TB213450V

Reg. No :.....

Name :.....

B. Sc. DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2022

(2021 Admissions Regular,2020 Admissions Supplementary/Improvement,2019 & 2018 Admissions Supplementary)

SEMESTER III - CORE COURSE (PHYSICS)

PH3B03B18 - SEMICONDUCTOR PHYSICS

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

Part A

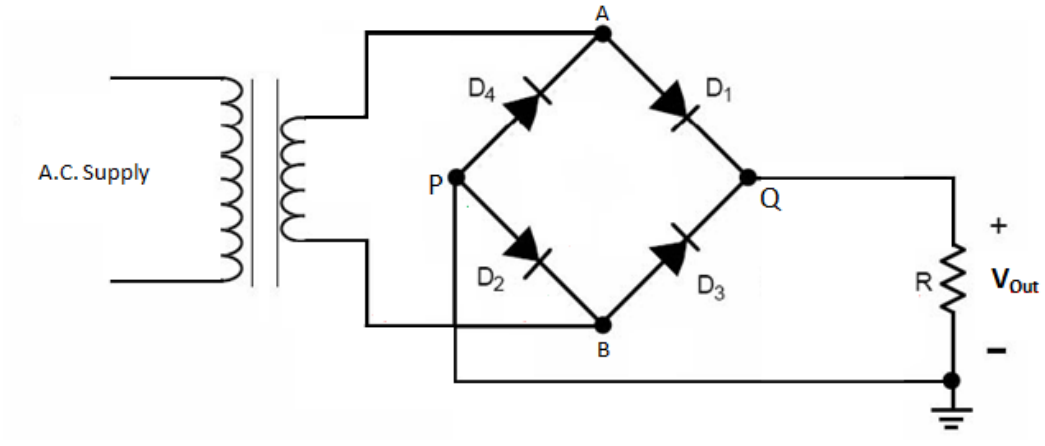
I. Answer any Ten questions. Each question carries 1 marks **(10x1=10)**

1. Draw the equivalent circuit of a forward biased real silicon diode.
2. Draw the circuit of a biased negative clamper.
3. Draw the output of a positive clipper if an input sine wave of Vpp 10 V is applied to it.
4. Explain why zener diodes have narrow depletion region.
5. Describe the working of transistor as a switch.
6. Using a relevant equation, demonstrate how to plot dc load line.
7. Draw the output characteristics of common base configuration and explain.
8. Briefly outline how to express amplifier gain in decibel system.
9. Give an equation for frequency of oscillations of an LC tank circuit.
10. Distinguish between modulation index and percentage of modulation in FM.
11. Draw the circuit diagram and explain the working of a buffer operational amplifier.
12. Compare the properties of FET and BJT.

Part B

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

13. 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.
14. Consider the circuit given in the figure. Specify the diodes which are forward biased during the positive and negative half cycles of the input. All the diodes are identical with a forward resistance of 10 Ω. The peak to peak voltage at the two ends of the secondary terminals is given by 50 sin (50π)t. Calculate the peak current through the load resistance of 2 kΩ, the average current, and rms value of current. Also calculate the ripple factor and efficiency.



15. 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 α = 0.98, calculate the collector emitter voltage (Vce) and base current.
16. A transistor in CEC has a supply voltage 9V. Collector resistance is 1 kilo ohm and the drop across it is 1.5 V. If current amplification factor of the same transistor in CBC is 0.98, calculate collector-emitter voltage and base current.
17. Describe how an LC tank circuit generates oscillations. Obtain an equation for oscillation frequency.
18. An amplifier has a voltage gain 500 and band width 250 KHz. With negative feedback its gain is reduced to 100. Calculate (i) feedback ratio (ii) feedback fraction and (iii) band width with feedback .
19. Explain the working of diode demodulator.
20. An inverting opamp with R_1=1K Ω and R2=100K Ω has the following parameters A_{OL}=50,000, Z_{in}=4MΩ and Z_{out}=50Ω. Find the value of input and output impedance. Also, find the closed-loop gain.
21. Describe the construction of N channel junction FET.

Part C

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

22. It is desired to construct biased clampers using silicon diodes to serve as inputs to a switching circuit whose upper and lower thresholds are +5V and -4V respectively. If the trigger signal is triangular with Vpp 10V, design suitable clampers. Explain its working and plot the output waveforms.
23. Using relevant circuits and graphs, explain the dc characteristics of transistors in CBC and CCC.
24. Explain the salient differences between an amplifier and an oscillator. With the help of a circuit diagram, describe the working of a Colpitt's oscillator.
25. With proper explanation and schematic representation, describe amplitude modulation. Also derive the power of AM wave and discuss the case when modulation index is one.