

**2020**

**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**

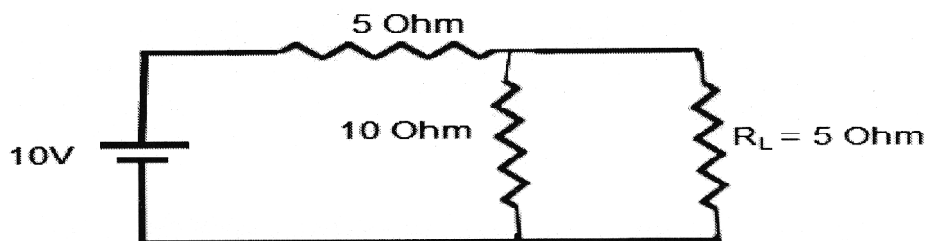
- (a) Which one of the following is a passive circuit component?  
(i) Transistor      (ii) Battery      (iii) Resistor      (iv) Diode.
- (b) What is the value of the resistance with following colour code : Brown, Black, Gold, Silver?  
(i)  $100\ \Omega \pm 5\%$       (ii)  $1\ \Omega \pm 10\%$       (iii)  $10\ \Omega \pm 10\%$       (iv)  $100\ \Omega \pm 10\%$ .
- (c) In Thevenin's equivalent circuit :  
(i) A voltage source is in series with Thevenin's resistance  
(ii) A voltage source is in parallel with Thevenin's resistance  
(iii) A current source is in series with Thevenin's resistance  
(iv) A current source is in parallel with Thevenin's resistance.
- (d) Capacitor stores :  
(i) Magnetic energy      (ii) Charge  
(iii) Heat      (iv) None of the above.
- (e) Diamond is :  
(i) An excellent electrical conductor  
(ii) A poor thermal conductor  
(iii) A poor electrical conductor but excellent thermal conductor  
(iv) None of the above.
- (f) Common P-type dopant for Si is :  
(i) Phosphorus      (ii) Boron  
(iii) Carbon      (iv) Oxygen.

**Please Turn Over**

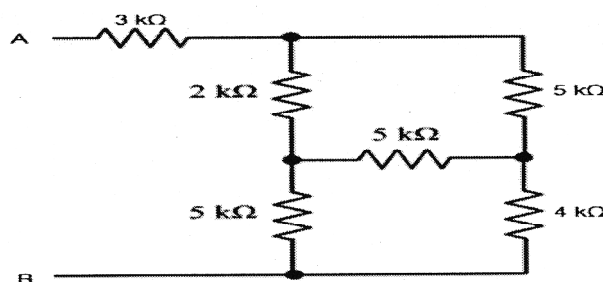
- (g) For moderately doped n-type semiconductor :
- (i) Fermi level remains at the middle of the band gap
  - (ii) Fermi level remains close to the conduction band
  - (iii) Fermi level remains close to the valance band
  - (iv) Fermi level penetrates the valance band.
- (h) Zener diode is used as :
- (i) Rectifier
  - (ii) Amplifier
  - (iii) Voltage regulator
  - (iv) None of the above.
- (i) In saturation region :
- (i) Both the emitter and collector junctions are forward-biased
  - (ii) Emitter junction is reversed-biased and collector junction is forward-biased
  - (iii) Emitter junction is forward-biased and collector junction is reversed-biased
  - (iv) Emitter junction is reversed-biased and collector junction is reversed-biased.
- (j) Highest current gain is obtained in :
- (i) CE configuration
  - (ii) CB configuration
  - (iii) CC configuration
  - (iv) None of the above.
- (k) In negative feedback :
- (i) Loop gain increases
  - (ii) Loop gain is zero
  - (iii) Loop gain decreases
  - (iv) None of the above.
- (l) Which of the following devices is a unipolar device?
- (i) BJT
  - (ii) MOSFET
  - (iii) PN junction diode
  - (iv) UJT.

### Unit - I

2. (a) State superposition theorem.
- (b) Determine Thevenin's equivalent circuit and find the current through load resistance ( $R_L$ ).



- (c) Determine the equivalent resistance of the following circuit at AB :



2+4+4

3. (a) What are donor and acceptor levels?  
 (b) Draw the band diagram of an unbiased PN junction diode.  
 (c) Explain with diagram how depletion region is formed in a PN junction diode in forward and reverse biased conditions.  
 (d) What is avalanche breakdown? 2+2+4+2
4. (a) Draw the circuit diagram of a bridge rectifier circuit and explain its working principle.  
 (b) Why transformer is used in rectifier circuit?  
 (c) What is the function of filter in rectifier circuit?  
 (d) Name different filter circuits used at the output of rectifier. 4+2+2+2

### Unit - II

5. (a) Why base region of BJT is lightly doped?  
 (b) Draw and explain the current flow mechanism in a p-n-p transistor.  
 (c) What is early effect?  
 (d) What are the advantages of n-p-n transistor over p-n-p transistor? 2+4+2+2
6. (a) What is load line?  
 (b) Draw the circuit diagram for voltage divider bias considering the n-p-n transistor in CE configuration and derive the expression for stability factor.  
 (c) What is thermal run away? 2+(2+4)+2

### Unit - III

7. (a) Explain with the help of a block diagram the working principle of a feedback amplifier. Find out an expression for the voltage gain with feedback.  
 (b) What is the basic principle of an oscillator?  
 (c) Name the different types of oscillators. What classes of oscillators are commonly used in AF and RF ranges? (3+2)+2+(2+1)

8. (a) Why FET is called a voltage controlled device?  
(b) Draw depletion region in JFET before and after pinch off.  
(c) Draw and explain the typical volt-ampere drain characteristics of a P-channel enhancement mode MOSFET.  
(d) Explain working principle of UJT.

2+2+3+3

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