Maharshi Dayanand University
Rohtak

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Ordinances, Syllabus and Courses of Reading for Geology M. Sc. (Final) Examination

Session—~~1997-98~~
1998—99

Available from :
Deputy Registrar (Publication)
Maharshi Dayanand University
Rohtak-124001 (Haryana)

Price :
At the Counter : Rs. 20/-
By Regd. Parcel : Rs. 30/-
By Ordinary Post : Rs. 25/-

ORDINANCE - 'MASTER OF SCIENCE EXAMINATION'

1. The Master of Science Examination shall be held in two parts. Part-I Examination shall be held at the end of the first year and Part-II Examination at the end of the second year.

2. The Examination in Part-I and Part-II shall be held once a year ordinarily in the month of April on such dates as may be fixed by the Vice-Chancellor.

   A supplementary examination in Part-II of M.Sc. will be held in December for those candidates who have passed all the papers of Part-I examination but have got 'reappear' or have failed or want to improve their score in paper(s) of part-II examination. However, total number of chances will not exceed as given in the Ordinance.

3. The last date for the receipt of admission form and fee without late fee as fixed by the Vice-Chancellor shall be notified to the Heads of the University Teaching Departments and the Colleges concerned.

4. A candidate's admission form and fee may be accepted after the last date on payment of Rs. 105/- up to the date notified by the University.

   No late fee shall be charged if the admission form and fee are received within three working days of grace after the last date for the receipt of the same without late fee.

5. No one shall be eligible to join the first year (Part-I) class of M.Sc. Course unless he has passed one of the following examination:-

   a) B.Sc. (Hons.) examination of this University with atleast 45% marks in the aggregate in the subject offered for the M.Sc. Course.

   b) B.Sc. (Pass) examination with atleast 50% marks in the aggregate.

   c) An examination of any other university recognised by the University as equivalent to (a) or (b) above.

   Provided that:

   i) to be eligible to join M.Sc. Course in Physics, a candidate must have passed B.Sc. Examination with Physics and Mathematics as two of the main subjects;

ii) to be eligible to join M.Sc. Chemistry, a candidate must have passed B.Sc. Examination with Chemistry as one of the main subject.

Note: A Minimum of 25% of the total seats shall be filled in by the students who have passed the B.Sc. Examination with Chemistry, Physics and Mathematics. Any seat remaining unfilled out of this quota may be offered to other eligible candidates.

iii) to be eligible to join M.Sc. course in Bio-Science, a candidate must have passed B.Sc. Examination with Botony, Zoology, Bio-Sciences and any one of the subjects viz. Chemistry, Bio-Chemistry, Micro-Biology Fisheries and Geology.

Note: The candidates will be required to opt for Animal Sciences or Plant Sciences or Environmental Biology in M.Sc. final course which will be allowed after taking into consideration the performance of the candidate in M.Sc. previous examination. However, an indication to this effect will be required to be given by the candidate at the time of his admission.

iv) conditions for admission to M.Sc. Course in Mathematics shall be same as prescribed for admission viz. M.A. Course in this subject.

v) To be eligible to join M.Sc. Course in Geology, a candidate must have passed B.Sc. Examination with atleast 50% marks in the aggregate with Geology and any of two of the subjects viz. Physics, Mathematics, Chemistry Botony, Zoology, Bio-Science and Geography;

vi) to be eligible to join M.Sc. Course in Mathematical Statistics and Operations Research a candidate must have passed B.A./B.Sc. (Pass) Examination with atleast 50% marks in the aggregate with Mathematics or Statistics as one of the subjects or have passed B.A./B.Sc. (Hons.) Examination in Mathematics or Statistics with atleast 45% marks in Mathematics/Statistics.

There shall be a Project Report in M.Sc. Mathematical Statistics (Final) and that the project report shall be evaluated by the external examiner on five point grading. The last date for submission of Project Report will be two months after the theory papers which can be extended further by two months

with the permission of the Vice-Chancellor.

Note : *A candidate who is placed under compartment in the qualifying Examination shall not be allowed to join M.Sc. Course. He/She will be eligible only after clearing the qualifying Examination.*

6.1 A candidate who has failed in one or more papers or fails to appear in the examination shall be allowed two additional subsequent chances only to pass the examination.

6.2 A candidate who fails to pass the M.Sc. examination within a period of four years of his admission to the course shall be deemed to be unfit for postgraduate studies in the subject concerned.

6.3 A person who has passed the M.Sc. (Previous) examination in the subject concerned from this University shall be eligible to join the M.Sc. final class. This is subject to Clause-6.2 above. However, the candidates who have passed atleast two theory papers out of four or five theory papers or atleast three theory papers out of six or seven theory papers of part-I examination of this University will be promoted to Part-II Class, provisionally.

7. M.Sc. Examination in Part-I/Part-II shall be open to a student who:-

a) has passed the requisite qualifying Examination or is covered under Clause-6 and

b) has his name submitted to the Controller of Examinations by the Head of the University Department/Principal of the College, he has most recently attended and produces the following certificates signed by him:-

i) of possessing good character;

ii) of having remained on the rolls of the Department/College, during the year preceding the Examination;

iii) of having attended not less than 65% of full course of lectures and tutorial separately and 75% of practicals in each part (the course to be counted upto the last day when the classes break up for the preparatory holidays).

8. A candidate whether a regular student or an ex-student shall submit his admission application to the Registrar/Controller of Examinations duly signed by the Principal of the College/Head

of the University Department he has last attended.

9. Every candidate shall be examined according to the Scheme of examination and syllabus as approved by the Academic Council from time to time.

10. The amount of Examination fee to be paid by a candidate for each part shall be as follows:-

Regular student	Ex-student
Rs. 100/-	Rs. 110/-

Note:- *Plus Rs. 20/- per practical subject.*

A candidate who re-appears in one or more theory or practical papers for the purpose of passing the examination or a candidate who appears in one or more theory papers for the purpose of improvement of score of marks/result shall pay fee as for the whole examination.

11. The medium of instructions and examination shall be English.

12.1. The minimum number of marks required to pass the examination shall be as under:-

i) 33% in each paper (written and practical) separately;

ii) 40% in dissertation/Viva-voce where prescribed;

iii) 40% in the aggregate.

12.2 A candidate who has completed the prescribed course of instructions in a College/University Teaching Department for Previous/Final examination but has not appeared in it or have appeared fails may be allowed on the recommendation of the Principal of the College/Head of University Teaching Department concerned to appear in the subsequent years in the examination paper(s) as the cases may be without attending a fresh course of instructions while re-appearing in the examination, the candidate shall be exempted from re-appearing in the paper(s) and/or practical(s) in which he has obtained atleast 40% marks.

13. As soon as possible, after the termination of the examination the Registrar/Controller of Examinations shall publish the result of the Candidates and issue Detailed Marks Card.

14. The result of candidates who have passed M.Sc. examination shall be classified into divisions, as under and the division obtained by the candidate will be stated in his degree.

a)	Those who obtain 60% or more marks	First Division
b)	Those who obtain 50% or more but less than 60% marks	Second Division
c)	All below 50%	Third Division

15.1 A candidate who has passed M.Sc. Previous examination, with atleast 55% marks may offer dissertation wherever prescribed in the Scheme of examination for the course. The subject of dissertation shall to approved by the Head of Department concerned. A candidate shall submit to the Head of the University Department an application for the approval of the topic for the dissertation alongwith a synopsis within one month of his admission to M.Sc. (Final) examination.

Provided in the case of M.Sc. (Geology) exam. there shall be a dissertation based on days field work (surface maping) in the M.Sc. Previous. The work of dissertation will be done in the M.Sc. previous and viva-voce examination of dissertation will be held at the end of M.Sc. previous alongwith practical examination. Provided further that the condition of obtaining 55% marks in M.Sc. previous examination, for offering dissertation in M.Sc. final shall not be applicable in the case of students of M.Sc. (Geology) course.

15.2 Every candidate who offers dissertation shall be required to submit three copies of his dissertation alongwith a brief abstract of the same giving an account of the Investigation research conducted and its main findings (which will not exceed 500 words). The dissertation shall be examined by one external examiner only.

15.3 The last date for receipt of the dissertation in the office of the Controller of Examinations shall be one month before the commencement of the theory examination: Provided that in exceptional cases; the Vice-Chancellor shall have the power to extend, on the recommendation of the Head of the Department the last date for receipt of the dissertation upto three months. If a candidate fails to submit the dissertation even during the extended period he will be considered to have absented in the dissertation paper and his result shall be declared accordingly.

15.4 A candidate who has submitted a dissertation as part of his examination may withdraw the same before it has been

examined but once it is examined and the candidate obtains the minimum pass marks he shall not be permitted to withdraw it or submit another dissertation in lieu thereof. The marks obtained by him for the dissertation shall be taken into account when he appears in any future examination for the purpose of passing therein or for improving score of marks/result.

16. A candidate who has already passed the Master of Science examination from this University, in a subject in which different optional papers are permitted, may appear in one or more optional paper(s) of that subject at an subsequent examination when held as a regular student only. The examination fee shall be Rs. 35/- each paper.

Such a candidate shall in order to pass, be required to obtain atleast 40% marks in each paper in theory and practical separately.

17.1 A person who has passed the M.Sc. previous examinations of this University will be allowed to appear as an ex-student in the M.Sc. previous examinations for improvement alongwith M.Sc. final examinations respectively, only once, in one or more theory paper(s) within a period of 3 years of passing M.Sc. previous examination.

A person who has passed the M.Sc. examination of this University, and desirous of improving his score of marks will be allowed to appear as an ex-student in the M.Sc. final examinations, for improvement only once in one or more theory paper(s) within a period of two years of his passing the M.Sc. examination. In all a candidate will be allowed to avail one chance within the period specified above. Improvement in practical paper is not permissible.

The result of such a candidate shall be declared only if he improves his score of marks, by taking into account the marks obtained by him in the paper(s) in which he re-appeared and the marks obtained by him earlier in the remaining paper(s). The fact that the candidate has improved the division shall be mentioned in the Detail Marks Cards. If a candidate opts to appear in both previous and final examinations for the purpose of improvement but finds that he has improved the score of marks obtained by him in the previous examination, he may not appear in the final examination as the case may be and

inform the Controller of Examinations for the declaration of his result.

Provided further that the candidate will take the examination according to the syllabus in force for the regular students for that examination. Provided that the syllabus for the candidates for the special examination to be held in September/October shall be the same as was in force for the regular student in the last annual examination.

18. Notwithstanding the integrated nature of this course which is spread over more than one academic year, the Ordinance in force at the time a student joins the course shall held good only for the examination held during or at the end of the academic year and nothing in this ordinance shall be deemed to debar the University from amending the Ordinance and the amended Ordinance, if any, shall apply to all students whether old or new.

19. Candidate admitted to M.Sc. Course in 1990-91 or earlier shall be governed by the old rules. The new rules shall be applicable w.e.f. the admission of academic Session 1991-92.

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SCHEME OF EXAMINATIONS

M.Sc. (GEOLOGY) (TWO YEARS COURSE)

M. Sc. Part—I (Geology)

It will be a two years course. In M.Sc. Part-I, the candidate will have to study the following compulsory papers :

		Max. Marks	Teaching hrs. per week
Paper-I	Geomorphology	80	4
Paper-II	Structural Geology	80	4
Paper-III	Crystallography & Minerology	80	4
Paper-IV	Petrology (Igneous & Metamorphic)	80	4
Papet-V	Practical structural Geology	50	4½
Paper-VI	Practical crystallography and Minerology	50	4½
Paper-VII	Practical Petrology	50	4½
Paper-VIII	Dissertation	30	

M.Sc. Part—II (Geology)

In M.Sc. Part-II, the candidate will study three compulsory papers (IX,X,XI) and one optional paper-XII :—

Paper-IX	Stratigraphy & Palaeontology	80	4 hrs.
Paper-X	Economic Geology	80	4 ,,
Paper-XI	Engineering Geology & ~~Hydrology~~ ground water	80	4 ,,
Paper-XII	(Optional) Geology	80	4 ,,

The candidate will opt. for one of the following papers :

i) Mining Geology and Geophysical Prospecting
ii) Advanced Tectonics and Himalayan Geology
iii) Applied Sedimentology & Petroleum Geology
iv) Applied Micropalantology
v) Mineral Economics and Ore-processing

PRACTICALS :

Paper-XIII	Practical Economic Geology	50	4½ hrs.
Paper-XIV	Practical Geology and Hydrology	50	4½ ,,
Paper-XI	Dissertation	80	

M.Sc. GEOLOGY (FINAL)

Paper IX (Stratigraphy & Palaeontology)

Max. Marks : 80
Time : 3 hrs.

SECTION-A

Stratigraphic principles and practice :

Basic principles, and difinitions. Stratigraphic classification and nomenclature. Stratification and stratigraphical column. Lateral variations and facies. Correlation. Orogonic succession. Graphical representation of stratigraphic data.

Indian Stratigraphy

Review of chief structural and stratigraphical features of Indian sub-continent.

Structure and tectonic history of the Indian sub-continent (Aravalli, Eastern Ghats, Satpura and Mahanadi Strike trends and their relative ages. Structure of Himalaya)

Study of major geological formations of the Indian sub-continent.

Archaean Group :	Distribution in peninsular and extra peninsulaar regions. Correlation of Dharwara. Structural trends.
Guddapah and Vindhyan Systems :	Distribution in peninsular Indian. Coppelation with the equivalent extra peninsullar formations. Age and correlation of Vindhyans.
Palaeozoic Group :	Distribution; Geological succession and fauna of each. Age of Saline series.

SECTION-B

Gondwana Group :	Distribution, geological succession and classification fauna and flora, age limits and structure of the Gondwana basins, Palaeogeography.
Mesozoic Group :	Distrtbution, geological, succession fauna and flora of each system. Igneous rocks and earth movements of Creataceous.

Deccan Traps : Distribution, geological succession petrology and alteration of traps. Lameta beds Inter trappeans and infra-trappeans age.

Tertiary Groups ; Break up of Gondwana land. Himalayan orogeny, Distribution, succession and fauna of the each of the systems. Siwalik system-distribution conditions of sedimentation fauna correlation.

SECTION-C

Fossils, their nature, mode of preservation and uses. Detailed morphology, classification and geological history of Corals. Brachiopods, Lemellioranche and Gaspopods, echinodermes and formaminifera. Principle gaps of verterbrates with emphasis of Gondwana and Siwalik fauna. Evoluationary histories of man, elephant and horse;

Vertebrates. Principle groups of vertibrates with emphasis of Gondwana and Siwalik faunas.

SECTION—D

Morphology, classification, Geological history and evolution Trilobite, Graptolite and ammonites.

Plants, fossil flora with emphasis on Gondwana flora and its significance and distribution.

Micropaleontology, its importance with special reference to forminiferids their ecology and palaececology.

Books Recommeded

1. Geology of India and Burma by D.N. Wadia.
2. Manual of Geology and Burma Vol. I, II and III by Edwin Pascoe.
3. Geology of India by M.S. Krishnan.
4. Woods, H. Paloeontology.
5. Moore, Lalicker & Fischer : Invertebrate Fossils.

Note : The examiner will set eight questions in all the theory papers selecting two questions from each section. The candidate will answer five questions in all selecting atleast one question from each section.

PAPER-X ECONOMIC GEOLOGY

Max. Marks : 80
Time : 3 hrs.

SECTION—A

The magma in its relation to mineral deposits: orthomagmatic deposits-pegmatic deposits-pyromatasomatic deposits hypothermal mesothermal and epithermal deposits.

Secondary enrichment : exidation, solution and precipitation in the zone of exidation-exidixed deposits and gossans secondary sulphide enrichment.

Secondary deposits : deposits formed by mechanical processes of transportation and concentration (detrital deposits)-deposits produced by—chemical processes of concentration in bodies of surface water by reactions between solutions-deposits formed by evaporation of bodies of surface water-mineral deposits resulting from processes of rock decay and wethering-deposits formed by concentration of substances contained in the surrounding rocks by means of circulating waters.

SECTION – B

General : the form, structure and texture of mineral deposits-ore sheets. Classification of mineral deposits. Structural control of mineral deposits. Geological thermometers. Metallogenetic epochs and previnces.

The study of the following with reference to origin, mode of occurrence, distribution in India and uses : –

Gold Copper-Lead-Zinc-Aluminium-Iron-Magnese-Chromium-Strategic mineral of India.

SECTION - C

Industrial Geology ; refractories abrasives-ceramics and glass making materials-fertilizers-natural points and pigments-cement-gem minerals.

The study of the following with reference to origin, mode of occurence, distribution in India and uses :

Mica Vermiculite Absestes-Barytes-Gypsum-Garnet—Corundum-Kyanite-Sillimanite-Ochro-Graphite-Talc-Flourspar-Bery-Zircon.

SECTION– D

Fuels : Coal : origin and classification of coal-ocurrence and distribution of coal in India-Indian reserves of coal conservation of coal in India.

Petroleum, natural gas and oil shale : its origin and accomulation-Gas and oil taps-classification of oil and gas reservoirs-petroleum bearing regions of India. Searching for new gas and oil fields.

Atomic energy minerals : Uranium and thorium minerals.

Books Recommeded

1 Principles of Economic Mineral Deposits by A.M. Bateman.

2 Mineral Deposit by W. Lindgren.

3 India's Mineral Wealth by Goggin Brown J. and A.K. Dey.

Note : The examiner will set eight qnestions in all. The Theory paper selecting two questions from each section. The candidates will answer five questions in all selecting atleast one question from each section.

Paper-XI ENGINEERING GEOLOGY & ~~HYDROLOGY~~ Ground water Geology

Max. Marks : 80
Time :3 hrs

SECTION—A

Engineering Geology : Introduction, application of geology to engineering and coordination between the two disciplines Engineering properties. of rocks Effect of geological structures. Rocks in Foundation materials. Rock defects, treatment and grouting. Soils types. formation and soil profile, Soil types of India. Soil organisation and conservation. Elements of soil mechanics Clay minerals and their properties Engineering behaviour of clays and soils.

Landslides and stability of hill slopes.

Rocks, gravels, sand and clays and construction materials. Geoolgy of aggregates Pezzelanic materials Elements of subsurface geological investigations Dams and reservoirs-their types forces acting on the dams Foundation, abutment, and reservoirs. area problems.

SECTION—B

Tunnels-their types. Alignment of tunnels in relation to geological air fields. Problems of their construction in mountanous regions. Bridges abutments, piers and foundation Harbour-coastal erosion and protection.

Importance of geomorphology, geological structures, rocks stresses lithology, groundwater, and availability of construction material for the above engineering works. Elements of Military Geology. Study of Engineering Geology case histories.

Well Logging :

Lithological, caliper and electrical logging including micre and focussing devices. S.P. and Induction loging Thermal, velocity and redicative logging. Interpretation and correlation of bore hole data.

Aerial Photo Geology : Photo-rading and interpretation; instrumentation and measurement; study of mesaics; interpretation physiography, stratigraphy and structure; use of aerial photographs in geological mapping; interpretation of aerial photographs in petroleum mineral geology, engineering geology and hydrological studies.

SECTION—C

Introduction : Definition and classification of sub-surface water.

Hydrology : Hydrological cycle, precipitation, evapetranspiration, infiltration, run-off. Ground water equation.

Hydrological properties of water bearing materials. Porosity permeability, transmissibility and storage coefficient. Principle of groundwater occurrence; occurrence of groundwater in igneous metamorphic, sedimentary and in consolidated rocks. Groundwater conditions soluble rocks and volcanic rocks, Spring and geysers confined and unconfined groundwater.

Groundwater flow, Farcy's law and its range of validity. Stready and unstready flow, flow not analysis.

Drilling methods :- Types of drills-percussion, churn rotary diamond drilling. Samples, records and logs, choice and purposes drilling method.

SECTION—D

Groundwater development : Prospecting for groundwater construction, design and development of water wells. Water wells screens Hydraulics of wells : Water table and Artesian wells. Pump Test Analysis and determination of aquifers characteristics. Theory of Image wells. Leaky aquifers and partially penetrating wells. Spacing and interference of wells Relation of yield to drawn dawn and diameter. Groundwater levels and fluctuations.

Methods of artificial replenshment. Fresh and salt water relationship in costal area. Groundwater provinces of India. Groundwater Inventory. Quality of water chemical zoning

Books Recommended :

1. Principles of Engineering Geology and Geotechniques by Krynin and Judd.
2. Engineering Geology by Loback.
3. Ground water by Tolman.

Note : The examiner will set eight questions in all the theory papers selecting two questions from each sections. The candidates will answer five questions in all selecting atleast one question from each Section.

Paper—XII (Optional)

(i) MINING GEOLOGY AND GEOPHYSICAL PROSPECTING

Max. Marks : 80
Time : 3 hrs.

SECTION—"A"

Prospecting : surface and underground indications; what minerals look for and where; field tests and measurements; trenching, prospecting pits and boreholes; prospecting for placer deposits, outline of the principles and methods of geophysical prospecting.

Sampling various methods, recording of samples; errors in sampling; sampling calculations, weighting, spacing and arrangement of samples; underground sampling and calculations, sampling practice, ore estimation.

SECTION—'B'

Developing and equipping a prospect, prospecting shafts; drifts and tunnels; ventilation of shafts and tunnels; development; elementary principles of mining; use of explosive, high and low; prevention against accidents in their uses,

Ore search and ore appraisal: different guides to ore location physiographical, mineralogical, stratigraphical and lithogical; fracture pattern and contacts and folds; dislocated ore bodies persistence of ore in depth, geological work at an operating mine and mine valuation.

SECTION—C

Drilling : uses, nature of evidence; various methods; churn drilling; shot drilling diamond drilling and their relative merits; common difficulties in drilling and their solutions; recording of borehole data, deductions from ore and sludge samples; geologists' duties, correlation.

SECTION—D

General principles of geophysical prospecting geophysical methods, gravitational methods, magnetic methods seismic methods, electrical methods, radioactivity, calculation of gravit anomaly, relation between gravity and structure relation between magnetic intensity and geological structure geological application of seismic methods. Well Logging.

Books Recommended

1. Hand book of Mining Geology, Vol. I,II by Peel.
2. Mining Geology by H.E. Mekinstry.
3. Introduction of Geophysical Prospective by M.V. Dovrin Mc. Graw.

Paper-XII (ii) ADVANCED TETONICS AND HIMALAYAN GEOLOGY M.M. : 80

SECTION—A Time : 3 hrs.

Earth movements and their influence on sedimentation study of rock deformations-continuous and discontinuous. Rock displacements. Deformations of non-tectoric origin. Kinematic interpretation of tectonic deformations. Tectonics of flow. Dynamic and mechanical interpretations Mechanism of everthrusts and Nappe structures. Gravitational tectonics. Rift and Wranch fault systems.

SECTION—B

Orogeny characteristics of various orogenies. Alpine and Himalayan orogenies and tectonic approach to continental drifts Review of various theories of mountain building. Growth of continents.

SECTION—C

Island ares and oceanic trenches, Geological cycles. Drainage patterns and its relation to the tectonics. Structural and tectonics units of earth crust. Detailed study of the structural and tectonic history of India.

SECTION—D

The wider frame of Himalaya, Geological history of Himalaya. Regional structural pattern of Himalaya. Study of the various tectonic elements of Himalaya. Geology and structure of the Himalayan belts of Kashmir, Himachal, Garhwal Kumaon, Nepal, Sikkim-Bbuttan and Nefa.

Books Recommended

1. Structures of Himalayas by Ganysser.

Note : The examiner will set eight questions in all theory papers selecting two questions from each section, The candidates will answer five questions in all selecting atleast one question from each section.

Paper-XI (iii) APPLIED SEDIMENTOLOGY AND PETROLEUM GEOLOGY M.M. : 80

SECTION—A Time : 3 hrs.

Applied Sedimentology

Principles of sedimentation and sedimentary environments. Sedimentation and tectonics. Lithification and diagenesis. Properties, classification and petrography of various sedimentary rocks.

SECTION—B

Sedimentary Textures and structures. Palaeocurrents and basin analysis. Sedimentary basins clastic, carbonate, evaporite, turbidite and reef. Facies concept. Sedimentary facies. Principles and methods of grain size and shapes analysis. Techniques of heavy mineral separation. Heavy mineral suites and provenance.

SECTION - C

Petroleum Geology :

Origin, migration and occurrence of petroleum and natural gas. Structural and stratigraphic traps. Reservoirs and their characterstics, Reservoir rocks their porosity and permeability.

SECTION—D

Subsurface Geological Methods :

Drilling methods. Drilling fluids. Subsurface sampling and examination of cell cuttings. Interpretation and correlation of well logs. Methods of estimating oil and natural gas reserves.

Petroleum Provinces :

Oils and gas fields of the world. Sedimentary basins and oil field in India. Oil prospects in India. Petroleum exploration and production programmes in the Five Year Plans.

Books Recommended

1. Sedimentary rocks by F.J. Petti John.
2. Microscopic Sedimentary Petrography by A.V. Carrozzi.
3. Petroleum Geology by A.I. Levorsan.

NOTE : The examiner will set eight questions in all the theory papers selecting two questions from each section. The candidate will answer five questions in all selecting atleast one question from each section.

Paper-XII (iv) APPLIED MICROPAL AEONTOLOGY

SECTION—A M.M. : 80

General : Time : 3 hrs.

Introduction, classification or organism with reference to microfossils, Environmental significance and stratiraphic importance of microfossils. Microfacies. Biostratigraphic correlation. Application of Micropalaeotology and new developments.

SECTION – B

Foraminifera :

Generalities, life history, alternation of generations dimorphism trimorphism and polymorphism. Contribution and morphology of the test. Classification. Systematic study of families, superfamilies and some important general and their phylogenetic and evolutionary relationship. Ecology and Paleoecology Stratigraphic imaportnce.

SECTION – C

Ostracode

Morphology, ornamentation and orientation of the carapack. Classification. Study of some important general and their stratigraphic importance.

SECTION—D

Plant Microfossils :

Spares and poliens, their morphology and classification. Techniques of spares and pollens analysis. Fossils seeds. Application and importance of Polynology.

Other Microfossils :

Conodonts their characteristics, origin orientation and stratigraphic importance.

Other microfossils and their stratigraphy.

Note: The examiner will set eight questions in all the theory Papers selecting two questions from each section. The candidate will answer five questions in all selecting at least one question from each section.

Paper-XII (v) MINERAL ECONOMICS AND ORE PROCESSING

SECTION—A M.M. : 80

SAMPLING

Principle, application and scope. Theory of sampling. Various methods of sampling. Errors and economic mineral deposits. Errors and procedures, in sampling calculations, practice, records and reports.

Assaying -

Scope and application. Various methods of assaying conventional procedures, rapid and instrumental techniques. Calculation of average assay values.

SECTION-B

MINERAL DRESSING

Scope and economic justification. Physical and chemical properties of minerals as applied to mineral dressing. Sieve analysis and its significance. Methods of separation and dressing-operating steps involved and flow sheets.

Preliminary and secondary breaking and a fine grinding. Principles of crushing. Crushers Saw, gyrating and cone Rollers, gravity and steam stamps. Balt, rods, tube and other types of mills and their efficiency. Economic considerations.

Sizing by screens Principles of settling classifying and settling in water. Jigs and Tables-their use in concentration.

SECTION - C

Heavy media separation-process using heavy liquids and heavy suspensions. Chance process.

Fleatation scope and principles; Floation reagents-frothers, collectors and modifiers. Fleatation machines and process, practice and flow sheets.

Magnetic section and other miscellaneous process as a separation and concentration (processes depending on differential hardness, heat and electrical properties.

SECTION—D

Treatment of concentrates-dewatering, filteration, drying and thickening. Ore examination and testing. Application of ore microscopy to ore dressing techniques.

Amalgamation, cyanidation and leaching of ores for recovery of metals.

Dressing of the ores and minerals of the following with special reference to Indian conditions: Gold, silver, copper lead, zink, iron, manganese, chromium and titanium, uranium and thorium, coal graphite, barytes, phosphate, clays and limestone.

Books Recommended

1. Principles of mineral dressing by Gaudin, A.M.
2. Minerals in World affairs, Lovering T.S.

Note : The examiner will set eight questions in all the theory papers selecting two questions from each section. The candidates will answer five questions in all selecting atleast one question from each section.

Paper--XIII ECONOMIC GEOLOGY PRACTICAL

Max. Marks: 50

1. Study of characteristic structures, textures and association of different ore minerals.

2. Study of metalic ore minerals in hand specimens with special reference to their distinguishing physical characters, association form and structure and probable origin of the following metals -

A. Iron and Ferroalloy metals : Iron, manganese, chromium, nickel, cobalt. vndadium, tungsten, molybdenum.

B The nonfeirous metals: Copper, lead, zinc, tin alumiunum

C. Precious metals: Gold, silver and Platinum.

D. Radioactive ore minerals:

E. Minor metals and related non metals: Antimony arsenic, bismuth, sodium, magnesium, mercury, beryllium, Tantalum, columbium, zirconium and lithium.

3. Study of industrial non-metallic minerals and rocks in hand specimen of the following:—

A. Minerals fuels (Peat, lignite coal, and petroleum).

B. Refractories.

C. Class and geranic

D. Abrasives

E. Fertilizers.

F. Building materials

G. Chemicals.

H. Natural pigments

I. Insulation and electrical industrial materials

J. Gemstones.

4. Preparation of mineral maps of India.

5. Preparation of polished ore specimen

6. Elementary study of important ore minerals and their texture in polished sections under ore microscop.

Note : For all the three practicals papers in M.Sc. Part-I and two practical paper in M.Sc. Part-II, one external examiner and one Internal examiner will be appointed.

Paper XIV PRACTICALS Max. Marks : 50
ENGG. GEOLOGY & HYDROLOGY Time 3 hrs.

ENGG. GEOLOGY

1. Study of rocks for use in various constructional purposes.

2. Mechanical analyses of the sediments and sedimentary rocks determination of statistical paramanets.

3. Specific gravity and moisutre content.
4. Field density and void ratic.
5. Atterberg limits
6. Compaction test
7. Permeability tests.
8. Unconfined compression test.
9. Study and interpretation of Geological maps involving dam site, tunnels, roads and stability of slopes.
10. Triaxial test.
11. Interpretation of bore hole data.

HYDROLOGY

1. Study and interpretation of water table maps.
2. Mechanical analysis of sediments-determination of statistical parameters.
3. Determination of porosity and permeability.
4. Interpretation of pump test analysis data and determination of aquiefer constants.
5. Chemical analysis of groundwater-plotting of data and interpretation.
6. Plotting of the groundwater provinces of India.

Note : For all the three practicals papers in M.Sc part-I and two practicals papers in M.Sc. Part-II, one external examiner and one Internal examiner will be appointed.

Paper-XV DISSERTATION

Max. Marks : 80

During the course of the year, each student shall be required to go for sub-surface Geological mapping to the suitable mine conducted by the teachers of the Department. It will be a field work of four weeks duration and one teacher will guide atleast four students