Ph.D. ENTRANCE EXAMINATION, NOVEMBER 2004

Time : 140 Minutes   Maximum : 160 Marks

Sections B & C

Note.—(1) *Answer any* **twelve** *questions from Section B and* **one** *question from Section C in the subject concerned.*

(2) *In Section B each question carries 10 marks. Section C carries 40 marks.*

(3) *In Section B an answer should not exceed 100 words. In Section C an answer should not exceed 500 words.*

(4) *The candidates are permitted to answer questions only from the subject for which he/she has been registered for the examination.*

(5) *The candidates should clearly indicate the section and question paper number in the answer paper.*

(6) *Page No. 1 to —51— Question Booklet and use Page No. —53— to —80— for Answering Questions.*

(7) *No page should be detached from this Booklet.*

(8) *No additional sheet shall be supplied.*

Reg. No. [ ][ ][ ][ ][ ][ ]

Ph.D. ENTRANCE EXAMINATION, NOVEMBER 2004

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Sections B & C

(This is to test the candidate's capability of defining concepts through short answers.)

Note.—(1) *Answer any* **twelve** *questions from Section B and* **one** *question from Section C in the subject concerned.*

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(5) *The candidates should clearly indicate the section and question paper number in the answer paper.*

FACULTY OF ARTS

1. English

Section B

1. Absurd Theatre.

2. The Romantic movement.

3. Feminist Criticism.

4. Early Indian writers in English.

5. Restoration period.

6. Victorian fiction.

7. The Great Tragedies of William Shakespeare.

8. *The Prologue* of *The Canterbury Tales* as a portrait gallery.

9. Bacon as an Essayist.

10. Metaphysical school of poetry.

11. Stream of consciousness technique.

12. T.S. Eliot as poet and critic.

13. Raymond Williams as a Culture Critic.

14. Comedy of Manners.

15. Growth of Vocabulary in the English language.

16. Satire and the Augustan poets.

4. Philosophy

Section B

1. Form and matter.
2. Empiricism.
3. Appearance and reality.
4. Induction.
5. Symbolic logic.
6. Quantification.
7. Vedas.
8. Yoga sutras.
9. Sadhana catustaya.
10. Apauruseya.
11. Bodhisattva.
12. Utilitarianism.
13. Situation ethics.
14. Existentialism.
15. Phenomenology.
16. Deconstruction.

Section C

1. Define the term "Research" and discuss its scope and objectives.

2. Select a topic of your choice for research and prepare a research design at the Ph.D. level on it.

3. Discuss the scope of research on contemporary Indian thought.

5. Library and Information Science

Section B

1. Information audit.
2. Logic in research.
3. Review article.
4. NISCAIR.
5. Scientometrics.
6. Bibliographic coupling.
7. Relay research.
8. Style manuals.
9. SOUL.
10. Scientific methods.
11. INFLIBNET.
12. CD-ROM search.
13. Visibility Index.
14. Citation Index.
15. Literature review.
16. Softbooks.

Section C

1. Role of IT in higher education.

2. Internet and societal issues.

3. Information policy of India.

FACULTY OF COMMERCE

6. Commerce

Section B

1. Scrip dividend.	2. Institutional investors.
3. Capital Rationing.	4. Balanced Budget.
5. Cost Effectiveness.	6. Concentration Banking.
7. Indirect tax.	8. 80-20 rule in marketing.
9. Leverage Ratios.	10. Double Insurance.
11. Factoring.	12. Pre-exchange rate.
13. Joint and Several Responsibility.	14. Letter of Credit.
15. Micro Accounting.	16. Merchant Banking.

Section C

1. Develop a research proposal for a business organization on a problem in marketing.

2. State the statistical tools available for analyzing and interpreting data for social research.

3. Write a note on the disinvestments of public enterprises in India mentioning the merits and demerits.

FACULTY OF EDUCATION

7. Education

Section B

1. What are the social, psychological and educational reasons for advocating craft-centred education ?

2. How can culture be transformed through education ?

3. Explain how you would handle a child with a specific behavioural problem.

4. What are the functions of a school testing programme ?

5. How far is autonomy desirable for teacher-education institutions in India ?

6. Will punishment prevent the repetition of mistakes in learning ? Why ?

7. With the help of examples, comment on the statement "what was dharma in one period may become adharma in another".

8. Distinguish between a "diagnostic" test and an "achievement" test. Identify the requisite of a good diagnostic test.

9. Define "repression". Point out its after effects.

10. What measures would you adopt in breaking the isolation of the colleges of teacher education from the village schools ?

11. What is a "sociogram" ? How is it useful for teachers ?

12. Select a situation and show how multimedia approach is adopted.

13. Give any *five* advantages of Programmed Instruction.

14. Write down the level of taxonomy of objectives of the cognitive domain. With suitable example, explain the relationship between an objective and a specification.

15. What are the qualities of a good test ? Explain how you will plan a test to guarantee for the above qualities.

16. What is motivation ? State any *three* functions of motivation in education.

Section C

1. Draw up a research proposal for studying the attitude of college students regarding the type of education they expect to be given at the higher education level.

2. (a) What are some of the more effective ways to find out a suitable research problem ?

   (b) With suitable examples distinguish between independent and dependent variables.

   (c) Under what circumstances could an independent variable in a study be a dependent variable in another study.

3. (a) With suitable examples, explain how are hypotheses formulated in a research proposal.

   (b) Explain important experimental designs in educational research.

FACULTY OF ENGINEERING AND TECHNOLOGY
M.Sc. Engineering by Research
8. Civil Engineering
Section B

1. Define Workability of concrete. How is it determined by compacting factor method ? Discuss the limitations of the method.

2. Determine the maximum BM which can occur when a train of loads 4 kN, 8 kN, 12 kN and 8 kN separated by distances 2 m., 3 m. and 2 m. respectively cross a girder of 40 m.

3. Explain the Lower bound, Upper bound and Combined theorem in plastic analysis.

4. Enumerate the differences between the Boussinesq's and Westergaard's theories used for the determination of stresses due to point load applied at the ground surface. Write down the equations for the same explaining the variables used and stating the assumptions in both the theories.

5. With neat sketches, explain Coulomb's wedge theory used for the determination of lateral pressure on retaining walls.

6. Explain the purification of waste water using stabilization pond.

7. What is break point chlorination ? Explain with figure.

8. (a) Explain briefly the various tests on road stones.

   (b) State the objectives on widening of pavements at horizontal curves.

9. (a) What are the various tests conducted on bitumen ?

   (b) Discuss the importance of highway drainage.

10. A rectangular portal frame has a span of 6 m. and a height of 4·5 m. Its two vertical members are fixed to the ground at their bottom edge. The horizontal member of the portal carries a uniformly distributed load of 30 kN/m. The moment of inertia of vertical members is I and that of horizontal member is 2I. Calculate the support reaction and draw the BM and SF diagram of the frame.

11. (a) Briefly explain the phenomenon of boundary layer separation. Suggest remedial measures.

    (b) Explain the classification of canals based on alignment.

12. The force required to tow a 1 : 30 scale model of a motor-boat in a lake at a speed of 2 m/s is 0·5 m. Assuming that the viscous resistance due to water and air is negligible in comparison with wave resistance, calculate the corresponding velocity in the prototype of 50 m. for a dynamically similar condition. What would be the force required to propel the prototype at that velocity in the same lake ?

13. Explain with illustrations how mud is used as a cost effective building material.

14. Which are the various agencies involved in the propagation of cost effective technology ?

15. Explain pre-cast construction and its advantages and disadvantages over the conventional construction.

16. What is meant by Modular co-ordination and what are its advantages ? Explain with sketches how modular co-ordination can be built into various building components into its function, planning and construction.

17. As per the Architects Act 1972, what are the powers and functions of the Council of Architecture ?

18. Describe the town planning principles of Indus Valley.

19. Critically examine the planning of Chandigarh.

20. Name the different types of sound absorbing materials. Explain how they absorb sound. How does the absorption vary with frequency ?

21. "Environmental conditions can be controlled and/or modified by proper landscape development." Discuss the statement giving suitable examples.

22. What are the aspects to be considered in the planning of a Five Star Hotel ?

23. Explain briefly the detrimental effects of traffic on the environment.

24. In what way does tourism affect land and water in coastal areas ? Explain with examples.

Section C

1. Prepare a complete site investigation report with necessary sketches showing the details for the construction of a 5 storeyed building. The soil profile available at the site are as follows :

Depth from surface (m)	Soil Type
Upto 0·5	Top soil
0·5—2·5	Weathered laterite soil
2·5—8·0	Sandy clay
8·0—15·0	Clay with high organic content

SPT values and other details can be assumed.

2. Comment on Low cost construction techniques adopted in our state.

3. Enumerate the various housing schemes that the Government has undertaken through various Five-Year Plans and discuss their aims, objectives and degree of achievements.

9. Computer Science

Section B

1. Differentiate between RISC and CISC computer architectures. Give examples for both types of computers.

2. What is emulation ? Explain briefly.

3. Compare hardwired and micro-programmed control unit implementations.

4. What is the need for Cache memories in modern computers ? Describe the Block Associative cache implementation method.

5. What are linked lists ? Write C routines for inserting and deleting a node from a linked list.

6. Write a C++ program to define a class "student" with appropriate fields and to read N such student records and to print out the records of those students who got more than 80 % aggregate mark.

7. Differentiate between B-trees and Binary trees.

8. Explain briefly the COCOMO software cost estimation method.

9. What are DFDs ? Explain balancing of DFDs with a suitable example.

10. Briefly explain MIS.

11. Explain semantic modeling approach using E/R diagrams with a suitable example.

12. Construct a DFA for accepting the language (a/b) * abb.

13. What are Domain Name Systems ? Explain.

14. Describe the TCP/IP network model.

15. Explain the token bucket congestion control algorithm.

16. Give a brief account of the various multiprocessor computer architectures.

Section C

1. Explain the network architectures and the various digital data transmission protocols used in today's mobile communication systems. Identify research issues in this field.

2. Evaluate the various methods adopted for ensuring security and secrecy in today's computer networks. Identify potential research issues.

3. What are the requirements of programming languages for distributed computing ? Identify research issues in this field.

10. Electronics and Communication Engineering

Section B

1. Explain the working of enhancement mode MOSFET.

2. Explain the working of tunnel diode.

3. Draw the circuit of a Wien-bridge oscillator and explain its working.

4. Explain, with circuit diagram, the working of a square wave oscillator.

5. State and prove maximum power transfer theorem.

6. Compare the characteristics of Butterworth, Chebyshev and elliptical approximations.

7. Explain the working of adaptive delta modulation, with a block diagram.

8. Compare the performance characteristics of ASK, FSK and PSK.

9. Explain Log periodic antenna.

10. Discuss the propagation characteristics of ionosphere.

11. Discuss Linear phase digital filters.

12. Explain DMA in computers.

13. Explain interrupt mechanisms in microprocessors.

14. Explain PAL colour TV transmitters.

15. Explain the salient features of Pentium IV.

16. Explain the working of transponder in a satellite communication system.

Section C

1. Recent trends in Digital Image Processing.

2. Recent trends in Microprocessor/Microcontroller based instrumentation system.

3. Impact of VLSI on system implementation.

11. Electrical and Electronics Engineering

Section B

1. Describe temperature coefficient of resistance of a metal.

2. Describe what is superconductivity.

3. What are the conditions required for synchronizing an alternator to infinite bus ? Describe one method for synchronizing.

4. List out the different losses in transformers and motors. Compare the level of efficiencies of both.

5. Show that in a balanced star-connected system, the current in the neutral is zero.

6. What is meant by Ferranti effect in power transmission lines ?

7. How does a modern variable speed drive work ?

8. Define string efficiency of a suspension type insulator.

9. What are the factors which affect corona in power system ?

10. Why binary system is used in digital applications ?

11. Why IC 555 is popular ? List four applications of this IC.

12. What is meant by slew rate of a linear IC ?

13. Why per unit system is preferred for analysing power system problems ?

14. Distinguish between Tidal energy and Wave energy.

15. Draw the circuit of a d.c. series voltage regulator using a power transistor and briefly describe its functioning.

16. Draw the circuit of a zero-crossing detector using Op-Amp. Briefly describe its working.

Section C

1. Modern trends in power generation from renewable sources of energy.

2. Importance of peak demand control and its implementation in power sector.

3. Computer applications and SCADA systems in electrical power industry.

12. Mechanical Engineering

Section B

1. Explain Statistical Decision theory.

2. Describe control chart for variables.

3. Describe Reliability measurement and its improvement.

4. Robotics in manufacturing—How far it is applicable in India ?

5. Explain application of composite materials.

6. Pollution control in automobiles—What are the options ?

7. Explain the functioning of a mono pump.

8. Describe the use of air vessels in a plunger pump.

9. Compare hot rolling and cold rolling.

10. What are the advantages and disadvantages of a line organisation ?

11. Explain the contributions of Henry Fayol to scientific management.

12. What is material requirement planning ? Explain.

13. Explain Highest Useful Compression Ratio (HUCR) in IC engines.

14. Compare product and process layouts.

15. Draw the line diagram of a thermal power station and explain the same.

16. Explain the mechanism of a pantograph.

Section C

1. Describe a masterplan for reviving Kerala's agriculture.

2. How can India make best use of liberalisation and privatisation ?

3. Global warming and ozone hole—Who is to be blamed ?

Ph.D. ENGINEERING

13. Civil Engineering

Section B

1. What is meant by curing of concrete ? Name the different methods of curing. Explain any *three* methods.

2. An ISA 125 × 95 × 10 mm. steel angle tension member is to be connected by its long leg to a 10 mm. thick gusset plate. Design a suitable welded joint using 6 mm. fillet weld. Assume permissible tensile stress in steel as 150 N/mm.^{2} and shear strength of the weld as 110 N/mm.^{2}

3. A beam of constant cross-section 6 m. long is freely supported at its ends. It is loaded at points at 2 m. from each end with point load of 20 kN. Find the ratio of the deflection under the centre of the beam to the deflection at a point under one of the loads.

4. What are deep foundations ? Explain the different types of deep foundations with neat sketches.

5. Briefly explain the commonly used geophysical methods employed for subsoil exploration.

6. What are the principles of house drainage ?

7. What is meant by self purification of natural streams ? What are the natural forces of self purification ?

8. (a) Explain with sketches the various factors controlling the alignment of roads.

   (b) Explain the significance of studying the behaviour of sub-grade soil.

9. (a) What are the uses of origin-destination studies ?

   (b) With sketches show the various types of traffic signs. Classify them in proper groups.

10. What are the different methods of reinforced concrete design ? Explain their principles.

11. For a basin, a 5 hour unit hydrograph is available. Explain how a 2-hour flood hydrograph can be derived for the basin.

12. The potential function for a fluid flow is given as 3 xy. Find the equation for streamlines. Also determine the discharge passing between the streamlines through the points (1, 3) and (3, 3).

13. Discuss the role of housing standards in Master Plan Preparation.

14. Give a brief account of the urban and rural housing problems of India.

15. What are the prospects of aided self help housing ?

16. The problem created by the fast growth of vehicle population has a direct impact on the environment in which we live. Briefly explain the above statement.

17. What is O.D. Survey ? Briefly explain the need for the O.D. Survey and the specific uses to which the survey data is used.

18. Historic sites are a major tourist attraction centre. Discuss the potentials and possibilities.

19. Explain the role of planning regulations and controls in the development of a township for a paper manufacturing company.

20. What is the influence of traditional house designs in the mitigation of climatic effects on the building ?

21. What is meant by modular co-ordination ?

22. Write a short note on "Techniques of Sampling".

23. What is meant by incremental housing ?

24. What are the various data required for the population projection of a country ?

Section C

1. Design a retaining wall for the following data :—

   (a) Height of wall above ground ... 4·0 m.

   (b) Depth of foundation ... 1·5 m.

   (c) Safe bearing capacity of soil ... 150 kN/m.^{2}

   (d) Unit weight of earth fill ... 18 kN/m.^{3}

   (e) Angle of internal friction of back fill ... 30°

   (f) Coefficient of friction ... 0·55

Assume any other missing data.

2. Comment on the importance of "rainwater harvesting" in the present day scenario.

3. Explain the objective, scope and content of a development plan. What are the various surveys to be carried out for the preparation of a Development Plan ?

14. Chemical Engineering

Section B

1. The heat of reaction at 300 K and one atmosphere pressure for the following gas phase reaction

$$A + 3B \rightarrow C$$

is – 50,000 calories per mole of A converted. Data on the molar heat capacity at constant pressure (cal./mol. K) of the various components are

C_p for A = – 0·4 + 80 × 10^{-3} T, T in K

C_p for B = 7

C_p for C = 26

Calculate the heat of reaction at 500 K and at one atmosphere pressure.

2. 1,000 kg./hr. of an aqueous solution of 20 % Na_2CO_3 is cooled gradually to T °C., to crystallize out $Na_2CO_3 \cdot 10 H_2O$. The solubility of Na_2CO_3 at T °C. is 2·1 %, calculate the percentage of Na_2CO_3 recovered in the form of crystals. (Assume no loss of Na_2CO_3 through the mother liquor adhering to the crystals and no carry over of crystals with the mother liquor).

3. Ammonia at atmospheric pressure and 300 K with a bulk stream velocity of 10 m/s flows in a pipe of I.D. 25 cm. Calculate the pressure drop per 100 m. length of the pipe and the power consumed. Friction factor $f = 0·079$ $Re^{-0.25}$ in the turbulent regime. Viscosity of ammonia may be taken as $10·2 × 10^{-6}$ kg./(m.s.)

4. What is meant by critical speed of a ball mill ? Derive an equation for the same.

5. In the vicinity of the triple point, the vapour pressures of liquid and solid ammonia are respectively given by

$$\ln p = 15·16 – 3063/T \text{ and } \ln p = 18·70 – 3754/T$$

where p is in atmospheres and T is in Kelvin. What is the temperature at the triple point ? Also calculate the triple point pressure.

6. A mixture of A and B conforms closely to Raoult's law. The pure component vapour pressures P_A^{sat} and P_B^{sat} in kPa are given by (t in °C.)

$$\ln P_A^{sat} = 14·27 – 2945/(t + 224)$$

$$\ln P_B^{sat} = 14·20 – 2973/(t + 209)$$

If the bubble point of a certain mixture of A and B is 76° C. at a total pressure of 80 kPa, find the composition of the first vapour that forms.

7. Calculate the value of K at 25° C. for the water gas reaction

$$CO + H_2O \rightarrow CO_2 + H_2$$
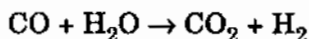
using the following data :

ΔG_f° (kJ) for CO, H_2O and CO_2 are respectively -137.27, -228.60 and -394.40.

8. What is Biot number ? What is the significance of Biot number in heat transfer ?

9. The wall of a cold storage unit comprises a brick layer (thickness $\delta_B = 0.1$ m., thermal conductivity $k_B = 1.4$ W/m. K) and an inner layer of polyurethane foam (thickness $\delta_P = 0.05$ m., thermal conductivity $k_P = 0.015$ W/m. K). Assume one-dimensional heat transfer by conduction through the composite wall, and that the inner surface of the polyurethane layer is at a temperature T_c and the outer surface of the brick layer is at temperature T_h.

Derive an expression for the heat flux through the wall.

10. In a counter-current exchanger, which has been in service for sometime, due to formation of scale, the heat transfer rate is reduced to 85 % of its original value based on clean surface. Assuming that the terminal temperatures of fluids are same in both cases, and the effective heat transfer area does not change appreciably due to scale formation, determine the overall fouling factor if clean overall heat transfer coefficient is 500 W/m.^{2}K.

11. Consider three infinite parallel plates. Plate 1 is maintained at 1227° C. and plate 3 is maintained at $-174°$ C. Emissivities are equal to that of a black body. Plate 2 is placed between plates 1 and 3, and receives no heat from external sources. What is the temperature of plate 2 ?

12. Explain how Murphree stage efficiency is defined for a tray tower handling multicomponent distillation.

13. Derive a relation between the overall number of transfer units N_{toG} and the individual number of transfer units N_{tG} and N_{tL} for a packed absorption column.

14. Derive Rayleigh's equation for simple distillation.

15. What is meant by sweetening of petroleum ? Mention some processes available for the same.

16. Briefly explain what is nylon 6, 6 and nylon 6 and the raw materials and reactions for producing the above.

Section C

1. Consider the set of elementary reactions

$$A \xrightarrow{k_1} B$$
$$A + B \xrightarrow{k_2} C$$
$$A + D \xrightarrow{k_3} 2E$$
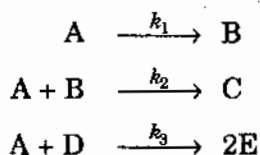
At time $t = 0$, at batch reactor is fitted with a mixture of A and D. What is the relation between the concentrations of B and D after time t ?

2. Explain with a neat flow diagram the manufacture of sulphuric acid by DCDA process.

3. What is meant by BOD ? (Biological Oxidation Demand) Explain the experimental procedure for determining BOD. Explain the activated sludge process for reducing BOD.

15. Computer Science Engineering

Section B

1. What is a microprogram ? Give the organization of a microprogrammed control unit of a computer.

2. Briefly explain with examples, the common addressing modes present in modern computers.

3. Explain the salient features of RISC architecture.

4. Define time complexity and space complexity of Algorithms. Give the differences between polynomial time algorithms and exponential time algorithms with suitable examples.

5. Explain quick-sort algorithm. What is its time complexity ?

6. What are Stacks ? Give stack representation using (a) Sequential representation ; and (b) Linked list representation.

7. What is BCNF ? Explain BCNF using a suitable example.

8. What are DSS ? Explain.

9. Construct an NFA that accepts strings of 0's and 1's containing odd number of 1's.

10. Describe the file allocation method in UNIX operating system.

11. Write a C program to copy the contents of a text file to another.

12. Briefly explain the features of Object Oriented Programming Languages.

13. Explain the following with examples (a) Inline functions ; (b) Friend functions ; and (c) Virtual functions.

14. What is an SRS document ? Give the general format of an SRS document.

15. Explain Software Re-engineering.

16. Differentiate between ISO-OSI and TCP/IP network models.

Section C

1. Discuss the various methods adopted by today's search engines to retrieve required information from the World Wide Web. Suggest improvements/new methods to improve speed and relevance of retrieval.

2. Discuss the requirements of Embedded System software. Identify potential research issues and suggest new methodologies in this field.

3. Explain the various aspects of Object Oriented Databases. Discuss their merits over conventional databases. Identify potential research issues in this field.

16. Electrical and Electronics Engineering

Section B

1. What is meant by steady-state stability and transient stability of power systems ?

2. What is the difference between on-line UPS and off-line UPS ? Which will you recommend for computer operation ?

[P.T.O.]

3. Drawing phasor diagrams, show that an unbalanced system of voltages or currents can be represented in terms of symmetrical components.

4. Which are the different types of faults in power transmission lines ? Which is the most severe among these ? Why ?

5. What is a double-cage induction motor ?

6. What are the different losses in transformers and motors ? Compare the efficiencies of both.

7. How can the polarity of a d.c. generator be reversed ?

8. Why does a single-phase induction motor have two windings on stator ?

9. Why induction generators find useful in wind-electricity generation ?

10. What is the significance of Common-Mode Rejection Ratio (CMRR) in Op-Amps ?

11. Why negative feedback is invariably used with Op-Amps ?

12. How do you compare FM radio broadcasting to AM ?

13. What are the differences between Fuel cells and Storage batteries ?

14. What is a combinational logic circuit ? What are its important features ?

15. What are the important applications of superconductivity ?

16. With an example, show how a decimal number can be converted into a hexadecimal number.

Section C

1. What are the modern power quality problems ? Why harmonics is a major concern in modern power systems ? What are the techniques for reduction of harmonics ?

2. Describe the energy situation of Kerala. Bring out ideas for an efficient energy management for the State of Kerala.

3. Innovations in electrical power metering and billing.

17. Electronics and Communication Engineering

Section B

1. Discuss the techniques to increase the speed of operation of a digital computer.

2. Explain the differences in the characteristics of primary and secondary memories in a digital computer.

3. Explain interrupt mechanism in a microprocessor.

4. Discuss the operation of compander in a communication system.

5. Explain how PLL can be used for frequency synthesis.

6. Explain the operation of successive approximations ADC.

7. Explain the operation of Varactor diode and give its uses.

8. Compare the characteristics of MOSFET with BJT when used as amplifying devices.

9. Explain FFT algorithm.

10. Discuss modes in waveguides.

11. Explain impedance matching in transmission lines.

12. Discuss stability criterion in LTI systems.

13. Explain the operation of a colour picture tube.

14. Design as oscillator for 1 kHz.

15. Design a modulo 6 counter.

16. Explain the architecture of a microcontroller.

Section C

1. Data compression techniques.

2. Recent development in Mobile Communication Systems.

3. Uses of artificial neural network studies.

18. Mechanical Engineering

Section B

1. Explain the working of a plunger pump. What is cavitation ?

2. How does a draft tube increase the efficiency of a reaction turbine ?

3. Explain the working of a hydraulic ram.

4. Explain the advantage of front wheel drive in cars.

5. What is multi point fuel injection ? Why is it superior to conventional ones ?

6. Explain the different methods of taper turning.

7. Describe quick return mechanism and one of its applications.

8. Explain the working of an inertia type governor.

9. Distinguish between Sticking friction and Slipping friction in rolling.

10. What are the contributions of F.W. Taylor scientific management ?

11. Draw a suitable chart and explain Average Outgoing Quality Limit (AOQL) in acceptance/rectification.

12. Illustrate any *two* methods of drawing an ellipse.

13. How do you run a demerits control chart ?

14. Explain any *two* methods of measuring surface smoothness.

15. What are the defects in castings ? Can they be remedied ?

16. Explain "critical examination" in work study.

Section C

1. What are Kerala's energy options for next 20 years—without hurting the environment.

2. In the light of more people likely to return from Gulf, how can we improve the job situation in Kerala ?

3. Bring out the importance of infrastructure in industrial development.

FACULTY OF FINE ARTS

19. Music

Section B

1. Yati patterns in a Kriti.

2. Rasanubhava (emotional aspects) of ragas.

3. 35 talas.

4. Dasavidha gamakas.

5. Lavani.

6. Jrattai pallavi.

7. Navasandhi talas.

8. Brindagana.

9. Geya natakas.

10. Musical stone pillars.

11. Varieties of tana.

12. Tevaram.

13. Time theory of ragas.

14. Development of musical scale from the period of Rig veda to the period of Samaveda.

15. Suddha, Chayalaga and Sankirna ragas.

16. Edakka.

Section C

1. Describe Bharata's experiment relating to Dhruvaveena and Chalaveena and mention the musicological value of this experiment.

2. Examine how far the geographical factors affect the growth of a country's music.

3. Hindustani music and Karnatak music—a comparative study.

FACULTY OF LAW

20. Law

Section B

1. Strict liability.

2. Double jeopardy.

3. *Consensus ad idem.*

4. *Lok ayukta.*

5. The *ejusdem generis* rule.

6. Legal realism.

7. Juvenile delinquency.

8. Freedom of information.

9. Gender justice in the Indian Constitution.

10. Discretionary powers of the Governor.

11. Misfeasance in public office.

12. Excessive delegation.

13. Public Interest Immunity.

14. International Criminal Court.

15. The Dualist Theory of International Law.

16. Humanitarian intervention.

Section C

1. Conflict between right to education and commercialisation of education.

2. Role of International Law in Environment Protection.

3. Judicial review of policy decisions.

FACULTY OF MANAGEMENT STUDIES

21. Management

Section B

1. Management by objectives.

2. Delegation.

3. Passive listening.

4. Perceptual mapping.

5. Operant learning.

6. Research design.

7. Multi branding.

8. Product rejuvenation.

9. Multi Dimensional Scaling.

10. Plant location.

11. MANOVA.

12. SPSS package.

13. Assessment centre.

14. Leverage ratios.

15. Indian Culture.

16. MM Theory.

Section C

1. Identify the factors that affect the research process. What are the characteristics that are needed for a researcher in Management to overcome the same ? Explain.

2. Prepare a research proposal for initiating a water resources management systems in different cities of Kerala to overcome drought.

3. Critically evaluate the relevance of Advertising in the current context and its impact on the living style of the common man.

22. Tourism

Section B

1. Role of government in promoting Tourism.

2. Ethnic Tourism.

3. Beach Tourism.

4. Backwater cruises.

5. Income multipliers of tourism.

6. Heritage and its importance to tourism.

7. Foreign exchange earning through tourism.

8. SARS and its impact on Tourism.

9. Carrying capacity of Tourism.

10. Assessment of Tourism impact.

11. Star rating of hotels.

12. Travel agency accreditation.

13. FAM tours.

14. Frequent flier programmes.

15. Eco tourism attractions in Kerala.

16. Indirect benefits of tourism.

Section C

1. Prepare a research design for studying the prospects of developing house boats as a tourist destinations in Kerala.

2. "Tourism industry is under the volatility of International happenings"—Discuss.

3. Evaluate the role of private sector participation in developing tourism in India.

23. Physical Education

Section B

1. Physical Education is a Science and Art.

2. Idealism in Physical Education.

3. League Tournaments.

4. Muscle fibers and characteristics.

5. Types of muscle contraction.

6. Hypokinetic diseases.

7. Winter Olympics.

8. Commonwealth games.

9. Biomechanical analysis of Shot put.

10. Application of Newton's laws of motion.

11. Circuit training or Interval training.

12. Status of Physical Education and Sports in Kerala.

13. Skills and Roles of a Manager.

14. Balance diet for a sports person.

15. Physical fitness and wellness.

16. History of Modern Olympics.

Section C

1. Experimental Designs in Research.

2. Obesity and Weight control.

3. Research Proposal.

FACULTY OF MEDICINE

24. Basic Medical Sciences

Section B

1. Describe briefly the normal position, coverings and vascular segments of Right Kidney.

2. Describe the boundaries of epiploic foramen and what is the clinical importance.

3. Describe the functional areas and blood supply of the superolateral surface of human brain.

4. Microscopic structure and function of serous and mucous salivary glands.

5. Describe in detail the sensory nerve supply of face.

6. Describe the formation, course, termination tributaries and applied importance of great saphenous vein.

7. Explain the role of Lymphocytes in immunity.

8. Name the movements of small intestine, give their basis and functions.

9. Give the functions of Hypothalamus.

10. Name the hormones of adrenal cortex. Give the functions of mineralocorticoids.

11. Explain the physiology of lactation.

12. Compare the two divisions of autonomic nervous system.

13. Action and uses of adrenaline.

14. Drugs used in peptic ulcer.

15. Antithyroid drugs.

16. Penicillin.

17. Antiviral drugs.

18. Drugs used in Tuberculosis.

19. Briefly describe how radioactivity interact with matter.

20. Give an account of the buffer system in plasma and RBC.

21. Describe the genetic code and how it was deciphered.

22. Discuss with experimental detail about semiconservative replication of DNA.

23. What are tumour markers ? Give example and the condition in which their levels are elevated in serum.

24. Discuss about post-transcriptional modification.

25. Define the terms oedema, transudate and exudates.

26. Describe the three major factors that predispose to thrombosis.

27. Contrast the CSF findings characteristic of acute bacterial meningitis and tuberculous meningitis

Section C

1. Common research designs in public health.

2. Facial space infections.

3. Molecular biology.

FACULTY OF ORIENTAL STUDIES

29. Arabic

Section B

(١) مميزات الشعر الجاهلي (٢) جمع القرآن وتدوينه

(٣) اسلوب الحديث الشريف (٤) الشعراء الاسلاميون

(٥) الجاحظ (٦) ابو العلاء المعرّى

(٧) سيبويه (٨) محمد الشافعى

(٩) الغزالى (١٠) عبد الرحمن بن خلدون

(١١) ابن بطوطة (١٢) محمد حافظ ابراهيم

(١٣) الثلاثيات لنجيب محفوظ (١٤) جبران خليل جبران

(١٥) جماعة أپولو (١٦) تطور المقالة فى الادب العربى الحديث

Section C

(١) تطور القصة القصيرة فى الادب العربى الحديث

(٢) طه حسين حياته وآثاره

(٣) زينب الدين المخدوم

30. Linguistics

Section B

1. Distinguish between Animal Communication and Human Language.

2. Differentiate phone, phoneme and allophone.

3. What is linguistic interference ?

4. What is external reconstruction ?

5. Distinguish between "deep" and "surface" structures.

6. What do you mean by descriptive and explanatory adequacy of grammatical descriptions ?

7. How do syntagmatic and paradigmatic relationships make language a system ?

8. Differentiate articulatory and acoustic phonetics.

9. "Phonetics gathers raw material, phonemics cooks it." Discuss.

10. What is discourse ?

11. Differentiate intra and interlingual translations.

12. Define and explain inflection and derivation.

13. Define and explain the notion of "linguistic level".

14. Why bloomfieldian grammar is called "structural" ?

15. What is linguistic competence ? Distinguish it from communicative competence.

16. What you mean by "applied linguistics" ?

Section C

1. Discuss the design features of human language. How are they relevant in organising research in linguistics ?

2. What are the principles and methods of descriptive grammars ? Are they adequate enough to account for natural languages ?

3. What are the major theoretical paradigms in linguistics ? Elaborate on their methodological priorities in linguistic research.

31. Sanskrit

Section B

1. Bhartṛhari.   2. Buddhacarita.

3. Caṭṭampisvāmikal.   4. Śrībhāṣya.

5. Keralakālidāsa.   6. Rāmāyaṇacampū.

7. Anandavardhana.   8. Śukasandeśa.

9. Patanjali.   10. Svapnavāsavadatta.

11. Vivekananda.   12. Sāṅkhyakārikā.

13. Kaṇāda.   14. Arthaśāstra.

15. Daṇḍin.   16. Sūryasiddhānta.

Section C

1. Write a critical review on a Sanskrit drama you have read.

2. How did the *Cārvāka* philosophy influence the Indian Society ?

3. Evaluate the contribution of Sanskrit studies to personality development.

32. Hindi

Section B

1. हिन्दी के आदिकाल का नामकरण ।

2. कबीर का रहस्यवाद ।

3. 'पद्मावत' का काव्यसौन्दर्य ।

4. तुलसी की समन्वयकारी चेतना ।

5. सूरदास का भ्रमरगीत ।

6. बिहारी की काव्यकला

7. 'कामायनी' में छायावादी तत्त्व ।

8. 'राम की शक्तिपूजा' की संवेदना ।

9. 'असाध्यवीणा' कविता का रचना विधान ।

10. आंचलिक उपन्यास ।

11. 'आषाढ़ का एक दिन' नाटक के नारी पात्र ।

12. रामचन्द्रशुक्ल के निबन्ध ।

13. समकालीन हिन्दी आलोचना ।

14. भीष्म साहनी ।

15. केरल की हिन्दी कविता ।

16. राजभाषा के रूप में हिन्दी ।

Section C

1. आधुनिक हिन्दी कविता का सब से प्रौढ़ काल आप किसको मानते हैं—स्वतंत्रता पूर्व काल को अथवा स्वातंत्र्योत्तर काल को?— तर्कसंगत उत्तर दीजिए ।

2. स्वातंत्र्योत्तर हिन्दी कहानी की प्रमुख प्रवृत्तियों को रेखांकित करते हुए हिन्दी कहानी साहित्य को महिला कहानीकारों के योगदान का मूल्यांकन कीजिए ।

3. प्रसादोत्तर हिन्दी नाटक साहित्य की उपलब्धियों का विवेचन कीजिए ।

[P.T.O.]

33. Malayalam

Section B

1. മലയാളത്തിന്റെ സംഗീതനാടക പാരമ്പര്യം.

2. ഭാഷാകൗടലീയവും ഗദ്യത്തിന്റെ പരിണാമവും.

3. കുട്ടിക്കൃഷ്ണമാരാരും പക്ഷപാത നിരൂപണവും.

4. നവചരിത്രവാദം.

5. മലയാള കവിതയിലെ നിയോക്ലാസിക് പാരമ്പര്യം.

6. കേസരിയും കേരളത്തിന്റെ സാംസ്കാരിക നവോത്ഥാനവും.

7. അപനിർമ്മാണം.

8. വക്രോക്തി കാവ്യജീവിതം.

9. തുള്ളൽ വൃത്തങ്ങൾ.

10. 'മാറ്റാത്തി.'

11. ഭാഷാ ഭഗവദ്ഗീത.

12. സാഹിത്യ വിമർശനത്തിലെ ഫെമിനിസ്റ്റ് സമീപനം.

13. നൂറ്റാണ്ടു യുദ്ധത്തിന് കേരള ചരിത്രത്തിലെ പ്രസക്തി.

14. ഭാഷാഭേദ വിജ്ഞാനം.

15. കവിതയിലെ ഭാവുകത്വ പരിണാമവും എൻ.വി. കൃഷ്ണവാര്യരും.

16. രസധ്വനി.

Section C

1. ധ്വന്യാത്മകതയും സംക്ഷിപ്തതയുമാണ്, ഉത്തമകാവ്യത്തിന്റെ ലക്ഷണങ്ങൾ. എന്തും വാച്യമായി പരത്തിപ്പറയുകയാണ് കുഞ്ചൻനമ്പ്യാരുടെ രീതി. അതുകൊണ്ടുതന്നെ, നമ്പ്യാരുടെ തുള്ളൽ സാഹിത്യം ഉത്തമസാഹിത്യത്തിന്റെ പദവിയിലേയ്ക്കുയരുന്നില്ല. വിമർശാത്മകമായി ചർച്ച ചെയ്ത് സ്വമതം സ്ഥാപിക്കുക.

2. സാഹിത്യകൃതിയുടെ അർത്ഥോത്പാദനത്തിനു നിയാമകമായ വ്യവസ്ഥ കണ്ടെത്തുകയല്ല, കൃതിയുടെ അനുഭൂതിമണ്ഡലം സ്ഫുടീകരിക്കുകയും അതിന്റെ മൂല്യ നിർദ്ധാരണം നടത്തുകയുമാണ് വിമർശനത്തിന്റെ ധർമ്മം. സാഹിത്യത്തെ ഒരു ഭാഷാവ്യവഹാരമായി മാത്രം കാണുകയും അതിന്റെ കലാത്മകതയെയും വ്യതിരിക്തതയെയും അവഗണിക്കുകയും ചെയ്യുന്ന, സമകാല വിമർശന പദ്ധതികൾക്കു കഴിയാത്തതും അതുതന്നെ—ശരിയോ· ചർച്ച ചെയ്യുക.

3. "ആധുനിക മലയാള കവിതയിൽ ഫോക്ലോറിന്റെ സ്വാധീനം" ഗവേഷണാത്മകമായി സമീപിക്കുക.

FACULTY OF APPLIED SCIENCE

34. Biotechnology

Section B

1. What kind of diseases are caused by Adenoviruses ?

2. What are the two types of hepatitis that can be prevented by vaccine ?

3. List three diseases caused by different antigenic types of *Chlamydia trachomatis*.

4. What are the causes of bacterial meningitis in new born infants ?

5. What are the differences between sporadic encephalitis and epidemic encephalitis ? Name the causes.

6. Give an account of entroviruses and arboviruses.

7. What would happen if the A and B chains of the diphtheria toxin become separated before rather than after entering a cell ?

8. Describe the five ways in which vaccines can be delivered painlessly without the need for injection.

9. What are monoclonal antibodies ?

10. Give three examples of energy sources used by chemolithotrophs.

11. Compare and contrast the relationship of Agrobacterium and Rhizobium species with plants.

12. Describe how the G:C content of DNA can be measured.

13. What are the three ways in which plasmids differ from bacterial chromosomes ?

14. What is the role of transamination in amino acid biosynthesis ?

15. How is preservation differ from pasteurization ?

16. List several functions of fungi in soil.

17. What do you mean by Somaclonal variation ?

18. What are Antibodies, Antigens and Lymphocytes ?

19. What is Humulin ? How is it produced ?

20. What is gene silencing ?

21. Describe the four levels of protein structure.

22. What are Cytokines ?

23. What is chromosome painting ?

24. Explain how ISH and FISH would demonstrate the location of a nucleotide sequence within a cell or chromosome.

Section C

1. What are vectors ? Give an account of the vectors used in gene manipulation.

2. Explain the techniques of cell and enzyme immobilization and its application.

3. What are GEMs ? Describe the role played by GEM in the biotreatment of wastes. What are the risks involved and the measures to be adopted to avoid the risks ?

35. Environmental Sciences

Section B

1. Structure of an Ecosystem.

2. GIS and Remote sensing.

3. EIA.

4. Bioremediation.

5. High pressure liquid chromatography.

6. Sources of air-pollution.

7. Eutrophication.

8. Eco-tourism.

9. Occupational health hazards.

10. Sand mining and its Environmental Impacts.

11. National Park and Sanctuaries.

12. Natural Hazards.

13. Bio-indicators.

14. Global warming.

15. Greenhouse effect.

16. Ecological pyramids.

Section C

1. Solid-waste management technologies.

2. Physico-chemical and microbiological analysis of water.

3. Wetland conservation.

36. Computer Science

Section B

1. What is an interrupt service routine ? What is the difference between external and internal interrupts ? Explain how a processor services an interrupt.

2. List the facilities provided by the outer most layer of UNIX OS. What are the functions of the kernel of UNIX ? What do you understand by shell programming ?

3. Explain how a video is acquired using a digital video camera.

4. What do you understand by the term "page frames"? What is "demand paging"? Write an algorithm for demand paging and explain how your algorithm works.

5. Consider a grammar :

$G = (V_N, V_T, S, \Phi)$, where $V_N = \{S\}, V_T = \{a, b\}$,

Φ consists of productions

$\quad$ $S \rightarrow a$,

$\quad$ $S \rightarrow Sa$,

$\quad$ $S \rightarrow b$,

$\quad$ $S \rightarrow bS$.

Show that $L(G) = \left\{ b^m \, a^n \, \middle| \, m, n \geq 0 \right\}$.

6. The logical address space in a computer system consists of 128 segments of capacity 32 pages of 4K words. The physical memory consists of 4K page frames, each of 4K word capacity. Formulate the logical and physical address format. Note the binary number of the logical address for segment 35 and word number 1999 on page 16.

7. Consider the five character alphabets {A, B, C, D, –} with the probabilities 0·35, 0·1, 0·2, 0·2, and 0·15 respectively. Construct the Huffman tree for this input.

8. Describe the movements of packets on a bus network and describe the movement of messages on a ring network.

9. Explain the CDMA system functions. What is a chip ? Why are bits replaced by chips in CDMA ?

10. Write the Warshall's algorithm for constructing the transitive closure of a diagraph G. Write a pseudo code for your algorithm.

11. Describe the client-server, three-layer architecture. What are the differences between a client and server ? Describe the functions of each layer in a three layer application.

12. What is commonsense knowledge ? How can you represent such commonsense knowledge ?

13. Describe the RSA Encryption algorithm and explain how that is used in designing digital signatures.

14. Define the concept of hashing. Design a hashing method using objects and classes.

15. Describe the various aspects of Ethernet networks including transmission speed, logical topology, supported transmission media and the relevant IEEE standard.

16. Discuss the properties of predicate-calculus as a language for representing knowledge.

Section C

1. Describe the concept of "Remote Method Invocation" and the various mechanisms available for implementing RMI. Explain how you can load classes in a run-time environment and develop an application program in a distributed computing system.

2. What is meant by "Resource Description Framework (RDF)" ? Explain the salient features of an RDF model. Describe the basics of RDF's syntax.

3. Discuss the issues of database security. Make a review of some popular techniques used to grant and revoke privileges in relational database systems and in SQL. Explain the new trends in the technology.

37. Optoelectronics

Section B

1. Give the concept of coherence.

2. What are optical solitons ?

3. Why are diode lasers used for long distance fiber communication ?

4. State some of the advantages of fiber optic sensors.

5. What is second harmonic generation ?

6. Distinguish between Stimulated emission and Spontanium emission.

7. What is population inversion ? How can it be achieved in lasers ?

8. Distinguish between Step index and Graded index fibers.

9. Distinguish between LED and Laser diode.

10. Write down the principle of superposition of waves.

11. Distinguish between Fraunhofer and Fresnel's diffraction.

12. Write down the Maxwell's electromagnetic equation.

13. What is optic axis of a crystal ?

14. What are quarter wave plates ?

15. Distinguish between Elliptically polarized and Circularly polarized light.

16. What is Birefringence ?

Section C

1. (a) Write down the principle of working of a laser.

   (b) Say how one can produce (i) Green light and (ii) U.V. light from a laser system which emits light at 1064 nm.

2. Write down the principle of Holography. Explain how holograms are recorded and reconstruction of images.

3. Explain the working of different photodiodes indicating their advantages and disadvantages.

FACULTY OF FUTURE STUDIES

38. Technology Management

Section B

1. Elucidate the concept of technology forecasting.

2. Develop a note on different growth curves in technology analysis.

3. Explain the Adaptive Estimation Procedure.

4. Give a brief account of econometric forecasting.

5. Conceptualise Early Warning System.

6. Briefly attempt the status of optical fiber technology in India.

7. How you make use value chain in technology analysis ?

8. Give an account of Venture Capital in India.

9. Develop a note on latest trends in ITES.

10. Distinguish process and product life-cycles in terms of their lags.

11. Explain the dimensions of Technology Information Systems.

12. Give an account of latest developments in IT security.

13. Elucidate the concept of Strategic Technology Management.

14. Develop a note on Chaos analysis.

15. Outline the System Dynamic Modelling.

16. Develop a note on Technology Assessment.

Section C

1. Give a detailed account of normative methods of technology forecasting.

2. Discuss the importance of fuzzy logic in Technology development.

3. Elucidate the concepts of knowledge revolution and knowledge management.

FACULTY OF SCIENCE

39. Aquatic Biology and Fisheries

Section B

1. Explain the algal resources in Kerala coast and their importance.

2. Give an account on microbial indicator of waster pollution.

3. Cat-fish an ideal candidate for bio-waste management. Discuss.

4. What are the problems and prospects of industrial wastes ?

5. Identified pollutant tolerant and pollution indicators of retting grounds. Distinguish.

6. Give the salient points on the incidence of algal blooms and their toxic effects on aquatic biota and human health.

7. How far the ornamental fish in coral reefs improve the economy of the fishing community ?

8. How will you forecast the disease outbreaks in shrimp culture ponds ?

9. What are the methods of culture in aquaculture operation and the suitability in the present scenario ?

10. Mangroves are the rich potential resources for fish cultivation. Comments on.

11. Fish nutrients are paramount importance in aquaculture industry. What type food do you really recommend for intensive fish culture ?

12. Give the present stock assessment of abundance of fisheries potential of Kerala coast.

13. Write a review on Epizootic Ulcerative Syndrome in India.

14. What are the monogenetic and digenetic trematodes in fishes ?

15. Distinguish interstial and intertidal fauna and their ecological balance.

16. Explain the population dynamics of biofouling in coastal regions of India.

Section C

1. Explain the physiological changes of fish and management practices in intensive culture systems.

2. Present status of classical taxonomy of woodborers, species diversity and possible control measures of biodeterioration. Discuss.

3. Comment on impact of the bottom trawling on seabed destruction, habitat loss and genetic disturbances.

40. Biochemistry

Section B

1. Glucose-6-phosphate stands at the junction of multiple pathways. Substantiate the statement.

2. ATP is a high-energy compound while another phosphorylated compound such as glucose-1-phosphate is not a high energy compound. Explain why.

3. Citrate is a key metabolite that can co-ordinate and regulate various intermediary metabolic pathways. Explain how.

4. Explain the phenomenon of end product inhibition with suitable example.

5. TCA cycle is referred to as an amphibolic pathway. Why ?

6. Describe the role of biotin as a coenzyme.

7. How does insulin receptor generate intracellular signals ?

8. What are tumour suppressor genes ?

9. What is the predicted fate of lysosomal acid hydrolases in I-cell disease, in which cells are deficient in the enzyme for formation of mannose-6. PO_4 residues ? Justify your answer.

10. How can increase in intracellular levels of CAMP activate genes ?

11. Explain the role of LDL receptor in the regulation of cholesterol level in the cell.

12. Explain the role of cyclin dependent protein kinase CdC_2 in initiating mitosis.

13. What is PCR ? Starting with DNA from a single sperm, how many copies of a specific gene sequence will be obtained after 15 cycles of PCR amplification.

14. What is meant by alternative splicing of RNA ? What is its significance ?

15. How does lactose induce the expression of the proteins that are required for E.Coli to take up and metabolise lactose ?

16. How does aspirin act to reduce inflammation and blood clotting ?

Section C

1. A cDNA that encodes an enzyme has been cloned. Using this cDNA clone, what experimental strategies can be employed to identify the amino acids that are critical for the catalytic activity of the enzyme.

2. A herbal preparation has been developed. It is claimed that the preparation has significant antiatherosclerotic and cholesterol lowering property. Design a study using a suitable animal model to test this.

3. A new protein that mediates cell migration has been identified. It is hypothesised that a hexapeptide sequence VRGDSI in the cell recognition domain of the protein binds to a specific cell surface protein. Design an experiment to isolate and characterise this cell surface protein to test the hypothesis.

41. Botany

Section B

1. Briefly describe chromosomal mechanisms of sex determination in plants. Give suitable examples.

2. What are molecular markers ? Give a brief description of important DNA markers and discuss their applications.

3. "Genes produce their effects on phenotype by controlling specific reaction in biochemical pathways." Comment on this statement. Giving examples.

4. What is transpossible elements ? Briefly explain how Ds locus occasionally moves from one chromosome to another.

5. What is bioremediation ? What is the difference between biotransformation and biodegradation ? Explain.

6. Describe a mouse model for human disease.

7. Discuss the structural significance of complementarity in DNA and RNA.

8. Briefly explain a breeding methodology to improve quantitative trait in a hybrid population.

9. Give a short account on the origin, taxonomy, cytogenetics and evolution of cultivated wheat.

10. Define Inbreeding. Why heterosis and inbreeding are two faces of the same coin ? Comment.

11. Write short notes on :

    (a) Overdominance hypothesis.   (b) Physiological races.

    (c) Gene cloning.   (d) Reporter gene.

    (e) In situ hybridisation.

12. Describe the achievements of mutation breeding and discuss the limitations of this approach in crop improvement.

13. "A crop ideotype is an evolving concept." Discuss this statement with the help of suitable example.

14. With suitable examples, explain the phenomenon of multiple alleles.

15. What is random drift ? Briefly explain how this phenomenon affect in population.

16. Discuss the pattern of transmission of cytoplasmic gene with appropriate example.

Section C

1. What is stress ? Explain in detail a protocol for the production of stress resistant paddy. Add a note on disadvantages of salinity.

2. Discuss the role of tissue culture technique in plant improvement.

3. Define Biodiversity. Briefly explain various methods of biodiversity conservation.

42. Chemistry

Section B

1. State and explain Jahn-Teller theorem with examples.

2. Discuss the oxidation states of lanthanides. What are the important applications of these metals ?

3. Write a note on autoionization of solvents with examples.

4. Discuss the application of Bohn-Haber cycle with an example.

5. Write a note on various nuclear reactions with examples.

6. Write shortly on halogens in positive oxidation states with examples.

7. Discuss briefly on the application of lead tetracetate in organic synthesis with examples.

8. Briefly describe the optical isomerism of biphenyls.

9. Give an account of the stereochemical aspects of Diels-Alder reaction.

10. Write a note on flexional molecules with examples.

11. Discuss the mechanism of benzoin condensation.

12. Explain the method of evaluating entropies using Third law of thermodynamics.

13. Discuss the Planck treatment of black body radiation.

14. State and explain the uncertainty principle by a thought experiment.

15. Derive Sackur-Tetrode equation.

16. Discuss the various changes undergone by an electronically excited molecule.

Section C

1. Discuss the application of molecular orbital theory to metal complexes. What are its merits and demerits over other theories ?

2. Discuss the principle and application of NMR spectroscopy for the characterization of organic compounds.

3. Write a critical account of reaction kinetics bringing out various mechanisms in reactions in solution with suitable examples.

43. Demography

Section B

1. Explain the special features of 2001 census of India.

2. Discuss the methods of smoothening the age data.

3. Discuss the different methods for finding out the volume of intercensal migration for a state.

4. Examine the role of intra-spouse communication in achieving demographic goals.

5. Discuss the relevance of Malthusian theory of population in developing countries.

6. Rapid urbanisation leads to several urban problems—Discuss.

7. Sociological knowledge is very essential in formulating population related policies. Explain.

8. Status of women in Kerala is much better than in the other parts of India. Comment.

9. Describe the salient features of Indian Rural Community.

10. Explain how rapid population growth deplete the resources in India.

11. Explain Shep's model on human reproduction.

12. Can demographers help in manpower planning ? How ?

13. Discuss the concept of sustainable development and explain its importance in the present context.

14. Discuss the importance of family life education.

15. Distinguish between limiting and spacing methods of contraception and explain the advantages and disadvantages.

16. Do you think that separate population policies should be formulated for the different states of India ? Give reasons.

Section C

1. Prepare a research design for a study of the "prevalence of M.T.P. in Trivandrum district".

2. Write a detailed proposal for a study of "problems and needs of elderly population in Kerala".

3. Critically examine the emerging health threats in Kerala.

44. Geology

Section B

1. Discuss the significant evolutionary stages of Karnataka craton.

2. Explain why the Archaean period is regarded as metallogenic period.

3. What is the role of carbon-dioxide in the metamorphic evolution of South India ?

4. What are strata bound ore deposits ? Give Indian examples.

5. Give an account of evaporate deposits of oceanic origin.

6. Distinguish glossopteris and gangamopteris.

7. What is epierogeny ?

8. Comment on water pollution and chemical quality of ground water.

9. With suitable examples discuss the formation of fissure vein deposits.

10. Illustrate the use of fold vergence in shear zone studies.

11. Discuss the seismic reflection and refraction methods as applied in exploration.

12. Write explanatory notes on Benioff zone.

13. Describe the important ore textures and comment on their genetic significance.

14. Discuss the geochemical mobility of elements.

15. Demonstrate how stereographic projection can be used in solving structural complexity.

16. Elucidate the application of GIS in morphometric analysis.

Section C

1. What is a ground water province ? Describe briefly the hydrogeological features and hydrauli characteristcs of the various groundwater provinces of South India with special reference to Kerala

2. Discuss how the optic sign is determined from a biaxial interference figure perpendicular to the acute bisectrix.

3. Elucidate on the origin of chromite deposits citing Indian examples to discuss tectonic setting an lithologic associations.

45. Geography

Section B

1. Explain the concept of Energy Budget.

2. Briefly discuss the structure and importance of tertiary sector of urban economy.

3. Examine the causes which have led to regional imbalances in the economic development in Indi

4. Discuss the utility of crop-combination analysis in Agricultural Planning.

5. Distinguish between Behavioural and Radical Geography.

6. Examine the significance of irrigation in India.

7. Summarise the spatial analysis and interpreting capabilities of a GIS.

8. Discuss the hierarchy of settlements.

9. Describe the earth features produced by plutonism.

10. Give an account on the effects of the jet streams.

11. How does the process of rectification carried out in an image processing ?

12. Discuss the basic concept and approaches of environmental studies.

13. Examine the use of gravity models in delineating urban zones of influence.

14. Give a short account on geographic matrix.

15. Analyse the spatial tradition in Geography.

16. Describe various approaches to Medical Geography.

Section C

1. Give an account of the sector theory of urban land use and examine the basis on which the theory was formulated.

2. Bring out the salient contributions of the European and the American Schools to the development of geomorphic thought.

3. Write a critical comment on lettering style, size and spacing in maps. Illustrate your answer with suitable examples.

46. Home Science

Section B

1. Write on the scope of folklore in extension work.

2. Explain the principles of body mechanics.

3. Write on the properties, deficiencies and good sources of riboflavin.

4. Discuss the elements of project formulation.

5. Describe the problems in communication.

6. Explain the common nutritional problems prevalent among school going children.

7. Explain the three basic institutions in a village.

8. Distinguish between values, goals and standards and explain their inter-relationship.

9. Give the nutritional importance of Spirullna.

10. What is co-ordination ? Explain its importance in extension administration.

11. Define planning in management and discuss its objectives.

12. Define Jaundice. How will you plan a diet for a patient suffering from viral jaundice ?

13. Discuss the role of co-operatives in Indian rural economy.

14. Mention any *two* fuel saving devices appropriate at household level. Explain the working principle of each with their social acceptance.

15. Explain the use of calorimeter in the Biochemical estimation. Explain the estimation of iron using a calorimeter.

16. Examine the role of IRDP in the eradication of rural poverty.

17. Discuss the types of circuits that are required in the modern kitchen with their use.

18. Write on the structure and metabolism of Purines.

19. Enumerate the methods available to assess the nutritional status of a community.

20. Describe the steps adopted in planning nutrition education programme.

21. Describe the tests to detect adulteration of foods.

22. Define the term "Evaluation". Write down the methods of evaluation in an education programme.

23. Describe the role of Home science in national development.

24. Describe the steps in writing a report.

Section C

Choose a separate problem in any *one* of the following three areas. Formulate a research proposal in the area stating :

   (a) The Research topic.

   (b) Objectives.

   (c) Hypothesis or assumption.

   (d) Methodology.

1. Evaluation of a continuing Education Programme.

2. Evaluation of a mid-day meal programme in a school.

3. Evaluation of an energy saving device.

47. Mathematics

Section B

1. Give an isomorphism between the groups $\mathbf{Z}_2 \oplus \mathbf{Z}_5$ and $\mathbf{Z}_{10}$. Verify completely.

2. Let $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 6 & 5 & 7 & 1 & 4 & 2 \end{pmatrix}$ be a permutation. Write σ as a product of disjoint cycles. Determine whether σ is even or odd.

3. Describe the automorphism group $\text{Aut}_Q F$ where $F = \mathbf{Q}\left(\sqrt{2}, \alpha\right)$ and α is the real cube root of 3.

4. Get the minimal polynomial of the matrix

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix}.$$

5. Define rank of a matrix and find the rank of

$$\begin{bmatrix} 1 & 2 & 3 & 1 \\ 0 & 1 & 1 & 2 \\ 2 & 3 & 5 & 2 \\ 0 & 1 & 1 & 1 \end{bmatrix}.$$

6. Let $\{u_1, u_2, \cdots,\}$ be a sequence of orthonormal vectors in a Hilbert space H. Using this prove that the closed unit ball in H is not compact.

7. Find the norm of the operator $T : \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x,y) = (x + y, x - y)$ where $\mathbb{R}^2$ has the usual norm.

8. Find the maximum and minimum of the function $f(x) = \sin 2x + \cos 2x$ in $\left[0, \dfrac{\pi}{2}\right]$.

9. Show that every metric space is a normal space.

10. Consider the set $\mathbb{R}$ of reals with cofinite topology. Discuss the convergence of the sequence $(1/n)$ in this space.

11. Show that the closed interval [0, 1] and the unit circle S′ are not homeomorphic.

12. Show that $\sin z$ can not be represented by a polynomial.

13. Prove that a non-constant analytic function maps open sets onto opensets.

14. Verify whether the real line $\mathbb{R}$ and the closed interval [0, 1] are homotopy equivalent spaces.

15. Write a short note on the impossibility of squaring a circle by ruler and compass.

16. Write a short note on Riemann hypothesis relating to Riemann-Zeta function.

Section C

1. Define splitting fields characterize them in terms of automorphisms and discuss the role of splitting fields in Galois theory.

2. Discuss uniform convergence, giving suitable examples and comparing it with pointwise convergence.

3. Discuss on Hahn-Banach theorem, giving various consequences of the theorem with suitable examples.

48. Statistics

Section B

1. Define random variable X, its probability distribution P_X and distribution function F_X. Give an example for each.

2. Stating clearly the results that you use, prove that

$$\max \{0, P(A) + P(B) - 1\} \le P(A\,B) \le \min \{P(A), P(B)\}.$$

3. Let F denote the distribution function of a standard normal variate X and G that of $Y = |X|$. Express F in terms of G and G in terms of F.

4. State and prove Bayes' theorem for a finite number of events.

5. Define characteristic function ϕ of a random variable X. Show that $|\phi(t)| \le 1$, $\phi(-t)$ is the conjugate of $\phi(t)$, for t real.

6. Let (X, Y) be distributed as bivariate normal $(0, 0, 1, 1, \rho)$. Derive the conditional density $f(x/10)$ of X given Y = 10. Find its mean and variance.

7. Let X be a random variable with density $f(x) = pq^x, x = 0, 1, 2, ...,$ where $0 < p < 1$ and $q = 1 - p$. For positive integers r, s show that $P(X \ge r + s | X \ge r) = P(X \ge s)$.

8. Let X be distributed as binomial with mean = 2 and variance = 1. Evaluate $P\{X = 1 \text{ or } X = 2\}$.

9. State (without proof) : (a) Khintehine's WLLN and (b) Classical CLT.

10. State (without proof) : (a) Rao-Blackwell theorem and (b) Lehmann-Scheffe theorem.

11. Let $\overline{X}$ denote the mean of a random sample of size n from a normal distribution with mean = μ and variance = 1. A test rejects $H_0 : \mu \le 0$ against $H_1 : \mu > 0$ if $\overline{X} > 0$. Derive the size and power function of the test. Is the test unbiased ?

12. Define : Mann-Whitney U-statistic and Wilcoxon statistic. Establish the relation between them.

13. Describe the model, hypothesis being tested and ANOVA table of a randomised block design.

14. Explain : Parameter and statistic ; census and sample survey ; sampling error and non-sampling error.

15. Establish the two inequalities connecting the strength (α, β) and the boundaries (A, B) of a SPRT (A, B), where $0 < B < 1 < A$.

16. Derive the MLE of (μ, σ^2) based on a random sample of size n (> 1) from a normal distribution with mean = μ (real) and variance = $\sigma^2 > 0$.

Section C

1. Let (X, Y) be distributed as bivariate normal $(0, 0, 1, 1, \rho)$. Derive the characteristic function of (a) (X, Y) ; and (b) XY.

2. Let X be distributed as exponential with density $e^{-x}, x > 0$. Define $X_1 = [X]$, integral part of X, and $X_2 = X - [X]$. Show that X_1 and X_2 are independent.

3. Based on a random sample $X_1, ..., X_n$ from a population with density

$$f(x, \theta) = e^{-(x-\theta)} \exp\left\{-e^{-(x-\theta)}\right\}, \theta, x \text{ real}$$

derive (a) Method of moments estimator of θ ; and (b) UMVU estimator of θ.

49. Physics

Section B

1. The masses of all nuclei are not exact integer multiples of the mass of a single nucleon. Why ?

2. What are the similarities between a *nutrino* and a *photon* ? What are the differences ?

3. Ionic crystals are often transparent, while metallic crystals are always opaque. Why ?

4. Can a hydrogen atom X-rays ? Justify your answer.

5. Why do the transition elements have similar chemical properties ?

6. What is the physical significance of the area under a graph of ψ^2 versus x between x_1 and x_2, if ψ is normalized ?

7. Why can an electron microscope have greater magnification than an optical microscope ?

8. Explain why the X-ray spectra of elements of nearby atomic numbers are qualitatively very similar, although the optical spectra of these elements may differ considerably.

9. The total energy of the hydrogen atom is negative. What significance does this have ?

10. State and explain the Planck radiation law.

11. When you inhale helium, your voice become high and squeaky ? Why ?

12. Compare and contrast Raman effect with Compton effect.

13. Does the universe have a centre ? Explain.

14. What observation led Rutherford to the belief that an atom is mostly empty in space ?

15. How is binding energy of a nucleus related to its stability ?

16. Distinguish between negative and positive feedback in amplifiers.

Section C

1. How do you identify the elements found in the sun by spectroscopic methods ? Give a detailed account of the methodology you adopt.

2. You have been asked to study the effect of impurities on the optical and electrical characteristics of an intrinsic semiconductor. How do you plan this programme ?

3. What are the different techniques used to grow single crystals ? Explain one such technique. How do you characterize the crystals thus grown ?

50. Zoology

Section B

1. Describe the chemistry, secretion and metabolism of insulin and explain the molecular basis of insulin action.

2. Explain Gene dosage and gene amplification.

3. Discuss Lactose metabolism and explain the concept of operon.

4. Explain how tryptophan operon is regulated.

5. What is Random Genetic Drift ?

6. Discuss the regulation of intermediary metabolism during fasting and feeding.

7. Explain the physiological effects of melatonin and its role in biological rhythms.

8. Explain the hormonal regulation of electrolyte and water metabolism.

9. What are chaperons and write notes on the non covalent and hydrophobic forces involved in protein folding ?

10. Discuss the metabolic functions of nucleotides.

11. What is Klenov fragment ? Describe the procedure for sequencing DNA.

12. What is SSCP ? Examine the role of primers in DNA replication.

13. Explain the allosteric control of enzyme activity.

14. Elucidate the structural details of prostaglandins and thromboxanes, and discuss the physiological significance.

15. Briefy explain passive and active mediated transport systems.

16. What is hypochromic effect ? Explain denaturation and renaturation of DNA.

Section C

1. Discuss the methods for characterization, purification of proteins in research.

2. Discuss the clinical applications of enzymes.

3. Examine the relevance of conservation biology in biodiversity.

FACULTY OF SOCIAL SCIENCES

51. Economics

Section B

1. Cobb-Douglas production function.

2. Scitovsky double criterion.

3. Price discrimination.

4. The life-cycle hypothesis.

5. Accelerator theory of investment

6. Keynesian unemployment.

7. The new growth theories.   8. Marketed surplus.

9. Doctrine of unbalanced growth.   10. Vote trading.

11. Social choice theory.   12. Down's model of political decision-making.

13. Immiserising growth.   14. Product cycle theory.

15. Leontief paradox.   16. Natural rate of unemployment hypothesis.

Section C

1. Bring out the factors contributing to the frequent rise in oil prices in India during 2004.

2. Examine the causes for the industrial backwardness in Kerala.

3. Critically evaluate the performance of decentralised planning implemented in Kerala.

52. History

Section B

1. R.D. Banerjee.   2. Marutham.

3. Incas.   4. Todar Mal.

5. Fort St. Angelo.   6. Cavalier Parliament.

7. Big Stick Diplomacy.   8. Simon Bolivar.

9. Van Rheede.   10. Justice Party.

11. Indian History Congress.   12. Self Respect Movement.

13. Civil Rights Movement.   14. The White Revolution.

15. Eschatology.   16. Heuristicism.

Section C

1. "All history is the history of thought." Comment.

2. What is Meta history ? Explain its scope and importance.

3. Analyse the nature and significance of archival records. Bring out its management and preservation.

53. Islamic History

Section B

1. Briefly discuss the life of Mohammad as a symbol of humanity.

2. The battle of Badr.

3. Evaluate the life of Caliph Ali as a man and as a Caliph.

4. Mention the social status of *Dhimmis* in Umayyad society.

5. Mention the contributions of Al-Baruni.

6. Evaluate the Pan-Islamic ideas of Jamal al-Din al Afghani.

7. Trace the beginnings of the Sanusi movement.

8. Highlight the doctrine of *Tauhid* in Islam.

9. Bring out the reforms of Mohamud II.

10. Write briefly on Balfour declaration.

11. Discuss the revenue and military reforms of Akbar.

12. Evaluate the role of Kunjali Marakkars as defenders of Malabar.

13. Write a note on Bait-ul-Hikma.

14. Assess the socio-reformist works of Vakkom Maulavi.

15. Comment on the great Muslim Philosophers of Spain.

16. Examine the policies of Firoz Shah Tughlaq.

Section C

1. Evaluate the work of Shaikh Zainuddin's "Tuhfatul Mujahidin" as a source to Kerala Historiography.

2. Assess the works of Ibn-Khaldun to be a historian of Science of Culture.

3. Prepare a synopsis on "the formation and development of Muslim League in Kerala".

54. Archaeology

Section B

1. Discuss the various archaeological excavation methods and cite their merits and demerits.

2. Discuss the C^{14} method of dating.

3. Give an account of prehistoric cultures of Sohan valley.

4. Give an account of prehistoric art in India.

5. Discuss the Palaeolithic cultures of South Africa.

6. What are the salient features of Harappan culture ?

7. Give an account of Chalcolithic cultures in Maharashtra.

8. Discuss the schools of art that flourished under Kushanas.

9. Give an account of Gupta art.

10. Elucidate the development of temple architecture under the Pallavas.

11. Discuss the growth of temple architecture under the Guptas.

12. Discuss temple architecture under the Pallavas.

13. Give an account of the various forms of Vishnu images.

14. Write a note on the Hatigumpha inscription of Kharavela.

15. Discuss the origin and antiquity of coinage in India.

16. Elucidate the coin types issued by Samudra Gupta.

Section C

1. Select a research topic of your choice and write a synopsis citing primary and secondary sources available.

2. Discuss the important aspects to be considered while selecting a research topic.

3. Prepare a research proposal on Megaliths of Kerala detail the objective and method to be used for data collection and analytical techniques.

55. Political Science

Section B

1. New Public Management.

2. Independent Regulatory Commissions.

3. Significance of E. Governance in Public Service.

4. Concept and functions of Civil Society.

5. Performance Budgeting.

6. Response of European Union towards global terrorism.

7. Gandhiji on Village Republics.

8. Caste and Class in the Indian context.

9. What is meant by Cyber Politics ?

10. Human Rights and the challenges of development.

11. Restructuring the U.N. Security Council.

12. Marx's perspective on Political Economy.

13. Distinguish between Decentralisation and Delegation of authority.

14. Women reservation in Parliament and State Legislatures : The need and challenges.

15. Gramsci's theory of Hegemony.

16. Pareto's theory on circulation of Elites.

Section C

1. Distinguish between Questionnaire and Schedule. What are the factors to be considered while preparing questionnaire ?

2. Prepare a synopsis on "Tribal Development and the problems of land alienation and poverty in Wayanad."

3. Examine the factors to be considered while selecting a research problem.

56. Social Work

Section B

1. Discuss the relevance of Gandhian philosophy to Social Work.

2. Define relationship and highlight the importance of relationship in Social Work.

3. Discuss the scope of social action as a method of Social Work.

4. Critically examine the values and beliefs of Indian Culture that hinders the practice of counselling.

5. "Adolescence is one of the traumatic phase in an individuals life." Comment.

6. Define Poverty. Discuss the causative factors in the Kerala context.

7. Discuss the scope of research in Social Work.

8. Write a brief note on pubic interest litigation.

9. Briefly describe the Fundamental Rights enumerate in the Indian Constitution.

10. What is the significance of project evaluation ? Indicate the criteria and techniques that are used to evaluate ?

11. What are the characteristics of a good research report ?

12. Define Mental Health. Describe the characteristics of a mentally healthy person.

13. Highlight the importance of values and ethical considerations in research.

14. Write a short note on group dynamics.

15. "Change is most effective when it comes from within".

16. Discuss the scope of Social Work in schools.

Section C

1. Briefly describe the types of research designs used in Social Work Research. Justify the reason for selection of the research design you intend to use for your dissertation.

2. What is a hypothesis ? Point out the characteristics of a good hypothesis and list out the major sources of hypothesis.

3. Suppose you are appointed as the project co-ordinator of the urban basic services programme in your corporation/municipality. The media reports that there is widespread malnutrition in one of the urban slums.

    (a) Prepare a research project to study the health condition of the women and children in that slum.

    (b) Prepare a hypothetical action plan for intervention.

57. Sociology

Section B

1. Social research.
2. Dialectical materialism.
3. Functional alternative.
4. Stock knowledge at hand.
5. Social exchange theory.
6. Random sampling.
7. Structuralism.
8. Ethnomethodology.
9. Pilot study.
10. Circulation of Elites.
11. Reference group.
12. Public sphere and knowledge communication.
13. Social system.
14. Participatory research.
15. Bureaucracy.
16. Self indication.

Section C

1. Explain the different steps in social research.

2. What is a research design ? Critically analyse the merits and demerits of different designs.

3. What is the relevance of testing hypothesis in a research study ? Illustrate your answer with suitable examples.

58. Psychology

Section B

1. Systematic desensitization.
2. Cognitive dissonance.
3. Independent variable.
4. Couple counselling.
5. Theory X.
6. Somatisation disorder.
7. Learning by Insight.
8. Random sampling.
9. Cross over design.
10. Transference in Therapy.
11. Double bind communication.
12. ADHD.
13. Schedules of reinforcement.
14. Non-parametric statistics.
15. Types of validities.
16. In-house training.

Section C

1. Develop a suitable research design to find out how personality dimensions like Extraversion and Neuroticism affect academic achievement.

2. Show how you would standardize a test to measure attitude of students to modern school education.

3. What are the uses of correlational methods in psychological researches ? Illustrate with examples.