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Code No. : 13406

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (ECE : CBCS) III-Semester Main Examinations, December-2017

Electronic Materials & Devices

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Compare Avalanche and Zener Breakdown mechanisms.
2. Draw the DC and AC models of PN junction diode.
3. A 230V, 50Hz voltage is applied to the primary of a 4:1 step down transformer used in a bridge rectifier having a load resistance of 600Ω. Assuming the diodes to be ideal, determine d.c. output voltage and d.c. power delivered to the load.
4. What is meant by Tunneling effect?
5. What is meant by thermal runaway in transistor amplifier circuits?
6. The following quantities are measured in a transistor: $I_C = 5\text{mA}$ and $I_B = 100\mu\text{A}$. Determine α and β .
7. Draw the equivalent h-parameter model for CB configuration.
8. Compare V-I characteristics of DIAC and SCR.
9. List the advantages of MOSFET over JFET.
10. Determine the values of resistors R_D and R_S for the self-biased n-channel JFET having the parameters. $V_P = -5\text{V}$, $I_{DSS} = 12\text{mA}$, $V_{DD} = 12\text{V}$, $I_D = 5\text{mA}$ and $V_{DS} = 6\text{V}$.

Part-B (5 × 10 = 50 Marks)

11. a) Derive the expression for the transition capacitance C_T and depletion width in case of P-N⁺ junction diode. [6]
b) Determine the position of the Fermi-level with respect to the edge of the conduction band of the p-type Ge at 300K if the conductivity is $100(\Omega\text{-cm})^{-1}$ and intrinsic concentration is $2.5 \times 10^{13}/\text{cm}^3$. Assume $N_v = 6 \times 10^{19}/\text{cm}^3$ and $E_G = 0.72\text{eV}$ at 300K. [4]
12. a) Design a filter for full wave rectifier circuit with LC filter to provide an output voltage of 25 V with a load current of 100mA and its ripple is limited to 3%. [5]
b) Explain the construction and working principle of LED. What are the merits of LED over LCD. [5]
13. a) Draw the circuit of self-biased CE amplifier using diode compensation for V_{BE} . Describe how bias compensation is achieved. [5]
b) Derive the expression for stability S and S' of a CE amplifier self – bias circuit. [5]
14. a) How will you find h-parameters for transistor in CE configuration using graphical method? [5]
b) Explain the working operation of UJT. List its applications. [5]

15. a) Explain the basic construction of a N-channel depletion type MOSFET. Draw and explain its characteristics. [6]
 b) A FET has a drain current of 4mA. If $I_{DSS} = 8 \text{ mA}$ and $V_{gs(off)} = -6 \text{ V}$. Find the values of V_{gs} and V_p . [4]
16. a) Explain Schottky and Ohmic junctions with help of energy-band diagrams. [4]
 b) A full wave rectifier with a centre-tapped transformer supplies a dc current of 100 mA to a load resistance of $R = 20 \Omega$. The secondary resistance of transformer is 1Ω . Each diode has a forward resistance of 0.5Ω . Determine the following: [6]
 i) Rms value of the signal voltage across each half of the secondary.
 ii) DC power supplied.
 iii) PIV rating for each diode.
 iv) AC power input to the rectifier.
 v) Conversion efficiency.
17. Answer any *two* of the following:
 a) Distinguish between d.c and a.c load lines of BJT with suitable examples. [5]
 b) Write short notes on TRIAC as a switch. [5]
 c) Draw and explain the Source follower circuit. [5]

