

Safar

FORMAT FOR QUESTION PAPER

(Question paper should be typed and sealed in the envelop provided for the purpose)

SEMESTER: MONSOON / WINTER, SESSION: 2005-06

Examination & Semester: 2005-06 IV

Subject (Block letters) Geothermics and Geodynamics Time: 3 Hours

Instructions, if any _____ Max. Marks: 100

Section (if any) Two Marks 40+60

SECTION A (Answer any two questions)		
Q. Nos.	Questions	Marks
1 ✓	What is a nebula? Name at least three modern nebular hypotheses. Discuss briefly any one of them in detail.	20
2 ✓	What are the sources of heat inside the earth? Give a brief account of the factors that affect the heat flow in any area. Discuss the variability of heat flow in continental and oceanic areas.	20
3 ✓	Explain with diagram different hypotheses of isostasy and discuss how isostatic anomalies can be used to derive over/ under compensation.	20
SECTION B (Answer all questions)		
Q. Nos.	Questions	Marks
4 ✓	What is difference between continental and oceanic lithospheres? Discuss briefly its features and characteristics.	8
5 ✓	Discuss the evolution of Himalayas in the light of northward movement of Indian plate.	10
6 ✓	Write briefly a technique for heat flow measurement in continental region.	8
7	Discuss briefly different types of plate boundaries and their characteristics.	10
8	Show with a neat sketch the nature of magnetic anomalies across ridges. On the basis of this, discuss briefly Vine-Matthews-Morley's hypothesis for Ocean floor spreading.	8
9	Discuss briefly magnetostratigraphy scale.	8
10	Write briefly different geological provinces in India.	8

① Radioactive
 ② slow cooling
 of earth
 ③ heat flow
 into the base
 of lithosphere
 from deeper
 mantle.

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Examination M.Sc.Tech.(AGP) 2003-2004 Semester IV (Winter)
 Subject (block letters) GEO THERMICS AND GEODYNAMICS Time 3 hours
 Instruction, if any _____ Max.Marks 100
 Section (if any) _____ Marks _____

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Q.No.	Question	Marks
SECTION-A(60 Marks)		
2	Answer <u>All</u> questions.	
1.	What are the processes involved in the sinking of iron and the core-mantle formation?	10
2.	Explain the role of geothermal field in the generation and maturation of hydrocarbons.	8
3.	Explain the following: (a) Adiabatic temperature gradient (b) Isostatic compensation.	4+6 =10
4.	Write recent views on the seismic structure of the continental and oceanic crust.	6+6 =12
5.	Give a brief note on heat flow zones in India.	10
6.	Write a note on Indian plate movement and formation of Himalaya.	10
SECTION - B(40 Marks)		
Answer any <u>TWO</u> questions.		
7.	Write a note on the distribution of major chemical elements in the terrestrial and extra-terrestrial planets and their significance to evolution.	20
8.	What is heat flow? How it is measured in an oceans basin? How heat flow is related to radioactive heat generation in the continental crust? $q = q_r \cdot DA$	20
9.	Give a brief account of the concept of continental drift, sea-floor spreading and plate tectonic theory.	20

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SEMESTER: MONSOON / WINTER, SESSION: 2010-11

Examination and Semester: 9th 5-YR INT M.Sc. Tech AGP / 5th 3 YR M.Sc. Tech AGP

Subject: GEOTHERMICS & GEODYNAMICS (GPC 99103)

Time: 3 hours

Instructions, if any - ANSWER ANY TWO QUESTIONS FROM SECTION A and ALL QUESTIONS FROM SECTION B Max. Marks: 100

Section (if any) - Marks

Q. No.	Question	Marks
Section A (Answer any two questions) 2x20 marks		
1	a) Define heat flow, giving its units and dimensions? Always use S.I. units.	4
	b) What are the sources of heat flow in continental and oceanic areas?	4
	c) How is heat flow determined? Explain briefly the techniques of measurements on land?	8
	d) Why does heat flow vary between different geologic/tectonic provinces? What is the general order of variability in the Indian shield?	4
2	a) Discuss the principal constraints on the thermal structure of the oceanic lithosphere?	4
	b) Explain briefly the cooling models for oceanic lithosphere. Write the empirical relationships between heat flow, bathymetry and lithospheric thickness with age. Use the expressions to estimate the three quantities for old ocean (age = 100 million years). How does the heat flow in old ocean compare with that in continents?	10
	c) Show schematic plots of (i) heat flow vs age and (ii) bathymetry vs age for both half space and plate cooling models. How do they compare with oceanic heat flow observations?	6
3	a) Explain Isostasy with examples. Why is it important in geodynamics?	4
	b) Explain the different models for isostatic compensation with neat diagrams.	8
	c) What is meant by compensation, undercompensation and overcompensation? Draw diagrams to explain the three situations.	8

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Q. No.	Question	Marks
Section B: Short questions (Answer all questions)		
1	Write short notes on any <u>three</u> of the following:	3x6=18
a)	Northward movement of Indian plate and its implications.	
b)	Heat transport mechanisms in the Earth	
c)	Bullard Plot method for determining heat flow and its applications	
d)	Geothermal energy resources in India and their distribution.	
e)	Sea floor spreading and continental drift	
	Why is knowledge of heat flow important in studies of geodynamics? Mention three applications of heat flow with examples?	6
	Define (a) Rayleigh number and (b) Nusselt number. Mention their typical values (order of magnitude) that characterize the convection in the asthenosphere.	6
	Define radiogenic heat production, giving its units and dimensions. Write the expressions for decay of three most important heat producing elements. Why is radiogenic heat production important in interpreting surface heat flow data?	6
	A typical continental crustal section comprises 5 km of granitic rocks underlain by 15 km of gneissic rocks and 15 km of granulitic rocks. How much heat does the crust produce? What is the percentage contribution of crustal radiogenic heat production to surface heat flow? Assume average surface heat flow of 50 mW m^{-2} and average values of radiogenic heat production ($2 \mu\text{W m}^{-3}$, $1 \mu\text{W m}^{-3}$ and $0.4 \mu\text{W m}^{-3}$ respectively for the three rock types).	6
	Write the generalized equation for heat conduction, showing the steady-state and transient components. Apply the equation in the case of dominantly vertical heat flow from the Earth's interior under steady state conditions, both with and without radioactive heat production. Derive the expression for computing temperature-depth profile in the crust by solving the steady-state heat conduction equation with radioactive heat sources. Use the following boundary conditions: (i) at $z=0$, $T=T_0$ and (ii) at $z=0$, $q=q_0=-k(\partial T/\partial z)_{z=0}$. z is depth, T is temperature, k is thermal conductivity,	10
	Explain plate tectonic hypothesis and illustrate with a labeled diagram. Briefly discuss the major plate driving forces?	8

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SEMESTER: MONSOON
 Examination: M. Sc. Tech. AGP
 Semester: 5th Sem. 3yrs. & IXth Sem. 5yrs. Int.
 Subject: GEOTHERMICS & GEODYNAMICS

SESSION: 2011-12
 Max. Marks: 100

Time: 3 Hours

Section A (60 marks)
(Answer all the questions)

Q. No.	Questions	Marks
1.	Derive the expressions for adiabatic and melting point temperature gradients inside the earth.	8
2.	Derive the expression for three-dimensional steady-state heat-conduction equation. Calculate an equilibrium geotherm from the one-dimensional heat-flow equation, given the following boundary conditions: (i) $\frac{\partial T}{\partial z} = 30^\circ\text{C/km}$ at $z = 0$ km depth and (ii) $T = 700^\circ\text{C}$ at $z = 35$ km depth. Assume that the internal heat generation is $1.0 \mu\text{Wm}^{-3}$ and the thermal conductivity is $3.0 \text{ Wm}^{-1}\text{C}^{-1}$.	14
3.	Explain any three of the followings: a) Thermal history of the Earth, (b) formation of proto-core, (c) adiabatic self-compression, and (d) distribution of major chemical elements in the inner and outer planets of the solar system.	9
4.	Write a brief note with suitable diagrams for maturation of hydrocarbon.	8
5.	Show with suitable diagram the detailed structure of oceanic crust.	5
6.	Define isostasy. Explain the regional isostatic compensation according to the model of Vening Meinesz.	6
7.	Discuss a method for calculation of tectonic plate velocity.	4
8.	Explain the stability of triple junction. Explain the terms (a) Polarity chrons, (b) polarity subchrons, (c) magnetic excursion, and (d) polarity transition.	6

Section B (40 marks)
(Answer any two questions)

20×2=40

9.	a) Explain the characteristic movement of Indian plate and formation of the Himalayas. b) Discuss a method for measuring oceanic heat flow.	14+6=20
10.	(a) Explain the followings evidences in support of the continental drift: (i) Paleontological, (ii) Structure and rock type, (iii) Glaciation, (iv) Paleoclimatic records, and (v) Paleomagnetism. (b) Write a brief note on tectonic processes along destructive plate boundaries.	15+5=20
11.	(a) Explain the following terms in case of mantle convection: (i) Reynolds number, (ii) Nusselt number, (iii) Peclet number, and (iv) Prandtl number. (b) Explain the conductive and advective heat flow processes inside the earth.	12+8=20