature and Salinity. Movements of ocean water – waves, currents and tides
4. Study of maps: Types of maps – topographical maps, aerial photographs, weather maps. Map projections – classification and choice of projections, merits and demerits of cylindrical, conical and zenithal projections, diagrams, graphs and distribution maps based on statistical data

Paper II

Human, Economic and Regional Geography

Marks – 100

1. Human Geography: Man and his habitat – concepts of environmentalism and possibilism, world population distribution, structure and growth (natural increase and migration), world, society and culture, races, languages and religions, levels of education and welfare. Settlements – rural and urban, characteristics and problems of urban places. Population / resource regions
2. Economic geography: Economic activities – primary, secondary and tertiary. Primary activity – agricultural systems, subsistence, intensive, extensive, mechanized and mixed farming. Production, distribution and trade of major cereal and non-cereal crops. Forests and fisheries. Power resources. Major industries – iron and steel, textiles and chemical industries, politico-economic relationship between the more developed and the less developed countries
3. Regional geography: Economic and social regions of the world, regional geography of South Asia with special reference to Pakistan under the following heads: Resource Base (Human, Physical And Economic) Transport, Trade and International Relations

20. GEOLOGY

Total Marks – 200

Paper I

Marks – 100

1. General Geology: Earth as a planet, its origin and age, internal structure of the earth and lithospheric plates, internal and external geological processes such as earthquakes, volcanism, weathering, erosion and deposition, geomorphic cycles
2. Structural geology: Primary sedimentary structures, mechanical properties of rocks, description and classification of secondary structures. Structures in metamorphic rocks. Orogeny and geosynclines in plate tectonic framework. Major tectonic features of the earth. Geodynamics of Pakistan
3. Paleontology: Fossils and their preservation. Morphology, evolution and geologic distribution of major invertebrate phyla. Micropaleontology of foraminifers, vertebrate and plant fossil
4. Stratigraphy: Stratigraphic nomenclature and stratigraphic codes. Principles of correlation. Sedimentary basins in Pakistan and detailed stratigraphy of type sections
5. Mineralogy: Chemical composition of the earth crust. Minerals – their physical and chemical properties. Space lattice, symmetry classes and crystal systems. Crystal optics. Atomic structure of crystals and X-Ray diffraction. Detailed study of important rock forming minerals.
6. Petrology: Origin and evolution of magma, binary and ternary silicate systems. Description of important plutonic and volcanic associations. Sedimentary environments and processes. Petrography of major types of sedimentary rocks. Metamorphism, metamorphic zones and facies. Description of principle types of metamorphic rocks, metamorphism and magnetism in relation to plate tectonics.

Paper II

Marks – 100

1. Economic Geology: Processes of formation of mineral deposits. Detailed study of metallic and non-metallic mineral deposits of Pakistan. Mineral based industries. Metallogeny in Pakistan.
2. Energy resources: Constitution and kinds of coal. Geology of Pakistan coal fields. Origin, migration and accumulation of natural hydro-carbons. Oil well drilling and drilling muds. Oil and gas fields in Pakistan. Origin and occurrence of radioactive minerals. Pakistan resource of atomic energy, minerals. Geothermal energy, recovery and uses.
3. Engineering geology: Geological factors in the construction of civil engineering projects. Geology of dam sites of Pakistan. Landslides and stability of slopes. Open and subsurface evacuations. Construction materials and building stones. Site investigation and foundation analysis
4. Hydrogeology: Groundwater occurrence and types of aquifers. Movement of groundwater. Salinity and water logging. Water resources of Pakistan.
5. Exploration Geology: Geological mapping and traditional prospecting methods. Photo geology and remote sensing mineral exploration. Dispersion of trace elements and geo-chemical surveys. Geophysical techniques for prospecting of solid minerals, oil and water

21. HISTORY OF PAKISTAN AND INDIA

Total Marks – 200

Paper I

Marks – 100

712 – 1857 (Excluding arrival of European nations, decline and fall of Muslim rule)

- Arrival of the Muslims in the sub-continent, foundation of Muslim rule – administrative system and reforms under the Sultans and the Mughals
- Structure of the Muslim society
- Industry, trade and commerce under the Muslim patronage, the army, financial administration, zakat, ushr, kheraj etc
- Administration of justice – Sufis and ulemas – the Madrassahs and maktabas – Auqaf
- Art and architecture, literature, sports, dress – Muslim contribution to scientific knowledge – policy of the Muslim rulers towards non-Muslims. The spirit and legacy of Muslim civilization

Paper II

Marks – 100

Part A: 1857 – 1947

- Arrival of European nations – decline and fall of Muslim rule, contributions of Shah Wali Ullah, Syed Ahmad Shaheed and Sir Syed Ahmad Khan towards regeneration of the Muslim Hindu reform movements and anti-Muslim role of Hindu leaders
- Constitutional reforms of the British government and growth of the political parties – Indian National Congress, All India Muslim League. Partition of Bengal, Simla Deputation, Role of Nawab Mohsin-ul-Milk, Nawab Waqar-ul-Mulk
- Syed Ameer Ali, the Agha Khan and other Muslim leaders, Lukhnow Pact, Khilafat Movement, Contribution of Maulana Muhammad Ali, Allama Iqbal, Quaid-e-Azam Muhammad Ali Jinnah for Muslim uplift and welfare
- Nehru report, Quaid-e-Azam's 14 points, Allama Iqbal's Allahabad Address 1930, Round Table Conference, the Congress role in the provinces, Lahore Resolution 1940, various missions and plans for the partition of the sub-continent
- Quaid-e-Azam as an organizer of the Muslim League, Muslim leader and maker of Pakistan

Pakistan since 1947**Part B**

- Constitution making in Pakistan – various attempts at constitution making. Difficulties in establishing a parliamentary democracy, imposition of various martial laws, nature of Pakistan's economy, development plans, role of foreign aid
- Separation of East Pakistan, causes and effects. Pakistan and the world – major powers, Islamic world, relations with India
- Social and intellectual trends after 1947. contribution of Quaid-e-Azam as first Governor General and Liaqat Ali Khan as first Prime Minister

22. HISTORY OF THE USA

Total Marks – 100

History of the USA : Facts of political history from the early settlers to the present day. Questions will also be asked on economic and constitutional development of the USA

Note: Credit will be given not only for precise presentations of facts but also for sound critical judgment.

23. INTERNATIONAL LAW

Total Marks – 100

International law: Public International Law. Important cases decided by the permanent court of International Justice, the International Court of Justice and UNO. Law of the Sea.

24. INTERNATIONAL RELATIONS

Total Marks – 100

Part A

1. The modern state system – history, basic features, evolving forms
2. International Relations as a field of study, basic approaches – Power, Balance Of Power, Imperialism, Nationalism

3. Interaction between states – diplomacy, international law, international economic and trade linkages – pressures in world politics

Part B

1. Evolution of the international system since 1815 (Congress of Vienna) Historical Overview
2. World War I, II. Decolonization. Rise of the Third World alliance system (NATO, SEATO, CENTO, Warsaw Pact), peaceful coexistence. Non-Aligned Movement. Theories of peace and security in nuclear age, (deterrence, limited war, crisis management etc), détente

Part C

1. Foreign policies of the superpowers, major powers (USA, USSR, China) with special reference to South Asia (Pakistan, India etc)
2. Issues in global politics: Nuclear Proliferation, Superpower rivalry in Indian Ocean, international economic order, Regional security issues and crisis (Afghanistan crisis, Iran-Iraq war, Palestine problem, apartheid and South Africa, Namibia, Polish crisis, Euro communism, Central American crisis etc)
3. Arms control and disarmament

25. ISLAMIC HISTORY AND CULTURE

Total Marks – 200

Paper I

Marks – 100

1. Humanity at the dawn of Islam: A brief survey of major world civilizations with special emphasis on their intellectual, humanistic and special institutions – their impact on world history
2. Advent of Islam: Life and teachings of the Holy Prophet. Foundations of a new and revolutionary world order. Institutions of Islam – political, social, economic and legal structure of the Islamic polity. The Quran – Emphasis on the study of nature and research. Changes brought by Islam in human thinking and behaviour
3. Foundation of Muslim State: Early conquests of the Khulafa-e-Rashideen. Administrative and legal structure of the state. Political and ideological differences and the emergence of the Umayyads – expansion and consolidation of the Empire
4. The grandeur of Islam: Philosophical, scientific and literary progress of the Muslims during the Abbassid period
5. The Ottoman Caliphate: Turkish march towards Europe. Political structure of the Turkish Empire, salient features of their administration, decline and disintegration

Part II

Marks – 100

1. Islam in Africa and Spain
2. Muslim achievements in Natural and social sciences, schools of Baghdad, Spain and Iran. Muslim contribution in history, science, medicine and other branches of human civilization
3. Muslim Arts: Muslims' contribution in architecture, music, painting, handicrafts, pottery, calligraphy, etc
4. Renaissance and reformation: Origin of this intellectual revolution. Contribution of Muslim universities and seminaries in Spain and Baghdad. Dissemination of Muslim learnings in the West.
5. Modern world: Impact of Islam on Western thought, social institutions and economic policies

26. JOURNALISM (MASS COMMUNICATION)

Total Marks – 100

Note: Candidate will be asked to attempt total five questions. They will attempt at least two questions from each Section. Short note within the question (without choice) can also be given

Section A

1. Concept and process of communication: Source, message, channel, destination, encoding, decoding, noise, feedback. Oral vs. written communication. Two step flow of communication. Role of opinion leader

2. Information and Journalism – functions: Scanning the horizon and reporting back – news function, educational function, opinion for motives, entertainment functions
3. Pakistani press: An overview of the evolution of the Muslim press in South Asia before 1947 and development of Pakistan Press since 1947, its social and economic impact. Trends and characteristics, problems and prospects
4. Mass media: Components, functions and effects, mass media in Pakistan: Size and dispersion, role in national development, prospects and problems

Section B

1. News principles and techniques of news writing, editorial definitions, ingredients, types and functions of writing of editorials
2. Public relations: definitions, purpose and scope. Ethics, PR in Pakistan, duties of PRO, PR procedures and processes
3. Magazine journalism: Mag-journalism in Pakistan. Types, functioning, purpose. Its social aspects and scope
4. Press release, press note and press communication: Definitions and basic ingredients. Writing of press release, press note and press communiqué
5. Advertising: Definition, functions, types and purpose, its social and economic aspects, principles of successful advertising
6. Press laws: Press laws in Pakistan (Gradual developments) and the "Right to know" concepts of press freedom and responsibility. Ethics of journalism

27. LAW

Total Marks – 200

Paper I

Marks – 100

Civil Procedure Code, Contract Act and Law of Torts

Paper II

Marks – 100

Qanoon-e-Shahadat 1984, Code of Criminal Procedure and Penal Code

28. MERCANTILE LAW

Total Marks -100

Mercantile Law – The main principles of law relating to Agreements, Contracts, Bailment, Pledge, Sale of Goods Act, Agency, Partnership Act, Indemnity and Guarantee, Negotiable Instruments Act, Companies Ordinance 1984, Contract Act, Life, Fire and Marine Insurances, Law of Arbitration

29. MUSLIM LAW AND JURISPRUDENCE

Total Marks – 100

1. The Islamic law as administered in Pakistan
2. Principles of Islamic Jurisprudence

Candidates will be expected to show some familiarity with the original sources

30. PERSIAN

Total Marks – 200

Paper I

Marks – 100

1. (a) Origin and development of the language

Outline:

- i. Elementary information about – Avesta, Old Persian and Pahlavi languages
- ii. The advent of Persian prose and poetry in the present script in the Islamic era
- iii. The earlier Persian prose writers and poets upto 4th century H/10th Century AC

(b) Significant features of the grammar of the language

Outline:

- i. Grammar: The three tenses, imperative modd (affirmative and negative) and muzara for present and future tenses
- ii. Translation of simple English passage into Persian

2. Literary history and literary criticism – Literary movements, classical background, socio-cultural influences and modern trends. Origin and development of modern literary genres.

Emphasis:

- a. The literary history should include the development of Persian language and literature, besides Iran, in Afghanistan, the Indo-Pakistan sub-continent and the Persian speaking areas of the former USSR
- b. In classical background, the four styles known as Khurasani, Iraqi, Hindi and Revivalist may be studied
- c. In the literary movements the revivalist and purist movements and in the modern trends, the adaptation of Western loan words in Persian language needs to be emphasized.

3. Short essay in Persian

Paper II

Marks – 100

The paper will require firsthand reading of the texts prescribed and will be designed to test the candidate's critical ability

Texts

- (a) Farrukhi Seestani (Qasida on the conquest of Soomnath)
- (b) Unsar-ul-Maali Qabus (Qabus Nama) --- Last Chapter 44
- (c) Rumi Masnavi ---- Daftar 1 (1st half upto Dastan-e-Peer-i-Changi)
- (d) Saadi Gulistan ---- Chapter 7 & 8
- (e) Hafiz --- Deewan upto radif Re
- (f) Iqbal: Asrar-i-Khudi upto Marhila-e-Siwum Naibat-e-Ilahi
- (g) Iqbal: Javed Nama (Last Chapter) – Address to Javed – (Dialogue with the new generation)

31. PHILOSOPHY

Total Marks – 200

Paper I

Marks – 100

Logic

1. Formal and informal arguments: Elements of deductive reasoning, validity and truth, proposition and syllogism
2. Definition with special reference to Aristotle, Ibn-e-Taimya's criticism of Aristotle, relativity of definition, Ambiguity, vagueness and motive use of language as impediments in clear thinking. Fallacies – formal, material and linguistic
3. Symbolic logic: value of special symbols, symbols for conjunction, negation, disjunction and implication. Method of deduction: Formal proofs of validity, Rules of Replacement
4. The nature of scientific theory, scientific method, inquiry at common sense level and scientific level, scientific explanation, the grounds of belief induction, probability and functional analysis
5. Muslim contribution to logic – inductive and deductive

Paper II

Marks – 100

Philosophy – Western & Islamic

1. Idealism, Pragmatism, Vitalism, logical positivism, existentialism and dialectical materialism. The main arguments of these philosophical theories and their impact on life and morals

2. Muslim Rationalists and social thinkers – Al-Farabi, Ibn-i-Sina, Ibn-i-Rushd and Ibn-i-Khaldun, their main doctrines
3. Schools of Muslim theology – Mutazilism, Ash'arism, Sufism, Al-Ghazali (his ethics and criticism of Muslim rationalists)
4. Muslim thought in South Asia with special reference to Shah Wali Ullah, Sayyid Ahmad Khan and Iqbal, the post-Iqbalian thought

32. PHYSICS

Total Marks – 200

Paper I

Marks – 100

Mechanics

1. Vectors – dots, cross and triple products. Gradient divergence and applications
2. Newtonian laws of motion, conservation law of energy, conservation of linear and angular momentum, dynamics of rigid body, spin and precession, gyroscope, gravitation, planetary motion including satellite
3. Special theory of relativity: Michelson – Morely experiment and Einstein's postulates, Lorentz transformation, time dilation and length contraction, equivalence of mass and energy

Fluid mechanics

Surface tension, Viscosity, Elasticity, fluid motion and Bernoulhe's theorem

Waves & Oscillation

Free Oscillation with one and two degrees of freedom, forced and dampened oscillations and phenomenon of resonance. Traveling waves and transmission of energy, phase and group velocity, standing waves

Reflection, refraction, interference, diffraction and polarization of waves, interferon-meter and Newton's rings, diffraction gratings and their resolving power, spectro-meters, electromagnetic wave equation, normal and anomalous dispersion, coherence, laser and its application

Heat and thermodynamics

Perfect gas and Van der Waals equation. Three laws of thermodynamics, thermal properties of simple system production and measurement of low temperature. Kinetic theory of gases, Maxwellian distribution of molecular velocities, Brownian motion, transport phenomenon, classical Maxwell-Boltzmann statistics and its application, Quantum Bose – Einstein and Fermi – Direct statistics

Part II

Marks – 100

Electricity and magnetism

Electric field due to point charges, Gauss' Law, electric potential and Poisson and Laplace's equation. Dielectric medium and polarization, Capacitance, moving charges and magnetic field. Ampere's law, vector potential, magnetic properties of matter. Transient current. Farrady's law of electromagnetic induction, Alternating Current and LRO circuit. Maxwell's equations, Poynting theorem and Poynting vector

Electronics

Thermonic emission, space charge, diode, triode tetrode, pentode and their static and dynamic characteristics. Amplitude modulation and demodulation or detection. Various basic circuits for rectification, amplification modulation and detection connected with radio receivers and transmission, n and p type semiconductors. Biased function, transistors, common base and common emitter configurations

Atomic physics

Bohr theory and quantum numbers including electron spin. Pauli's exclusion principle, spectra of simple systems with one or two valence electrons. Photo electric effect. Compton scattering, pair production, Lande's g factor and Zeeman effect. Raman effect, waves and particles and De Broglie's hypothesis, Schrödinger wave equation and its application to one dimensional harmic oscillator. Heisenberg's uncertainty principle

Nuclear physics

Structure of nuclei: Radioactivity α , β and decay. Methods of detection. Mass Spectrometer, accelerators, phenomenon of fission, reactor and nuclear power, nuclear fusion and its application. Elementary particles and their properties

33. POLITICAL SCIENCE

Total Marks – 200

Paper I

Marks – 100

Part A

1. Political Theory
 - a. Western political thought: Plato, Aristotle, Machiavelli, Montesquieu, Hobbes, Locke, Rousseau, Bentham, Mill, Marx, Lenin, Mao
 - b. Muslim political thought: Al-farabi, Al-Mawardi, Nizam-ul-Mulk Tusi, Al-Ghazali, Ibn-e-Khaldun, Iqbal

Part B

2. The nature and emergence of modern state system, Islamic concept of state
3. political concepts: Sovereignty, law, liberty, equality, rights and duties
4. Political dynamics: Public opinion, propaganda, political parties, pressure groups
5. Political Institutions: Legislature, executive, judiciary, political elites, civil and military bureaucracy
6. Forms of government: Monarchy, democracy, dictatorship, unitary and federal, Presidential and Parliamentary
7. Totalitarianism: Fascism, communism
8. Local self-government: Theory and practice with special reference to Pakistan

Paper II

Marks – 100

Part A

1. Selected political systems: Nature and dynamics of major political institutions in USA, UK, France and former Soviet Union

Part B

2. Political systems of developing countries: Turkey, Iran, India and China
3. Rise of Muslim nationalism in South Asia with special reference to the role of Sir Syed Ahmad Khan, Iqbal and Quaid-e-Azam Mohammad Ali Jinnah
4. A comparative and critical analysis of the 1956, 1962, 1973 and 1985 Constitutions of Pakistan

34. PSYCHOLOGY INCLUDING EXPERIMENTAL PSYCHOLOGY

Total Marks – 200

Paper I

Marks – 100

1. Definition and scope of Psychology, psychology as a source of science of behaviour, schools and systems of psychology, recent trends to psychology
2. Nervous system: Structure and functions of cells, central and peripheral nervous system, Endocrine system
3. Learning: Conditioning – classical and operant, reinforcement, avoidance conditioning, extinction, discrimination learning, imprinting, theories of learning, verbal learning, probability learning, concept learning, perpetual learning, transfer and interference, motivational factors in learning, readiness and individual differences in learning
4. Nature of motives and emotions: Homeostasis, biogenic and social motives. Measurement of human motivation, theories of motivation – Maslow, Lewin and Freud, theories of emotion, role of endocrine glands, frustration and conflict
5. Nature of perceptual organization: Perception of distance, movement, space, depth, colour, perceptual constancy, effect of learning and motivation on perception, senses viz. vision, hearing and other senses. Perception and sensation, determinations of perception (needs, attitudes, sets, values, personality traits, emotional states, suggestions etc)

6. Nature and determinants of personality: Factors in development of personality. Theories of personality, trait and types, Freudian, Neo-Freudian, Murry, Allport, Cattell. Types of personality tests and their rationale
7. Socialization: Society and personality, formation of opinions and attitudes, Prejudice
8. Structure and functions of groups, role status relations, group norms, group solidarity, intergroup tensions, international tensions

Paper II

Marks – 100

1. Meaning, phases and characteristics of growth development and maturation, methods of developmental psychology, biological and socio-cultural factors, importance of developmental psychology, broad approaches to study of children
2. Pre-natal development and infancy: Genetic factors, hereditary transmission and chromosomal abnormality, stages, developmental irregularities, psychological and physical characteristics of the infant. Method of studying infant behaviour
3. Physical, motor and sensory development, perceptual development, intellectual development: Development of logical thought in early childhood, development of concepts, creativity, emotional development patterns, characteristics, some common emotional patterns
4. Concept of abnormality: Popular and scientific, goals of clinical diagnosis, personality assessment, behavioral assessment. Nature of clinical judgment, sources of information in clinical diagnosis, assessment of organizations, institutions and environment. Professional issues. The nature of professional preparation for clinical psychological work. Ethical standards and legal issues
5. Therapies: Somatic therapies, environmental therapies, psycho-analytic, phenomenological, existential, Gestalt, rational – emotive and cognitive therapies, behaviour therapy and behaviour modification. Group therapies
6. Intelligence: Its nature and assessment. Mental retardation
7. Biological and sociological factors in maladjustments and crime. Juvenile delinquency, drug addiction, alcoholic and sex offences – characteristics, causation and treatment
8. Psychoneurotic disorders, psychosis, character disorders, Psychosomatic disorders
9. Industry: Nature of the work situations, work, vocation, personality and society, working environment, work methods and modern approaches, work efficiency, group dynamics, work incentives, job satisfaction

35. PUBLIC ADMINISTRATION

Total Marks – 100

1. Public administration: Its nature and scope, the role of public administration in a modern welfare state
2. Major schools of thought in administration: Scientific Management Movement. Human relationists, behavioral school, systemic theory
3. Bureaucracy: Concept of bureaucracy, theories of bureaucracy, ecology of bureaucracy, bureaucracy of Pakistan as a change agent
4. Administrative leadership: Approaches to the study of leadership, forms of leadership, leadership qualities
5. Administrative accountability: Internal and external controls, executive control, legislative control, judicial control, Ombudsman, public opinion and pressure groups, problems of administrative accountability in Pakistan
6. Planning: Types of plans, planning process, principles of planning, planning machinery, the system of planning and programming in Pakistan. Planning machinery in Pakistan
7. Organization: Types of organization, theories of organization, principles of organization, the organization of federal and provincial governments in Pakistan. Public corporations in Pakistan
8. Personnel administration: Nature and scope of personnel administration, personnel functions, tools of personnel management, salient features of the system of Public Personnel Management in Pakistan
9. Controlling and coordination: Forms of controls, control mechanism, the process of control, principles of controlling, principles of coordination, machinery for coordination, problems of coordination in public administration in Pakistan
10. Communication: Types of communication, communication channels, communication process, principles of communication

11. Financial administration: Elements of financial administration, performance and programmed budgeting, capital budget. Principles of budgeting, auditing and accounting

36. PURE MATHEMATICS

Total Marks – 200

Paper I

Marks – 100

Candidates will be asked to attempt three questions from Section A and two questions from Section B

Section A

Modern Algebra

1. Groups, subgroups, languages, theorem, cyclic groups, normal sub-groups, quotient groups, fundamental theorem of homomorphism. Isomorphism theorems of groups, inner automorphisms. Conjugate elements, conjugate sub-groups, commutator sub-groups
2. Rings, sub rings, integral domains, quotient fields, isomorphism theorems, field extension and finite fields
3. Vector spaces, linear independence, bases, dimensions of a finitely generated space, linear transformations, matrices and their algebra. Reduction of matrices to their echelon form. Rank and nullity of a linear transformation
4. Solution of a system of homogenous and non-homogenous linear equations. Properties of determinants. Cayley-Hamilton theorem, Eigen values and eigenvectors. Reduction to canonical forms, specially diagonalization

Section B

Geometry

1. Conic sections in Cartesian coordinates, Plane polar coordinates and their use to represent the straight line and conic sections. Cartesian and spherical polar coordinates in three dimension. The plane, the sphere, the ellipsoid, the paraboloid and the hyperboloid in Cartesian and spherical polar coordinates
2. Vector equations for plane and for space-curves. The arc length. The osculating plane. The tangent, normal and bi-normal. Curvature and torsion. Serre-Frenet's formulae. Vector equations for surfaces. The first and second fundamental forms. Normal, principal, Gaussian and mean curvatures

Part II

Marks – 100

Candidates will be asked to attempt any three questions from Section A and two questions from Section B

Section A

Calculus and Real Analysis

1. Real numbers, limits, continuity, differentiability, indefinite integration, mean value theorems. Taylor's theorems, indeterminate form. Asymptotes, curve tracing, definite integrals, functions of several variables. Partial derivatives. Maxima and minima. Jacobians, double and triple integration (Techniques only). Applications of Beta and Gamma functions. Areas and volumes. Riemann-Stieltjes integral. Improper integrals and their conditions of existence. Implicit function theorem. Absolute and conditional convergence of series of real terms. Rearrangement of series, uniform convergence of series
2. Metric spaces. Open and closed spheres. Closure, interior and exterior of a set
3. Sequence in metric space. Cauchy sequence, convergence of sequences, examples, complete metric spaces, continuity in metric spaces. Properties of continuous functions

Section B

Complex analysis

Function of a complex variable, Demoiver's theorem and its applications. Analytic functions, Cauchy's theorem. Cauchy's integral formula, Taylor's and Laurent's series. Singularities. Cauchy residue theorem and contour integration. Fourier series and Fourier transforms. Analytic continuation

37. PUSHTO

Total Marks – 100

1. Essay on prominent works of personalities and writers
2. translation of unseen passages from pushto into English and Urdu
3. Translation of unseen passages of English or under into Pashto
4. General questions on evolution and criticism of Pushto prose and poetry
5. folk literature: Introduction of tappa, charbaita, lobha, neemakai, sandara and badala (including folk stories)

38. SOCIOLOGY

Total Marks – 100

1. Individual, culture and society: Individual as a social product. The variety of social forms, methods of socialization, ethnocentrism, norms and values, cultural patterns, varieties of sub-cultures
2. Sociological theory: The sociological perspectives – Evolutionary, order and conflict, evolutionary theorists – Ibn-i-Khaldun, Spencer and Tannis. Order theorists – August Comte, Emile Durkheim, Max Weber. Conflict theorists – George Hegel, Karl Marx, Lewis Coser, Mills
3. Methods of sociological research: Research design, surveys, participant observation, experiments, case studies
4. Social interaction: Significance of social classes, forms of social classes – tribes, biradaris, castes, classes and feudal system in Pakistan. Social mobility – nature of social mobility. Mobility determinants in Pakistan society, social immobility, culture in poverty
5. Social control: Mechanism of social control – internal and external means of social control. Alienation, integration – integrative patterns in Pakistani society
6. Social and cultural change and social policy: Processed of social and culture change – discovery, invention, diffusion, factors in rate of social and cultural change. Incentives and inhibitions to social and cultural change in Pakistan. Social planning and directed social and cultural change
7. Community: The rural community, traditional characteristics of rural life, the urban community, rural – urban convergence, urbanism, future of cities in Pakistan
8. Social institutions: The nature and genesis of institutions, the process of institutions, functions and trade of social institutions. Family, religion, educational, economic and political institutions
9. Social problems in Pakistan: Population growth, demographic transition – deviant behaviour, institutionalized evasions, social conflicts, internal and international migration, aging, drug abuse, prostitution, smuggling, illiteracy and poverty

39. STATISTICS

Total Marks – 100

1. Basic probability: Axiomatic definition of probability, random variable, distribution function, probability density function, mathematical expectation, conditional probability, jointly distributed random variables, marginal and conditional distribution, conditional expectation, stochastic independence
2. Some special distributions: Binomial, Poisson, negative binomial, hyper geometric, normal distributions with their derivation of their mean and variance. Definition and application of chi-square, "T" and "F" distributions
3. Statistical inference: Maximum likelihood estimation of the mean and the variance of a normal population. Confidence interval for mean, difference of means and for variance, testing hypothesis for the equality of two means (paired and un-paired observations), testing of equality of several means (ANOVA) and testing of variance and equality of two variance
4. Correlation and regression: Simple linear regression model, point and interval estimation of parameters. Simple, partial, multiple correlation and testing of these correlations
5. Sampling, simple random, stratified, systematic and cluster sampling, estimates of mean and total and their precision
6. applications of statistics in social, economic and political problems, public health, crimes, law, social innovations, economic development, socio-political inequality

40. ZOOLOGY

Total Marks – 200

Paper I

Marks – 100

Invertebrate and chordate zoology

The candidates will be required to attempt five questions – three from Part A and two from Part b

Part A**Invertebrate**

General organization (general morphology, mode of life, adaptations, life cycles and economic importance) of the following groups with special reference to the topics mentioned in each group:

1. Protozoa: Parasitism, conjugation and auto gamy, medical importance
2. Porifera: Canal system skeletal structures and their taxonomic value, position of porifera in the animal kingdom
3. Coelenterata: Polymorphism, mesenterics, corals and coral reefs
4. Platy helminthes: Parasitic adaptations, medical importance
5. Nematode; Medical importance
6. Annelida: Coelum, metamerism
7. Mollusca: Shell, modifications of foot, feeding, respiration, shell fishery
8. Echinodermata: Skeleton, water vascular system, larvae
9. Anthropoda: Appendages, feeding, respiration, larvae

Part B**Chordate**

Origin, comparative account of skeleton, circulatory, excretory and nervous systems, development (Egg types, cleavage, blastula and gastrula, germ layer / formation, embryonic membranes and placentation) natural history (mode of life, migration, adaptations, biting mechanism of snakes)

Part II

Marks – 100

The candidates will be required to attempt at least one question from each part

Part A

Cell biology: Morphology, chemical composition and functions of nucleus, nuclear inclusion and cytoplasmic organelles, protein synthesis and molecular genetics, mechanism of mitosis and meiosis

Part B

General physiology: Respiration, respiratory mechanism, respiratory pigments, transport of oxygen and carbon dioxide, circulation. Haemodynamics, control of cardio vascular system, nutrition, modes of nutrition, digestion and assimilation of food stuff. Excretion – nature and sources of substance excreted, modes of excretions, nervous system, nerve impulses, hormones and their biological action

Part C

Genetics: Mendelian principles, multiple alleles, interaction of genes – linkages and crossing over, mapping of genes, sex determination and sex linkages, mutations, chromosomal aberrations, gene concept

Part D

Evolution: Origin of life, organic diversity, theories to account for organic diversity, Phylogeny and ontogeny, species concept, mechanism of evolution, modern concept of natural selection, evolutionary trends

Part E

Ecology: Concept of Ecosystem, biochemical cycles, animal adaptations to major habitats, environmental pollution and its effect on life.