2/21

0305N207

Candidate's Seat No :_____

MSc Sem.-2 Examination

409

Medical Physics

Time : 2-30 Hours] **May-2025** **[Max. Marks : 70**

Q.1 (A) Explain the construction and working of an NPN Bipolar Junction Transistor (BJT) in common-emitter configuration. Sketch and explain its I-V characteristics in different regions of operation. [07]

(B) What are the essential components of a regulated DC power supply? Define line regulation and load regulation. Explain their significance in power electronics. [07]

OR

Q.1 (A) Describe the structure and working of a Light Emitting Diode (LED). Explain how the color of the emitted light is determined. [07]

(B) What is a DC-DC converter? Explain the working principle of a buck or boost converter and discuss applications in RF power supplies. [07]

Q.2 (A) Explain the concept of feedback in electronic circuits. Differentiate between positive and negative feedback with suitable circuit examples. How does feedback influence gain, bandwidth, and stability of an amplifier? [07]

(B) State and explain the Barkhausen criterion for sustained oscillations. Derive the condition for oscillation in a general feedback oscillator circuit using loop gain analysis. [07]

OR

Q.2 (A) Draw and explain the Wien-bridge oscillator circuit. Derive the condition for oscillation and expression for frequency. How is amplitude stabilization achieved in practical circuits? [07]

(B) Explain the construction and working of a UJT relaxation oscillator. Derive an expression for its frequency of oscillation. Why is it suitable for sawtooth waveform generation? [07]

Q.3 (A) Describe the structure and working of a differential amplifier. Explain the roles of inverting and non-inverting inputs. Discuss common-mode and differential-mode operation with appropriate equations. [07]

(B) Describe and derive the operation of Voltage-to-Current (V-I) and Current-to-Voltage (I-V) converters using op-amps. Mention typical scenarios where each is used. [07]

OR

Q.3 (A) Discuss the working of a logarithmic amplifier using an op-amp and diode. Derive the expression for the output voltage and mention practical applications. [07]

(P.T.O)

(B) How can op-amps be used to build function generators? Explain with circuits for generating square, triangle, and sine waveforms. [07]

Q.4 (A) Draw logic symbols of OR, AND, NOT, NOR, and NAND gates, and write truth table of each gate [07]

(B) Give classification of the 8085 Microprocess instructions and discuss each with relevant example [07]

OR

Q.4 (A) Draw circuit diagram of R-S and J-K flip-flops and explain working of each one with their truth tables [07]

(B) Give brief introduction of 8085 Microprocessor: Draw INTEL 8085 pinout diagram and discuss it. [07]

Q.5 Answer in brief **Any Seven** questions from the following: (Each question is of **two** mark). [14]

(i) Why is MOSFET preferred in digital circuits?

(ii) Compare tunnel diode and conventional diode in terms of doping and I-V characteristics.

(iii) Name one advantage of SMPS over linear power supplies.

(iv) Why are LC oscillators unsuitable for low-frequency applications?

(v) Why is a three-stage RC network used in a phase-shift oscillator?

(vi) What is a varactor diode and how is it used in a tuned oscillator? Write its applications.

(vii) List ideal characteristics of an operational amplifier.

(viii) What is the voltage gain expression for an inverting amplifier?

(ix) What is an active filter? Name two types of active filters.

(x) Write name of general-purpose registers of INTEL 8085 MPU

(xi) What is function of address bus?

(xii) How many flags are there in 8085 MPU?

***** PAPER ENDS *****