2021

ELECTRONICS — GENERAL

Paper : GE/CC-1

Full Marks : 50

The figures in the margin indicate full marks.

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

Answer **question no. 1** and **any four** questions, taking **at least one** from **each unit**.

1. Answer **any ten** questions : 1×10

   (a) Which one of the following is/are linear circuit component(s) with AC signals?

      (i) Capacitor (ii) Inductor

      (iii) Resistor (iv) Diode

   (b) What is the value of the resistance with following colour code : Brown, Black, Orange, Gold?

      (i) $100\ \Omega \pm 10\%$ (ii) $10\ k\Omega \pm 10\%$

      (iii) $10\ k\Omega \pm 5\%$ (iv) $100\ k\Omega \pm 5\%$

   (c) For maximum power to transfer from a source to load

      (i) internal resistance of the source should be greater than the load resistance.

      (ii) internal resistance of the source should be less than the load resistance.

      (iii) internal resistance of the source should be equal to the load resistance.

      (iv) None of the above.

   (d) Find out the wrong statement from the following :

      (i) Capacitor allows AC and blocks DC.

      (ii) Inductor allows AC and blocks DC.

      (iii) Resistance is a frequency independent circuit component.

      (iv) Capacitors and inductors are used in filter circuits.

   (e) Si has

      (i) direct band gap (ii) indirect band gap

      (iii) zero band gap at room temperature (iv) none of these.

   (f) In an intrinsic semiconductor, Fermi level remains

      (i) at the middle of the forbidden gap (ii) just below the conduction band

   (iii) just above the valence band (iv) none of these

Please Turn Over

(g) Reverse saturation current appears in reverse biased PN junction diode due to

    (i) majority carrier flow

    (ii) minority carrier flow

    (iii) donor ion flow

    (iv) acceptor ion flow.

(h) Zener breakdown occurs

    (i) in heavily doped PN junction diode

    (ii) in lightly doped PN junction diode

    (iii) in Schottky diode

    (iv) all of these.

(i) Base width modulation in BJT is called

    (i) Early effect

    (ii) Pinch off

    (iii) Thermal runaway

    (iv) None of these.

(j) Full-wave rectifier has efficiency of

    (i) 40.6%

    (ii) 80.2%

    (iii) 100%

    (iv) 0%.

(k) Highest power gain is obtained from

    (i) CE configuration

    (ii) CB configuration

    (iii) CC configuration

    (iv) none of these.

(l) FET is a/an

    (i) voltage controlled device

    (ii) current controlled device

    (iii) temperature controlled device

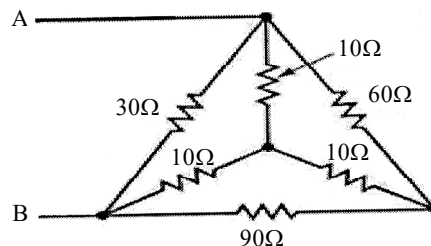   (iv) none of these.

Unit – I

2. (a) State Thevenin's theorem.

    (b) Determine Thevenin's equivalent circuit and find the current through R_4 resistor.
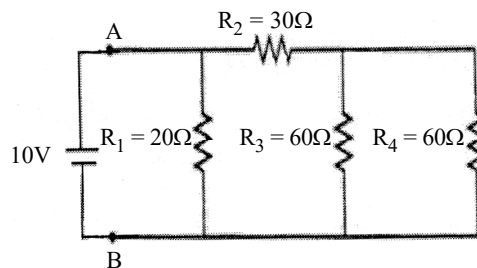
    (c) Determine the equivalent resistance of the following circuit at AB :   2+4+4

3. (a) What is Fermi level?

 (b) Explain how position of Fermi level of a semiconductor changes with doping concentration and type of doping.

 (c) Draw the band diagram of an unbiased, forward biased and reverse biased PN junction diode.

2+4+4

4. (a) Draw the circuit diagram of a full-wave rectifier circuit and explain its working principle.

 (b) What is ripple factor?

 (c) What is regulated power supply?

 (d) What are load and line regulations? 4+2+2+2

Unit – II

5. (a) Why transistor is called transfer resistor?

 (b) Why collector region of BJT is made wider?

 (c) Why emitter region is heavily doped?

 (d) Find out the relation between α and β in connection with BJT. 3+2+2+3

6. (a) What is operating point?

 (b) What is stability factor in relation to transistor biasing?

 (c) Draw the circuit diagram of a collector to base bias circuit.

 (d) Derive the expressions for stability factors in collector to base bias circuit against I_{CO}. 2+2+2+4

Unit – III

7. (a) Find out an expression for voltage gain of an amplifier with negative feedback.

 (b) Write down Barkhausen criterion for sustained oscillation.

 (c) Draw Wien bridge oscillator circuit and derive the expression for frequency of oscillation.

3+2+(2+3)

8. (a) Why FET is called unipolar device?

 (b) Draw the output and transfer characteristics of a JFET.

 (c) Draw and explain the typical volt-ampere (IV) drain characteristics of an n-channel depletion mode MOSFET for positive and negative gate voltages. 2+(2+2)+(2+2)