Name ....

25U430

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025
SEMESTER 4 : PHYSICS
COURSE : **19U4CRPHY04** : SEMICONDUCTOR PHYSICS
(For Regular 2023 Admission and Improvement / Supplementary 2022/2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer any 8 (2 marks each)

1. Describe the various methods used for transistor biasing. State their advantages and disadvantages.
2. What is duty cycle of a wave train?
3. In AM transmission modulation index larger than 1 is not optimum. Why?
4. Examine the action of the series resistor in the zener voltage regulator circuit?
5. What is meant by forbidden energy gap? How does it occur in semiconducting crystals?
6. Show that the output voltage of a single stage common emmiter transistor amplifier is 180° out of phase with the input voltage.
7. Explain how a zener diode behave when it is (a) ON and (b) OFF
8. What is virtual ground?
9. What are the methods of negative feedback?
10. Mention the essentials of biasing circuits.

(2 x 8 = 16)

PART B
Answer any 6 (4 marks each)

11. Illustrate the schematic of (i) inverting amplifier with gain 5 and (ii) non-inverting amplifier with gain 6, using an operational amplifier.
12. An npn silicon transistor has V_{CC} = 5V and collector load R_C = 2kΩ. Find: (I)The maximum collector current that can be allowed during the application of signal for faithful amplification (ii)The minimum zero signal collector current required
13. What is meant by Biasing a transistor? Mention various biasing circuits.
14. Write short notes on the following: (i)phase reversal (ii)d.c. and a.c. load lines (iii)operating points (iv)classification of amplifiers.
15. The tuned circuit of an oscillator in an AM transmitter uses 40 micro henry coil and a 1 nano farad capacitor. If the carrier wave is modulated by audio frequency upto 10 kHz, analyse the frequency band occupied by the side bands and channel width.
16. A sinusoidal input 20V peak to peak signal is applied to a negative biased silicon diode clipper with a bias voltage of 4.5V. Sketch the output waveform of the signal.
17. A, zener is rated as follows. Vz = 6.2 V; rz = 2Ω; Iz = 50 mA; Iz (min) = 5mA and Iz(max) = 100 mA. Calculate the voltage drop across the diode when the load current varies from 10mA to 80mA. Hence calculate the percentage of regulation.
18. Compare the (i) output waveform and (ii) the waveform behind any RC section of a phase shift oscillator, by drawing them on a single figure.

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. Give the advantage of negative feedback. Discuss and compare different methods of feedback.

20. Explain with a neat circuit diagram the working of an operational amplifier based inverting and noninverting amplifiers. How can we implement a differential amplifier, based on the circuits discussed?

21. Explain with a neat circuit diagram the working of an astable multivibrator. Give the waveforms at the capacitor leads, as well as the collector leads, as a single plot.

22. What is a PN junction diode? Explain its behaviour when it is forward biased and reverse biased. Draw and explain its V-I characteristics.

(10 x 2 = 20)