

3E1641

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B. Tech III Sem. (Main) Exam. Jan. 2016
Electronic Instrumentation & Control
3EI1 Electronic Devices & Circuits
Common to EE, EC & EIC

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. Scientific Calculator.

2. NIL

UNIT-I

Q.1 Explain Hall Effect and its applications. What properties of a semiconductor are determined from a Hall Effect experiment? [16]

OR

Q.1 Give the Energy Band description of semiconductors? If the effective mass of air electron is equal to thrice the effective mass of a holes, find the distance in eV of the fermi level in an intrinsic semi conductor from the centre of the forbidden band at room temperature. [16]

UNIT-II

(a) Consider a circuit consisting of a diode 'D' a resistance 'R', and a signal source [10]

'Vi', in series. Define -

- (i) Static characteristics
 - (ii) Dynamic characteristics
 - (iii) Transfer characteristics
 - (iv) What is the correlation between (ii) and (iii)
- (b) A silicon diode operates at 0.4V. Calculate the factor by which the current will be multiplied when the temperature is increased from 25°C to 150°C. [6]

OR

Q.2 (a) What are the general characteristics of diode clipper circuits? [8]

(b) A full wave rectifier circuit is required to give a DC output voltage of 80V. Neglect resistance of diode. Find: [8]

- (i) DC load current, if R_L is 5000 ohm
- (ii) Efficiency of rectifier
- (iii) Peak current through diode.

UNIT-III

Q.3 (a) Define the pinch - off voltage V_p . Sketch the depletion region before and after pinch - off. [8]

(b) A pnp transistor with $\beta = 60$ is connected in a common - base configuration and is biased in the forward - active mode. The collector current is $I_c = 0.85\text{mA}$.

Determine - α , I_E & I_B . [8]

OR

- Q.3 (a) Draw the transfer characteristics of transistor and indicate the Cut-off, Cut-in, Active and Saturation region. [8]
- (b) Explain the Ebers- Moll model of transistor and with the help of it find the collector reverse saturation current. [8]

UNIT-IV

- Q.4 (a) State and explain Miller's theorem with the aid of a circuit diagram. [8]
- (b) Two MOSFETs having drain resistances of r_{d1} and r_{d2} and amplification factors of $\mu_1 + \mu_2$ respectively are connected in parallel. Show that -

(i)
$$\frac{1}{r_{d1}} + \frac{1}{r_{d2}} = \frac{1}{r_d}$$

(ii)
$$\mu = \frac{(\mu_1 r_{d2} + \mu_2 r_{d1})}{(r_{d1} + r_{d2})}$$

Where, r_d and μ are equivalent resistances and amplification factors respectively. [8]

OR

- Q.4 (a) Distinguish between JFET and BJT. [8]
- (b) Explain the construction and working of MOSFET. [8]

UNIT-V

Q.5 (a) Explain a CMOS inverter. [8]

(b) Draw the circuit diagram of Darlington Amplifier. Give its Characteristics, merits and applications. [8]

OR

Q.5 (i) Discuss the frequency response curve of R-C coupled amplifier by deriving suitable derivation for low and high frequency. [8]

(ii) Calculate the DC bias voltages and currents in the circuit shown below - [8]

