TB243173Z

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2024

2023 ADMISSIONS REGULAR

SEMESTER III - CORE COURSE (PHYSICS)

PH3C03B23 - Semiconductor Physics

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 marks **(10x1=10)**

1. Briefly describe the working of a clamper.
2. Compare the VI characteristics of ordinary diodes and zener diodes.
3. Suggest any two materials used to make diodes. Compare any two properties of these materials.
4. Draw the schematic diagram of a regulated power supply.
5. Derive the gain of negative feedback amplifier.
6. Describe the working of transistor as a switch.
7. Using a schematic diagram, explain what is leakage current I_{CBO}. Mention any one of its consequences on current gain.
8. State the resonance condition in LC circuit.
9. Mention the differences in the trigger signals used for astable and mono stable multivibrators.
10. Define the term transconductance of FET and write its unit.
11. Define the modulation index in AM.
12. Draw the circuit diagram and explain the working of a buffer operational amplifier.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. A silicon diode is used as a positive biased clipper. Let the input be 20V(pp) sine wave which is to be clipped at 5V. Assuming the diode to be silicon, estimate the voltage of the battery required.
14. A half-wave rectifier is used to supply 50V d.c. to a resistive load of 800 Ω. The diode has a resistance of 25 Ω. Calculate a.c. voltage required.
15. Explain the working of photodiode.
16. When negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50. Calculate the fraction of the voltage feedback. If this fraction is maintained, calculate the value of the amplifier gain required if the overall stage gain is to be 75.
17. A transistor is connected in the CE configuration to a supply of 9V. The voltage drop across Rc of 1 KΩ is 1.5V. If $\alpha = 0.98$, calculate the collector emitter voltage (Vce) and base current.
18. Describe the construction of P channel junction FET.
19. Using a schematic diagram, explain how positive feedback ensures sustained oscillations.
20. An amplitude-modulated wave is represented by the expression $e_m=10(1+0.6\cos 6280t)\sin(211\times 10^4)t$ volts. Calculate the (i) minimum and maximum amplitude of AM wave (ii) modulation index and (iii) total power of AM wave.
21. A non-inverting opamp with R_1= 1KΩ and R2= 20KΩ has the following parameters A_{OL}=250,000, Z_{in}=25MΩ and Z_{out}=100Ω. Find the value of input and output impedance. Also, find the closed-loop gain.

Part C

III. Answer any Two questions. Each question carries 10 marks **(2x10=20)**

22. With a suitable circuit diagram, explain the working of biased and unbiased clampers.
23. Describe an experiment to determine the CE static characteristics of an npn transistor. Explain each characteristic with the help of characteristic curves.
24. Draw any circuit used for generating sine wave and describe its working. Compare the outputs of an astable, monostable and bistable multivibrators.
25. With a proper circuit diagram of a non-inverting amplifier, derive the expression for voltage gain, input resistance, output resistance and CMRR.