



24020667

QP CODE: 24020667

Reg No :

Name :

B.Sc DEGREE (CBCS) REGULAR EXAMINATIONS, APRIL 2024

Fourth Semester

Core Course - PH4CRT04 - SEMICONDUCTOR PHYSICS

(Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 Admission Onwards

AFF9F89B

Time: 3 Hours

Max. Marks : 60

Part A

Answer any **ten** questions.

Each question carries **1** mark.

1. Mention the factors on which the width of a depletion layer depend on.
2. Name the diode parameters.
3. Find the ripple factor of a series inductor filter?
4. What is a voltage doubler?
5. How does a clamper circuit affect the peak-to-peak and rms values of a waveform?
6. Compare the input resistances of CB and CE configurations, giving typical values.
7. What is leakage current in BJT? What is the effect of temperature on its leakage current?
8. How does thermal fluctuation affect the biasing of a transistor?
9. Draw the circuit diagram of a CE amplifier.
10. Write down the expressions for voltage gain in dB.
11. Explain what is CMRR?
12. What will be the percentage of modulation if the signal amplitude is half the carrier amplitude?

(10×1=10)

Part B

Answer any **six** questions.

Each question carries **5** marks.



13. Draw and explain the V-I characteristics of a P-N junction diode.
14. A full wave rectifier uses a double diode of forward resistance $10\ \Omega$ each. The rectifier supplies current to a load resistance of $4\ \text{K}\Omega$. The primary to secondary turn ratio of the centre tapped transformer is $10 : 1$. The transformer primary is fed from a supply of $220\ \text{V}$ (rms). Find (i) the dc load current (ii) the direct current in each diode, (iii) the dc power output, (iv) the efficiency of rectification
15. Design and draw a clipper circuit to clip the output at $+2.5\text{V}$ and -3V .
16. Draw the symbols of NPN and PNP transistors. What are the functions of emitter, base and collector? Explain the doping levels of emitter, base and collector.
17. In a CB connection $\alpha = 0.95$. The voltage drop across $2\text{K}\Omega$ load resistance which is connected in the collector is 2V . Find the base current.
18. In a transistor circuit, collector load is $4\text{K}\Omega$ whereas quiescent current is 1mA . (i) what is the operating point if $V_{cc} = 10\text{V}$? (ii) what will be the operating point if $R_c = 5\text{K}\Omega$?
19. Find the voltage gain and output voltage of a non-inverting amplifier with $R_f = 56\text{K}$, $R_1 = 1\text{K}$ and input voltage = 1V(P-P) a.c. signal. Given supply voltage = $\pm 12\text{V}$. Comment on the result.
20. What is the modulation index of an FM carrier having a carrier swing of $200\ \text{KHz}$ and modulation signal of $2\ \text{KHz}$?
21. An AM radio station broadcasts audio signals in the range 500Hz to 5000Hz . It uses a carrier wave of frequency 1MHz . Calculate the maximum and minimum frequencies of sidebands and its channel width.

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **10** marks.

22. What is the difference between zener diode and ordinary diode? Draw and explain the V-I characteristics of zener diode.
23. With neat block diagrams, explain the four types of negative feedback amplifiers. Explain what happens if their (i) input resistance and (ii) output resistance with negative feedback.
24. What is LC oscillator? Explain the working of Hartley oscillator with suitable diagram.
25. Discuss briefly about JFET parameters. Explain the formation of depletion region in JFET.

(2×10=20)