

**BASIC ELECTRONICS ENGINEERING
(ECEN 1001)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The majority charge carrier in the emitter of NPN transistor are
(a) Pentavalent atoms (b) Trivalent atoms
(c) Electrons (d) Holes.
 - (ii) Temperature coefficient of Zener breakdown voltage is
(a) negative (b) positive
(c) has no effect (d) none of these.
 - (iii) Band gap of Silicon and Germanium are respectively
(a) 1.67 eV and 1.2 eV (b) 1.12 eV and 0.9 eV
(c) 1.12 eV and 0.67 eV (d) 1.67 eV and 0.67 eV.
 - (iv) The width of the depletion layer of a pn junction
(a) decreases with light doping (b) increases with light doping
(c) is independent of applied voltage (d) none of these.
 - (v) For npn transistor I^{co} double for rise in temperature by
(a) 5° C (b) 7° C (c) 9° C (d) 10° C.
 - (vi) Negative feedback in amplifiers
(a) result in oscillation (b) decrease stability
(c) reduce gain (d) decrease stability.
 - (vii) An ideal Op-Amp has
(a) infinite A_v (b) infinite R_i
(c) zero output resistance (d) all of above.
 - (viii) Highest input impedance is obtained in
(a) MOSFET (b) BJT (c) JFET (d) Diode.

- (ix) Which of the following is an active device?
(a) Diode (b) BJT (c) Transformer (d) Resistance.
- (x) An Op-amp as a voltage follower has a voltage gain of
(a) infinity (b) zero (c) less than unity (d) unity.

Group- B

2. (a) Differentiate between P type and N type semiconductors. Also name the doping materials used for their formation.
(b) Explain the operation of full wave rectifier with the help of circuit diagram and calculate its rectification efficiency.
(c) The reverse saturation current flowing in a PN junction diode at room temperature is 2×10^{-7} A, when a large reverse bias voltage is applied. Calculate the current when a forward voltage of 0.1 V is applied across the junction.

3 + 5 + 4 = 12

3. (a) Explain the operation of centre tapped full wave rectifier with the help of circuit diagram and mention its advantages and disadvantages when compared with a full wave rectifier.
(b) A bridge rectifier feeds a load resistance of 2500Ω from a 100 V (rms) supply. Each diode of the rectifier has a forward resistance of 50Ω . Calculate (i) the dc load voltage (ii) the ripple voltage at output.

6 + 6 = 12

Group - C

4. (a) What are the factors that effect the stability of a transistor?
(b) Draw the circuit diagram of common emitter self biased transistor amplifier circuit and explain its operation. Why it has better stability compare to other bias circuit?
(c) Calculate V_{CE} and I_c in the circuit given in the Fig. 1. Assume $V_{BE} = 0.7$ V and $\beta = 50$.

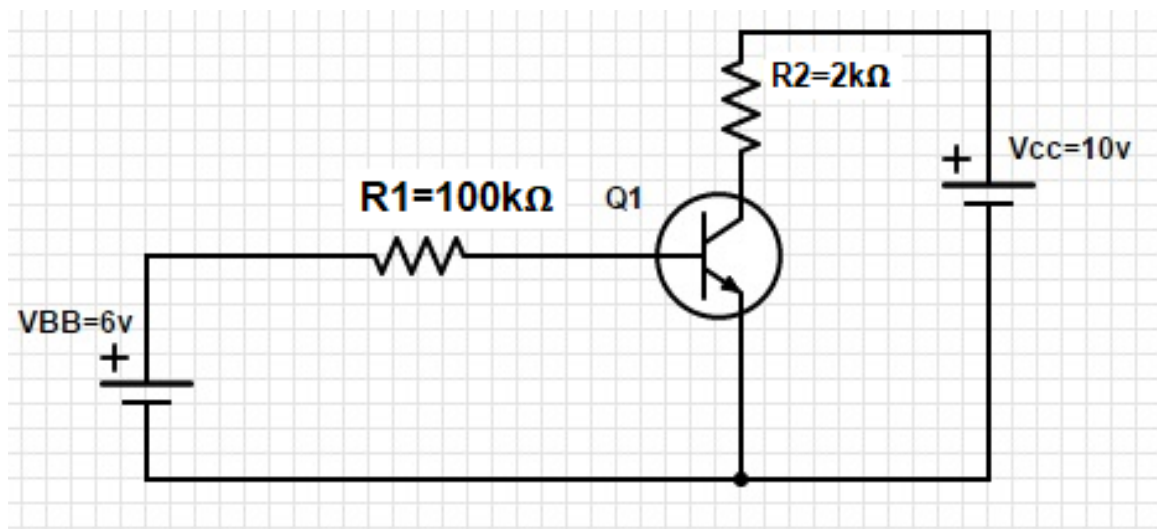


Fig. 1

2 + 5 + 5 = 12

5. (a) Draw the common emitter circuit of NPN transistor and explain its input and output characteristic with the help of graph.
(b) Why the value of α increases with the increasing of reverse bias voltage of the collector junction.
(c) The reverse saturation current in NPN transistor in Common Base configuration is $15.5 \mu\text{A}$. For an emitter current of 4 mA , collector current is 2.47 mA . Find the value of current gain and base current.

5 + 2 + 5 = 12

Group - D

6. (a) Explain the working principle of a feedback amplifier with the help of a block diagram. Find out an expression for the voltage gain with negative feedback.
(b) An n-channel JFET has $I_{\text{dss}} = 12 \text{ mA}$ and a pinch off voltage $V_p = -4\text{V}$. Find the drain current for $V_{\text{gs}} = -2\text{V}$. If the transconductance g_{mo} of a JFET with the same I_{dss} at $V_{\text{gs}} = 0$ is 4 millimho , find the pinch off voltage.
(c) What are the advantages of negative feedback amplifier over positive feedback amplifier?

5 + 5 + 2 = 12

7. (a) Differentiate between enhancement type and depletion type MOSFET. What do you mean by the threshold voltage of MOSFET?
(b) Describe briefly the construction of a MOSFET in depletion mode. Draw its characteristics.
(c) What do you mean by Pinch off voltage of JFET?

5 + 5 + 2 = 12

Group - E

8. (a) What are the characteristic of ideal OP- AMP?
(b) How Op-Amp can be used as a integrator and differentiator with the help of circuit diagram?
(c) Find the output voltage v_o of the three-input summing amplifier circuit shown in Fig. 2.

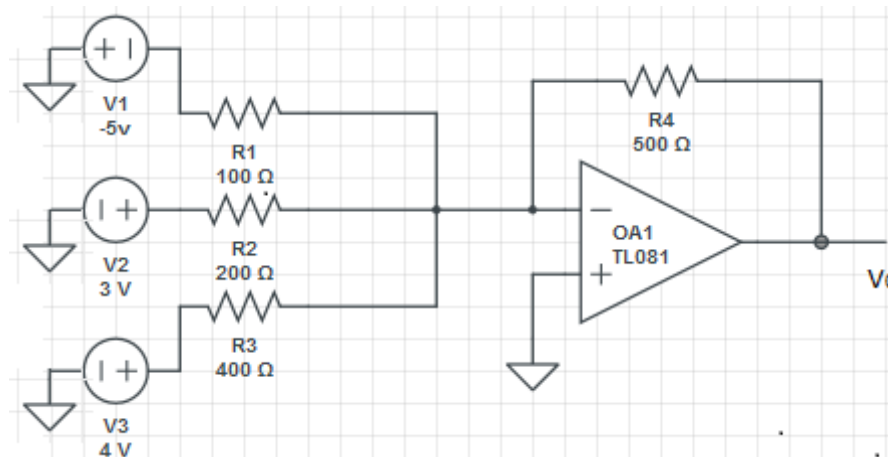


Fig. 2

2 + 5 + 5 = 12

9. Write short notes on any *two* of the followings:

- (i) Drift and diffusion current
- (ii) Feedback topology
- (iii) Zener and Avalanche diode.

(6 + 6) = 12