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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Regular) - December, 2017

Regulation: IARE – R16

ELECTRONIC DEVICES AND CIRCUITS

(Common for EEE | ECE)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Define a PN Diode. Illustrate the operation of PN diode with V-I characteristics. [7M]

(b) A 5 V stabilized power supply is required to be produced from a 12 V DC power supply input source. The maximum power rating P_Z of the Zener diode is 2 W. Using the Zener regulator circuit calculate: The maximum current flowing through the Zener diode, The minimum value of the series resistor, R_s , The load current I_L if a load resistor of 1 k Ω is connected across the Zener diode & the Zener current I_z at full load. [7M]
- (a) Derive the current equation for a semiconductor diode with suitable assumptions [7M]

(b) Determine the germanium PN junction diode current for the forward bias voltage of 0.2V at room temperature 24 °C with reverse saturation current equal to 1.1 mA. Take $\eta = 1$. [7M]

UNIT – II

- (a) A half-wave rectifier, having a resistive load of 1000 Ω , rectifies an alternating load voltages of 325 V peak value and the diode has a forward resistance of 100 Ω . Calculate [7M]

 - Peak, Average and RMS value of current
 - DC power output
 - Efficiency of the rectifier.

(b) Compare various rectifier filter circuits. [7M]
- (a) Write a short note on [7M]

 - Varactor diode
 - Photo diode

(b) Design a filter for full wave circuit with LC filter to provide an output voltage of 10 V with a load current of 200 mA and the ripple is limited to 2%. [7M]

UNIT – III

5. (a) Draw the symbol of a Unijunction transistor and explain the VI characteristics with its equivalent circuit. [7M]
- (b) When the reverse gate voltage of JFET changes from 4.0 to 3.9 V, the drain current changes from 1.3 mA to 1.6 mA. Find the value of transconductance. [7M]
6. (a) Explain how JFET acts as a voltage variable resistor. [7M]
- (b) Explain the operation of MOSFET in enhancement mode configuration. [7M]

UNIT – IV

7. (a) Explain the criteria for fixing the operating point to a transistor. [7M]
- (b) Calculate the operating point of the self-biased JFET having the supply voltage $V_{DD} = 20$ V, maximum value of drain current $I_{DSS} = 10$ mA and $V_{GS} = -3$ V at $I_D = 4$ mA. Also determine the values of resistors R_D and R_S to obtain this bias condition. [7M]
8. (a) Explain various bias compensation techniques. [7M]
- (b) Calculate the value of R_S required to self-bias an N-channel JFET with $I_{DSS} = 40$ mA, $V_P = -10$ V and $V_{GSQ} = -5$ V. [7M]

UNIT – V

9. (a) Illustrate how FET is used as common source Amplifier with a neat figure and explain its features. [7M]
- (b) Illustrate the FET small signal model with relevant figure of the small signal model of FET in CS configuration and expressions. [7M]
10. (a) With the help of a neat figure showing the small signal low frequency h-parameter model, define the various h-parameters, provide the h-parameter equivalent circuit for transistor and list benefits of h-parameters. [8M]
- (b) A Common Emitter amplifier circuit is drawn by a voltage source of internal impedance $r_s = 800 \Omega$, and the load impedance is a resistance $R_L = 1000 \Omega$. The h-parameters are $h_{ie} = 1 \text{ K}\Omega$, $h_{re} = 2 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 25 \mu\text{A/V}$. Compute the current gain A_I , input resistance R_I , voltage gain A_V and output resistance R_O using exact or approximate analysis. [6M]

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