

--	--	--	--	--	--	--	--	--	--



# 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 $\Omega$  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  $\Omega$ , rectifies an alternating load voltages of 325 V peak value and the diode has a forward resistance of 100  $\Omega$ . 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]

