

M. Sc. (PHYSICS)

(MSCPH)

Term-End Examination

June, 2026

MPH-005 : ELECTRONICS

Time : 2 Hours

Maximum Marks : 50

Note : (i) Attempt any **five** questions.

(ii) You can use calculators.

(iii) Symbols have their usual meanings.

1. (a) What are the assumptions in deriving the ideal diode equation ? Explain the effect of temperature on the breakdown voltage of the diode ? 2+3

- (b) How can the efficiency of a solar cell be increased ? 5
2. (a) With the help of waveforms of switching cycle, explain the origin of forward recovery time and reverse recovery time of a power diode. 5
- (b) With the help of schematic diagram explain the construction and working of a P-I-N photo diode. State its advantages over P-N photovoltaic photodetector. 3+2
3. (a) Explain with the help of appropriate diagram the construction and working of E-MOSFET. 5
- (b) Draw the circuit diagram of UJT relaxation oscillator and explain its working. 5

4. (a) In a single ended input-single ended output configuration of differential amplifier using matched pair of silicon transistors, the input voltage is 5 mV. If the collector resistors $R_{C1} = R_{C2} = 51 \text{ k}\Omega$, emitter resistor $R_E = 47 \text{ k}\Omega$ and supply voltage is $\pm 10 \text{ V}$, calculate the differential gain and output of the circuit. 4+1
- (b) Explain the important processes involved in microwave generation by the vacuum tube devices with the help of reflex Klystron oscillator. 5
5. (a) Design and draw the circuit of a inverting Schmitt trigger using an op-amp with hysteresis of 25% of $\pm V_{\text{sat}}$. 3+2

- (b) Draw the circuit of basic logarithmic amplifier using an op-amp. Obtain the expression for its output voltage in terms of input voltage V_{in} . 2+3
6. (a) What is switching mode power supply ? Compare its advantages and disadvantages vis-a-vis a linear power supply. 2+3
- (b) What is PLL ? Explain the terms capture range and lock range of a PLL. 1+4
7. (a) Draw the circuit of op-amp based astable multivibrator and explain its working. 2+3
- (b) Draw the circuit of 2-bit Flash ADC and discuss its truth table. 5

8. (a) With the help of a block diagram, explain the organization of 8085 microprocessor-based system. 5
- (b) State the operations carried out by microcontroller 8051 by the following instructions : 5
- (i) MOV A, R1
 - (ii) MOV R2, #5
 - (iii) ADD A, #3d
 - (iv) MOV R3, E8
 - (v) MOV @R3, A

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