

(Pages : 4)

P – 2493

Reg. No. : .....

Name : .....

**Fifth Semester B.Sc. Degree Examination, December 2022**

**First Degree Programme under CBCSS**

**Physics**

**Core Course VII**

**PY 1543 – ELECTRONICS**

**(2013-2017 Admission)**

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each carries **1** mark.

1. Distinguish between extrinsic and intrinsic semiconductors.
2. Explain the applications of tunnel diodes.
3. Explain the function of the collector in the operation of a junction transistor.
4. What are ***h*** parameters?
5. How does a power amplifier differ from a voltage amplifier?
6. What do you mean by push-pull amplifier?
7. Explain the advantages of negative feedback.

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8. Define the modulation index of FM.
9. Give the theory of operation of a JFET.
10. What is the slew rate of an operational amplifier?

**(10 × 1 = 10 Marks)**

### SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

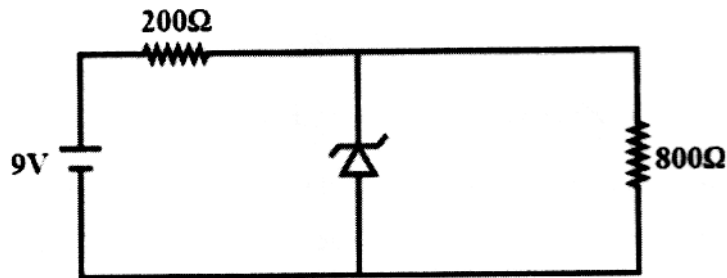
11. Explain how the process of Zener breakdown occurs in a P-N junction diode.
12. Discuss why CE configuration is the most popular in the amplifier circuits.
13. Discuss the operation of class A amplifier.
14. What are multistage amplifiers? Explain.
15. What is a feedback circuit? Explain how it provides feedback in amplifiers.
16. Give the Barkhausen criterion for oscillations.
17. What are modulation and demodulation?
18. Summarize the advantage of FM over AM.
19. Explain in what respect FETs are better than BJTs.
20. How does a MOSFET differ from a JFET.
21. Explain the terms CMRR and PSRR.
22. Discuss the concept of virtual ground in OP amp.

**(8 × 2 = 16 Marks)**

## SECTION – C

Answer any **six** questions. Each carries **4** marks.

23. Determine the current through zener diode for the circuit shown in figure (Given: zener diode break down voltage  $V_z = 5.6$  V)



24. The intrinsic concentration of free electrons for silicon at room temperature is  $1.5 \times 10^{16}$  per  $\text{m}^3$ . The mobilities of free electrons and holes are  $0.13 \text{ m}^2/\text{Vs}$  and  $0.05 \text{ m}^2/\text{Vs}$ , respectively. The atomic density in silicon is  $5 \times 10^{28}$  per  $\text{m}^3$ . If it is doped with antimony with the concentration of 1 antimony atom per  $2 \times 10^8$  silicon atoms, determine the conductivity of this extrinsic semiconductor.
25. For a transistor, on changing the emitter current by 1 mA, its collector current is found to change by 0.995 mA. Find  $\alpha$  and  $\beta$ .
26. A class A power amplifier has a transformer as the load. If the transformer has a turn ratio of 10 and the secondary load is  $100 \Omega$ , find the maximum a.c. power output. Given that zero signal collector current is 100 mA.
27. When a negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50. Calculate the fraction of output voltage feedback.
28. A sinusoidal carrier voltage of frequency 1 MHz and amplitude 100 volts is amplitude modulated by the sinusoidal voltage frequency 5 kHz producing 50% modulation. Calculate the frequency and amplitude of lower and upper side band terms.

29. A p-channel JFET has a pinch-off voltage  $V_p = -5 \text{ V}$  and  $I_{DSS} = -15 \text{ mA}$ . Calculate the value of  $V_{GS}$  and  $V_{DS(sat)}$  when  $I_D = 3 \text{ mA}$ .
30. When  $V_{GS}$  of JFET changes from  $-3.1 \text{ V}$  to  $-3\text{V}$ , the drain current changes from  $1 \text{ mA}$  to  $1.3 \text{ mA}$ . What is the value of transconductance?
31. Draw the circuit diagram of summing amplifier and obtain the expression for output voltage.

**(6 × 4 = 24 Marks)**

#### SECTION – D

Answer any **two** questions. Each carries **15** marks.

32. Discuss the theory and application of LED.
33. Explain the CB characteristic of BJT.
34. What are the different methods for the generation of FM signals? Explain any one method in detail.
35. Explain inverting and non-inverting amplifiers.

**(2 × 15 = 30 Marks)**

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