2025

Time : 3 hours

Full Marks : 70

Pass Marks : 32

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Answer any **five** questions in which Q.No. 1 is compulsory.*

1. Answer any **four** questions of the following : $3\frac{1}{2} \times 4 = 14$

   (a) What is meant by Common Mode Rejection Ratio in op-amps ?

   (b) Draw the block diagram of an operational amplifier.

(c) Design a square wave generator using op-amps.

(d) What is the functions of Frequency Division Multiplexing ?

(e) Explain the working principle of optical memories.

(f) Brief the wave modes in microwave devices.

2. Explain the concept of negative feedback in op-amp circuits with suitable circuit diagram and derive expression for gain. 14

3. Design and explain the working of an op-amp based adder and subtractor circuit. 14

4. Compare astable, monostable and bistable multivibrators using operational amplifiers. 14

5. Describe, in detail, the generation and detection of Amplitude Modulated (AM) waves. 14

6. Discuss the various types of semiconductor memories including SRAM, DRAM, CMOS and NMOS. 14

7. What is Single Sideband (SSB) modulation ? Explain the generation and detection techniques of SSB waves. 14

8. Compare the working of magnetron and travelling wave tube (TWT) in tems of their construction, operating principles and applications. 14

9. Write short notes on any **two** of the following : 7×2 = 14

   (a) Charge-coupled device

   (b) Velocity modulation

   (c) Operational amplifier

   (d) Phase shift oscillator

2025

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The figures in the margin indicate full marks.

*Answer any **five** questions in which Q. No.1 is compulsory.*

1. Answer any **four** questions of the following : $3\frac{1}{2} \times 4 = 14$

   (a) Define Phase and group velocity.

   (b) What do you mean by Drude model of solids ?

   (c) Define electronic polarizability..

   (d) Define polaritons.

(e) What is spontaneous magnetization in ferromagnets ?

(f) Name any two ferrites.

2. Explain the vibration of linear diatomic lattice obtaining dispersion relation. Also define Brillouin Zones in a diatomic lattice. 10 +4 = 14

3. Define phonons explaining quantization of elastic waves. Also discuss the scattering of phonons by neutrons. 7+7 = 14

4. Discuss the phenomena dispersion and absorption in the interaction of solids with electromagnetic field. 14

5. Discuss different types of polarization in dielectric and obtain Clausius-Mossotti relation. 6+8 =14

6. Obtain frequency of plasma oscillations and define plasmons. 10+4 =14

7. Give the quantum theory of paramagnetism to obtain the expression of magnetic susceptibility. 14

8. Define permanent polarization and discuss the dipole theory of ferroelectricity. 4+10 = 14

9. Write short notes on any **two** of the following : 7×2 = 14

(a) Monoatomic lattice vibration

(b) Electron-phonon interaction in ionic crystals

(c) Ferrites and their properties

(d) Antiferromagnetism and Neel temperature

2025

Time : 3 hours

Full Marks : 70

Pass Marks : 32

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer any ***five*** *questions in which Q.No. 1 is compulsory.*

1. Answer any **four** questions of the following : $3\frac{1}{2} \times 4 = 14$

   (a) Define signal to noise ratio.

   (b) Explain up-link satellite model.

   (c) What are the importance of Mnemonics in assembly language ?

   (d) Define opcode and operand.

(e) What are two main advantages of microwave communications ?

(f) What is the difference between TE and TM mode in waveguides ?

2. Draw the block diagram of a RADAR system. Discuss RADAR transmitting and receiving system in detail. 6+8 = 14

3. Discuss the different types of satellite. Explain the working of a Geostationary satellite communication system. 6+8 = 14

4. How are mnemonics and operands used together to form valid assembly instructions ? 14

5. Explain machine and language programming in the context of Microprocessor. How does a microprocessor execute machine code internally ? 8+6 = 14

6. Discuss in detail the effects of atmospheric phenomena on microwave signal propagation. How do these effects vary with frequency and altitude ? 8+6 = 14

7. Describe the phenomenon of fading in microwave communication. Identify and explain the primary sources of fading. 8+6 = 14

8. Explain in detail the modes of propagation in waveguides. Discuss the structure and working of a rectangular waveguide with appropriate diagrams. 6+8 = 14

9. Write short notes on any **two** of the following : 7×2 = 14

   (a) Satellite link model

   (b) INTEL 8085 microprocesor

   (c) RADAR range equation

   (d) Antenna look angles

2025

Time : 3 hours

Full Marks : 70

Pass Marks : 32

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Answer any **five** questions in which Q.No. 1 is compulsory.*

1. Answer any **four** questions of the following : $3\frac{1}{2} \times 4 = 14$

   (a) Define effective mass.

   (b) What are the importance of imperfections in solids ?

   (c) Define Magnetoresistance.

(d) Explain Schottky defect.

(e) What are the properties of High temperature superconductors ?

2. Dicuss the theory fo nearly free-electron approximation model to study the energy bands in solids. 14

3. Define Fermi surface. Draw Fermi surface in two-dimensional monovalent system. Discuss its characteristics in brief. 4+6+4 = 14

4. What are the different types of imperfections ? Discuss the theory of the Frenkel defect. 4+10 = 14

5. Define edge and screw dislocations. Discuss the role of dislocations in crystal growth. 8+6 = 14

6. Discuss the theory of anomalous skin effect in solids. 14

7. What is Cooper pair ? Discuss BCS theory of superconductor. 4+10 = 14

8. Define superconducting tunneling. Discuss the theory of AC and DC Josephson effect for superconducting tunneling. 4+10 = 14

9. Write short notes on any **two** of the following : 7×2 = 14

(a) Tight-Binding approximation

(b) De-Hass-Van Alphen effect

(c) Quantum Hall-effect

(d) Type-I and Type-II superconductors