

B Sc DEGREE END SEMESTER EXAMINATION - JULY 2021**SEMESTER 4 : PHYSICS****COURSE : 19U4CRPHY04 : SEMICONDUCTOR PHYSICS***(For Regular - 2019 Admission)*

Time : Three Hours

Max. Marks: 60

PART A**Answer any 8 (2 marks each)**

1. Write down the merits of a π filter over that of a LC filter.
2. What are clamping circuits? What are its uses?
3. Draw the diagram of a voltage doubler. Explain how it functions.
4. What is a transistor? Why is it so called?
5. In a transistor $\beta = 45$, the voltage across $5k\Omega$ resistance which is connected in the collector circuit is 5volts. Find the base current.
6. What is faithful amplification? Explain the conditions to be fulfilled to achieve faithful amplification in a transistor amplification.
7. Mention the essentials of biasing circuits.
8. A transistor amplifier employs a $4k\Omega$ as collector load. If the input resistance is $1k\Omega$, determine the voltage gain. Given $\beta = 100$, $g_m = 10mA/volt$ and signal voltage = $50mV$.
9. Give two differences between a FET and BJT.
10. What is virtual ground?

(2 x 8 = 16)**PART B****Answer any 6 (4 marks each)**

11. Determine the dynamic resistance of a silicon diode which sends a forward current of $3mA$. Assume the volt equivalent of temperature to be $0.025V$.
12. A zener is rated as follows. $V_z = 6.2 V$; $r_z = 2\Omega$; $I_z = 50 mA$; $I_z(\min) = 5mA$ and $I_z(\max) = 100 mA$. Calculate the voltage drop across the diode when the load current varies from $10mA$ to $80mA$. Hence calculate the percentage of regulation.
13. Calculate the closed loop voltage gain of a negative feedback amplifier having open loop gain $A = 300$ and feedback factor 0.05 .
14. With a neat diagram, explain the action of Hartley Oscillators.
15. Illustrate the schematic of a one shot multivibrator with a pulse width of 1 micro second.
16. Illustrate the schematic of an astable multivibrator with a pulse width of 2 micro seconds.
17. The tuned circuit of an oscillator in an AM transmitter uses 40 micro henry coil and a 2 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.
18. Discover a operational amplifier based circuit which gives the average of two voltages.

(4 x 6 = 24)**PART C****Answer any 2 (10 marks each)**

19. State and explain the diode equation. What are the different parameters of a PN junction diode?

20. Design an experiment to determine the input and output characteristics of CE configured pnp transistor. Draw the characteristic curves and find the input and output resistance
21. Explain with a neat circuit diagram the working of a RC phase shift oscillator. Give the waveforms at the three RC segments and the output waveform, in a single plot.
22. What is modulation? Explain with diagrams the working of (i) an amplitude modulation transmitter and (ii) an amplitude modulated signal receiver. Also discuss, various AM schemes.
(10 x 2 = 20)