

B.Tech. (Sem.III) (Main/Back) Examination, 2015
Electrical Engineering
3EE1 Electronics Devices & Circuits

Time : 3 Hours]

[Total Marks : 80
 [Min. Passing Marks : 26

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.

UNIT-I

1. (a) In a P-type semiconductor, $p = 10^{16} / \text{cm}^3$ and $\mu_p = 400 \text{cm}^2 \text{V-s}$. If a magnetic field (B) of $5 \times 10^{-4} \text{wb/cm}^2$ is applied in the + x direction and an electric field of 2000 v/cm is applied in the + y direction, determine the value of the electric field in the + z the +z direction due to the Hall effect. (8)
- (b) Explain mobility and conductivity. (8)

OR

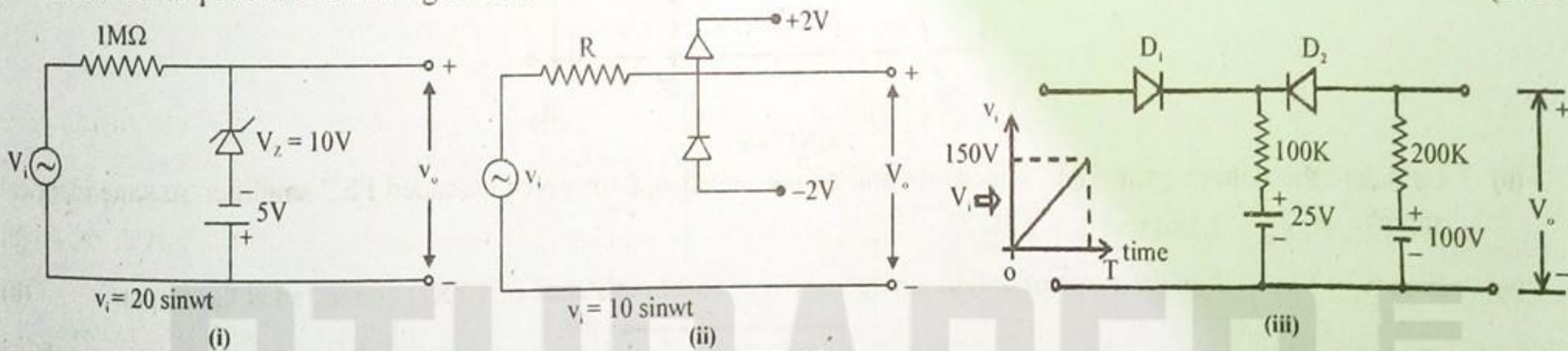
1. (a) Explain diffusion and continuity equation. (8)
- (b) Find the concentration of holes and of electrons in p-type germanium at 300K if the conductivity is $100 (\Omega - \text{cm})^{-1}$. (8)

UNIT-II

2. (a) Explain the physical mechanism of avalanche and zener breakdown. Also explain the effect of temperature on breakdown voltage in both the cases. (8)
- (b) $I_o = 1\mu\text{A}$ for P-N junction (Si type) at 300K. Calculate the dynamic and static resistance at 200 mV forward bias at 300 K. Here $\eta_{\text{si}} = 2$. (8)

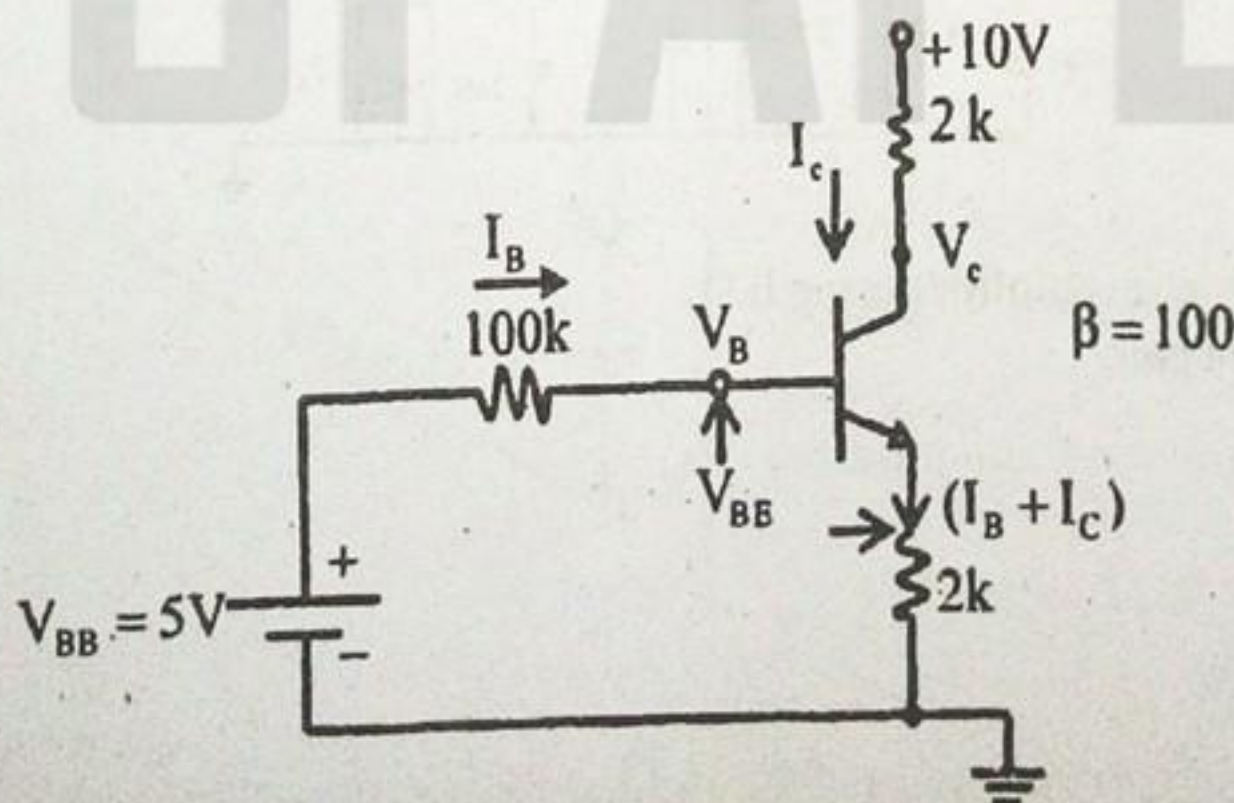
OR

2. Draw the output of the following circuits. (5+5+6)



UNIT-III

3. (a) Explain Ebers-Moll model. (8)
- (b) Find the region of operation and the node currents and voltages of the circuits. Here neglect I_{co} . (8)



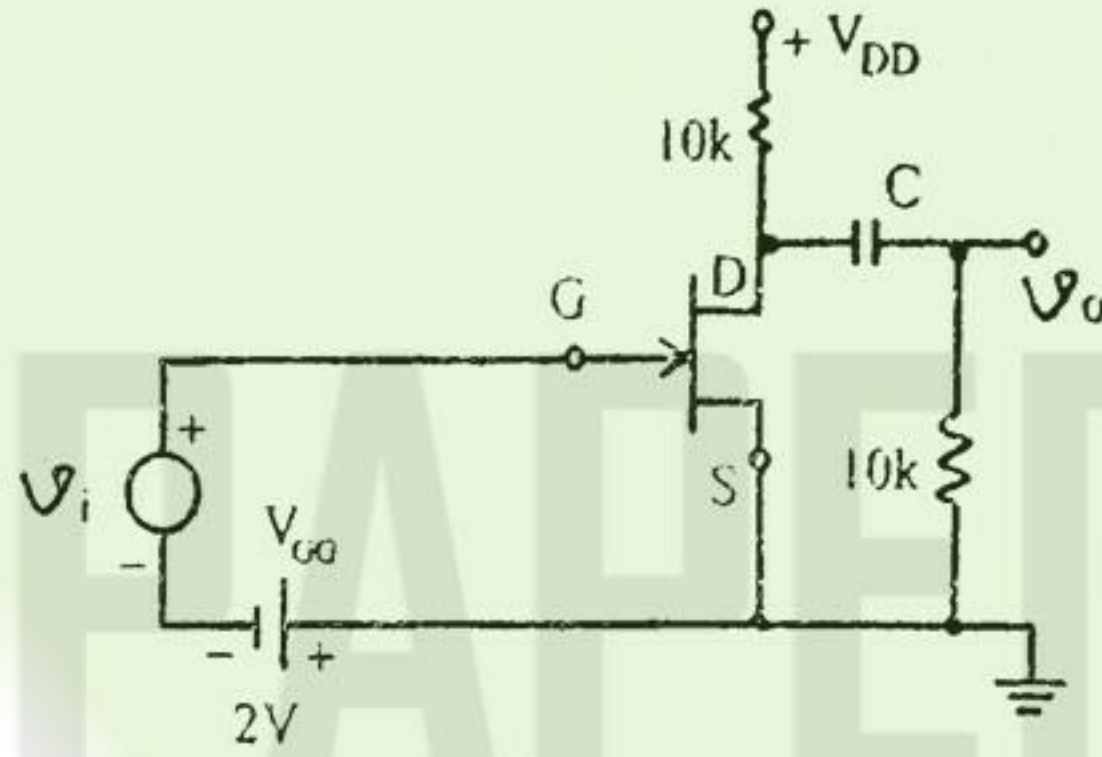
3. (a) Explain thermal runaway.
 (b) h-parameters of a BJT used in CE amplifier are -

$h_{ie} = 1k\Omega, h_{fe} = 100, h_{re} = 2 \times 10^{-4}$ and $h_{oe} = 20\mu A / V$

If $R_C = 5k\Omega$ and $R_S = 1k\Omega$, determine $A_V, R_L, A_{VS}, A_{VS}, R_O$ and R'_O

UNIT - IV

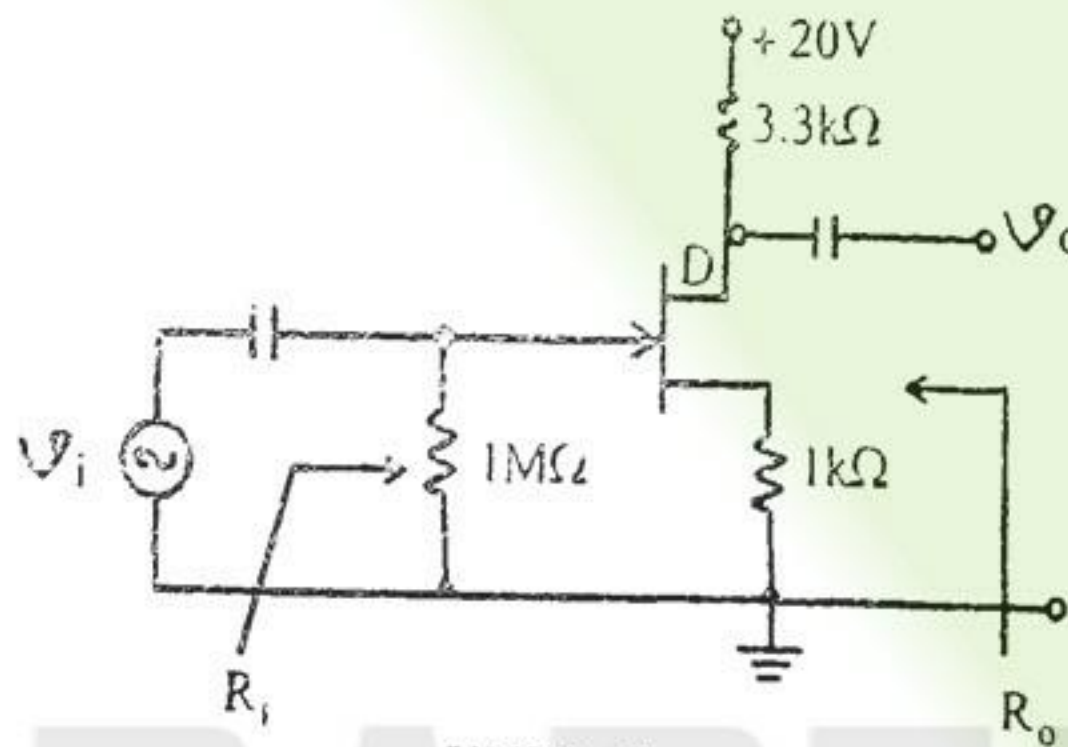
4. (a) Explain construction & operation of E-MOSFET. Also draw the required characteristics.
 (b) Find voltage gain of a given CS amplifier. Here
 $g_m = 2mA / V, r_d = 10k\Omega$



OR

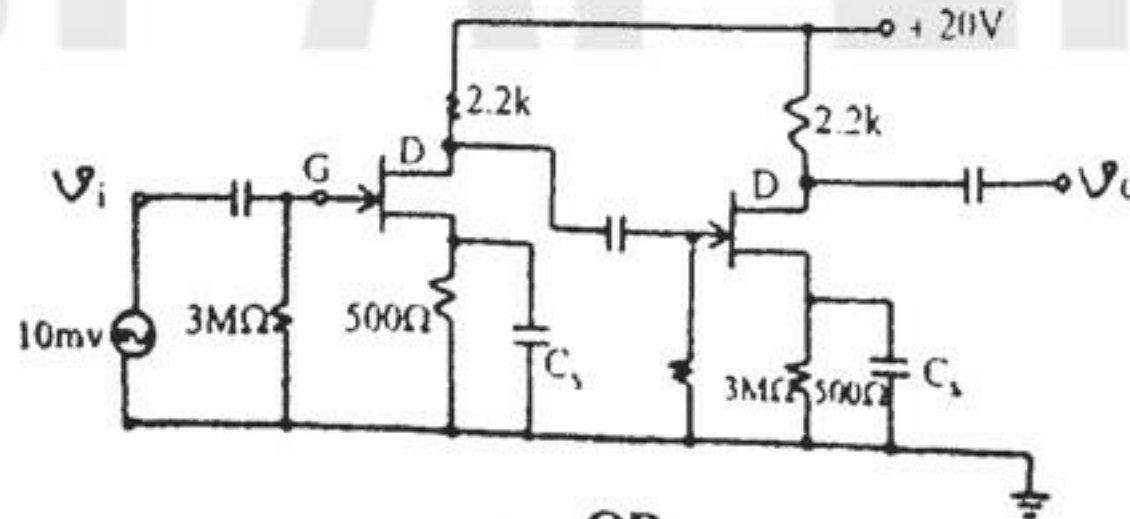
4. (a) Draw the circuit diagram and explain the biasing methods for E-MOSFET.
 (b) For given CS amplifier. $V_{GSQ} = -2.6V$ and $I_{DQ} = 2.6mA$, with $I_{DSS} = 3mA, V_p = -6V$ and $r_d = 50K\Omega$.

Find g_m, M, R_i, R_o and A_V



UNIT - V

5. (a) Calculate the voltage gain, input impedance and output impedance for given cascaded FET amplifier. Assume JFETS with $g_m = 2.5ms$ and $r_d = 2.2k\Omega$.
 (b) If an $v_i = 10mV$, find the value of output voltage across the load resistance of $10 K\Omega$ connected at the output.



OR

5. (a) Draw and analyse the differential amplifier using BJT.
 (b) Draw and explain darlington pair.