SIKKIM UNIVERSITY

(A Central University established by an Act of Parliament of India, 2007)
6th Mile, Samdur, PO Tadong, Gangtok- 737102

Academic Session 2010-11
Entrance test (SET:D- GEOGRAPHY)

Post Graduate Courses

Time: Three hours   Maximum Marks: 100

Instructions for the candidates

1. Duration of the Entrance Test is three hours.

2. No candidate shall be allowed to enter the examination hall half an hour after the commencement of the examination.

3. Candidates can only be allowed to leave the examination hall one hour after the commencement of the examination.

4. No candidate shall be allowed to continue writing the examination after the final bell.

5. If any answer is to be crossed out, cancel it by drawing a line across it.

6. Please read the questions carefully before answering.

7. Each question shall carry **20 marks**. Wherever required the marks distribution is indicated alongside the questions.

8. Candidates have to answer only **5 questions**. One question from each section is compulsory.

9. Please ($\sqrt{}$) mark the question you have attempted in the cover page of the answer booklet.

10. Candidates can choose any discipline/subject and can attempt any question subject to the condition mentioned at sl. No. **8** above.

11. After finishing the work, handover the answer book only to the Invigilator.

1

One question from each section is compulsory

SECTION 1: GENERAL

1. Naxalism has been major issue in the state security discourse in India. Discuss the state's response to naxalism.

2. Is NAM still relevant in the present world order? Discuss

3. Write an essay on the problems and prospects of regional co-operation in South Asia.

4. "Ragging in educational institutions should be treated as crime". Give your views

5. Write a note on Climate Change and global warming (500 words)

SECTION 2: CORE-GEOGRAPHY

6. What is weathering? Explain the different processes of weathering.

7. Give a critical account of the theory of Plate Tectonics.

8. Define biogeography. Write on the scope and significance of biogeography.

9. "Landscape is a function of structure, process and stage"- Explain.

10. Discuss in detail the problems of Indian Agriculture. Suggest some remedial measures to solve them.

SECTION 3: ELECTIVE

BOTANY

11. State five characteristic features of anthocerotopsida and describe life cycle of a hornwort.

12. Name ten plants of Eastern Himalaya having biopesticidal properties. Also furnish short account of their active biochemicals, parts used and target pests/pathogens.

13. Give an account of the morphological, anatomical and physiological modifications of halophytes.

14. What are the functions of different forms of RNA? What are the primary and secondary structure of RNA? Illustrate the structure of a tRNA, indicating the various unusual bases in it.

15. Describe the ultrastructure of mitochondria. Why is it called semi-autonomous? Describe the different enzyme complexes that are found in the membrane of mitochondria.

CHEMISTRY

16. (a) What do you mean by K_p and K_c ? Establish the relationship between them.

    (b) Deduce van't Hoff's equation. What is its importance ?

    (c) State and explain Le Chatelier's principle.

    (d) Give an expression of K_p for the following reaction:
    $\frac{1}{2}N_2 + \frac{3}{2}H_2 = NH_3$

    (e) Give an expression for Maxwell's distribution of molecular velocities.[5+6+3+4+2]

17. (a) Discuss the spectroscopic characteristics of the following molecules (i.e. UV, IR, NMR):
    (i) Acetyl acetone
    (ii) acetophenone
    (iii) Ethanol
    (iv) Toluene
    (v) Benzyl alcohol

    (b) What is peptide bond ? Explain a helix structure of protein.

    (c) Write a brief account on photo electric effect.   [2 x 5 + 3 + 3 + 4]

18. Discuss the following reactions on the basis of mechanism and applications:
    (a)Gatterman-Koch reaction
    (b) Sharpless asymmetric epoxidation
    (c) Baeyer-Villiger oxidation
    (d) Meerwin-Pondorf-Verley reduction
    (e) Mannich reaction.   [4 x 5]

19. (a) What is a radical distribution function ? Draw this function for 1s, 3p and 4p orbitals.

    (b) What are radio ratio rules ? Show that the limiting radius ratio for a tetrahedral structure is $0.05 - 0.225$.

(c) Write down the Born-Lande equation clearly explaining the terms involved. [8+8+4]

20. (a) How are aldehydes and ketones differentiated during qualitative analysis? Write the relevant tests and equations for the chemical reaction involved.

(b) What is the role of pH in redox titrations ? Illustrate your answer with one example.

(c) What precautions should you take while liberating iodine during an iodometric analysis and why? [7+7+6]

COMMERCE

21. Discuss the provisions of Income Tax Act regarding residential status of an individual.

22. Explain Uruguay Round and Dunkel proposals.

23. Describe the modes of dissolution of a partnership firm?

24. Compare and constract Memorandum of Association with Articles of Association?

25. What do you mean by valuation of shares? Why its valuation is necessary?

ECONOMICS

26. "The assumption of diminishing marginal rate of substitution automatically establishes the convexity of the indifference curve" discuss. Show graphically the substitution and the income effects of a price change as per Hicks version.

27. What do you know about agricultural marketing in India? Explain its defects and remedies. Do you think that the recent scenario of rising food prices in the country is due to poor marketing system of agricultural commodities?

28. Define gains from trade. Discuss the sources of gains from trade. Explain Absolute Cost Advantage and Comparative Cost Advantage theory of trade.

29. Comment the statement that "technology is the heart of economic development". Discuss briefly the problem of technology in underdeveloped countries and suggest measures to prevent it.

30. Describe the function of money. Who controls the money supply and how? Explain the relationship between Liquidity Preference and Rate of Interest.

EDUCATION

31. What is the modern concept of curriculum? What are the basic principles of curriculum construction?

32. What do you mean by International understanding? Education is the only means to develop this feelings why? Discuss in detail.

33. What are the defects in the present system of examinations and what reforms do you like to suggest?

34. Describe the major recommendations of Mudaliar Commission in respect of aims, structure and curriculum for multipurpose school.

35. Define guidance. What are the objectives of educational and vocational guidance?

ENGLISH

36. Write an essay on the influence of science in literature

37. Write an essay on the "Poetic Drama" of the twentieth century

38. Write a short essay on the metaphysical poets of the seventeenth century

39. Trace the origin and development of English essay

40. "Wordsworth is a poet of nature". Do you agree with this statement? Substantiate your arguments

HISTORY

41. Explain Ashoka's Dhamma.

42. Analyse the main causes of the decline of Aurangazeb.

43. What was Gandhi's "Satyagraha"? Give an account of the non-cooperation movement.

44. Why was India partitioned in 1947? Was partition inevitable?

45. What is Drain of Wealth? How did it operate in the 18th Century?

MATHEMATICS

46. State and prove Green's Theorem in the plane. Hence verify the theorem for

$$\oint_{\tau} (x^2 dx + xydy) \quad ,$$

where τ is a square in the xy plane given by $x = 0$, $x = a$, $y = a(a > 0)$ described in the positive sense.   [2+10+8]

47. (a) Define giving examples

     i. monotonically increasing functions

     ii. even functions.

     iii. implicit functions.

     iv. bijective functions.

   (b) Show that $y = |x|$ is continuous at $x = 0$ but not differentiable at that point. Is differentiability of a function is sufficient condition for continuity at that point? Justify your answer.   [10+10]

48. (a) Using Graphical method solve the following L.P.P

$$\text{Maximize} z = 2x_1 + 3x_2$$

$$\text{subject to} x_1 - x_2 \leq 2 \quad , \quad x_1 + 2x_2 \geq 4 \quad , \quad x_1, x_2 \geq 0$$

   (b) Obtain an initial basic feasible solution of the following T. P.

	A	B	C	
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
	6	10	15	

by Vogel's approximation method.   [10+10]

49. (a) State and prove Rolle's theorem

   (b) A function $f(x)$ is defined in the following way,

$$f(x) \quad = -x, \quad \text{when} \quad x \leq 0 \quad ,$$
$$= x \quad \text{when} \quad 0 < x < 1 \quad , \tag{0.1}$$
$$= 2 - x \quad \text{when} \quad x \geq 1 \quad . \tag{0.2}$$

Discuss the continuity of the function at $x = 0$ and at $x = 1$.   [10+10]

6

50. (a) Show that differentiability of a function implies its continuity. Is the converse true? Justify your answer. [5+5]

   (b) Define the following giving examples:

      i. Explicit functions
      ii. Odd functions
      iii. Onto Functions.
      iv. Monotonically decreasing functions. [10+10]

MICROBIOLOGY

51. Define antibodies. Classify immunoglobulins on the basis of their differential characters. Describe with diagrams the structure and functions of Immunoglobulin G.

52. Give an illustrative account of the virus that causes AIDS. How is it transmitted? Write the pathological changes that can results from this infection.

53. What is conjugation? Elucidate the process of conjugation.

54. If the bacterial culture is grown in medium containing glucose and lactose, which of these will be utilized first and why? Explain Glycolysis.

55. What is Nitrogen fixation? Describe symbiotic and non-symbiotic nitrogen fixation. Mention the role of leghemoglobin in this process. Give two example of nitrifying bacteria.

PHYSICS

56. (a) What is meant by crystal lattice, basis and crystal structure.

   (b) What are Miller indices? Calculate the distance between the adjacent parallel planes with Miller indices (h, k, l). Drawa $(2, 2, 0)$ plane in a cubic unit cell.

   (c) What is diamagnetism? Why diamagnetic materials have negative susceptibility?

   (d) What do you mean by apparent length contraction. Show that the velocity of light is the maximum in the universe.?

   (e) What is one electron volt? Find the expression for velocity of an electron moving through a potential difference of $'V'$ volt. [2+6+3+5+4]

57. (a) What do you mean by matter-wave duality? Explain de-Broglie hypothesis. Show that the de Broglie wavelength of a particle of rest mass m_0 and kinetic energy E_k is given by $\lambda = \frac{h}{\sqrt{2m_0 E_k}}(1 + \frac{E_k}{m_0 c^2})^{-1/2}$.

(b) What are the differences between Galilean and lorentz transformation? Explain.

(c) Using velocity addition formula prove that 'c' is the maximum attainable speed. [5+5+10]

58. (a) State and prove Gauss' theorem on Electrostatic.

(b) Show that the energy stored in the electric field produced by a metallic sphere of radius R and containing charge Q is given by $U = \frac{Q}{8\pi\epsilon_0 R}$

(c) What is meter bridge? Discuss, in brief, its working principle. [4+8+8]

59. (a) What is wavefront? When does it become (i) spherical (ii) plane?.

(b) Explain Huygen's principle for wave propagation and deduce the law of refraction from it.

(c) What is mean by resolving power of diffraction grating.

(d) Show that resolving power is given by the product of the total number of fringes and the order number of spectrum. [6+2+6+6]

60. (a) Find the maximum frequency of the X-rays emitted by an X-ray tube operating at $30kV$

(b) Describe with the help of diagram, the working principle of PNP transistor. Hence define its α and β.

(c) Why is the base region of transistor is made very thin.

(d) What do you mean by Barkhausen criteria for sustained oscillations? Explain. [5+3+8+4]

POLITICAL SCIENCE

61. The United Nations has partially succeeded in its role in maintaining world peace and security. Is it true? Discuss.

62. What is sovereignty? Explain monistic theory of sovereignty.

63. What are the main features of India's foreign policy today? Is it different from the features of foreign policy during Nehru era?

64. Explain the main characteristic of the Marxist theory of class struggle and 'withering away' of the state.

65. What is a welfare state? What are its functions? Critically evaluate the theory of welfare state.

SOCIOLOGY

66. Critically examine the theory of religion given by Max Weber.

67. Define social change. Discuss the various factors of social change with suitable examples.

68. Write a short note on primary and secondary sources of data with suitable examples.

69. What are the causes of indebtedness among tribals in India? What remedial measures do you suggest?

70. Define kinship. Discuss in brief kinship usages. What is the importance of studying kinship system?

ZOOLOGY

71. Define gene mutation. Discuss different types of mutation caused by various mutagens. Describe post mutation DNA repair mechanism.

72. What do you understand by organic evolution? Justify the concept of evolution with the help of embryological and biochemical evidences. Correlate the topic with Darwin's theory of natural selection.

73. Define ecosystem. Discuss the limiting factors of an ecosystem. Mention the fate of solar energy from its source to consumers in an ecosystem. What is the functional unit of an ecosystem?

74. What is the composition of blood? Enumerate the functions of blood. Give the detail account of different types of blood groups. Explain Rhesus factor.

75. What do you mean by economic zoology? Name the different species of silk moths and honey bees of India. Describe in brief the life history of any one of them. Give an account of the diseases of the insect and their remedies.