



MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL

Paper Code : ES-101

BASIC ELECTRICAL AND ELECTRONIC ENGINEERING-I

Time Allotted: 3 Hours

Full Marks: 70

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

*The questions are of equal value.*

Part I

Group - A

(Multiple Choice Type Questions)

1. Choose the ~~correct~~ alternative for *any five* of the following: <http://www.makaut.com>

1×5=5

(i) The form factor of a current waveform is 1, its shape is

- (a) ~~sinusoidal~~ (b) triangular  
(c) ~~square~~ (d) sawtooth

(ii) A series circuit consists of two elements, has the current and applied voltage as

$$i = 4 \sin(2000t + 11.32^\circ) \text{ A}$$

$$v = 200 \sin(2000t + 50^\circ) \text{ r.}$$

The circuit elements are

- (a) ~~Resistance and Capacitance~~ (b) Capacitance and Inductance  
(c) Inductance and Resistance (d) Both Resistances

(iii) The reluctance of a magnetic circuit is given by <http://www.makaut.com>

- (a)  ~~$1/\mu_0 \mu_r$~~  (b)  $\phi/NI$   
(c)  $1/\mu_0 A$  (d)  $1/\mu_r A$

Turn Over

- (v) Relationship between  $\alpha$  and  $\beta$
- (a)  $\alpha = \beta/(1 + \beta)$  (b)  $\alpha = \beta/(1 - \beta)$   
(c)  $\alpha = 1/(1 + \beta)$  (d)  $\alpha = 1/(1 - \beta)$
- (vi) The Fermi level of an  $n$ -type semiconductor lies <http://www.makaut.com>  
(a) near the conduction band (b) near the valence band  
(c) at the middle of the forbidden gap (d) None of these
- (vii) Avalanche breakdown primarily depends on the phenomenon of  
(a) Particle collision (b) Impurity doping  
(c) Ionization (d) Direct rupture of covalent bond
- (viii) Which one of the following BJT bias configurations is most stable?  
(a) Fixed bias (b) Voltage divider bias  
(c) Collector divider bias (d) Emitter stabilised bias

#### Group - B

(Short Answer Type Questions)

Answer any two of the following.

5×2=10

1+4=5

2. What is stability? Define different stability factors.
3. What is built-in-potential? Explain it in forward and reverse biased condition of  $p$ - $n$  junction diode. 1+4=5
4. What is biasing? Explain fixed biasing circuit with diagram. <http://www.makaut.com> 2+3=5
5. Explain how a zener diode can be used as voltage regulator.

#### Group - C

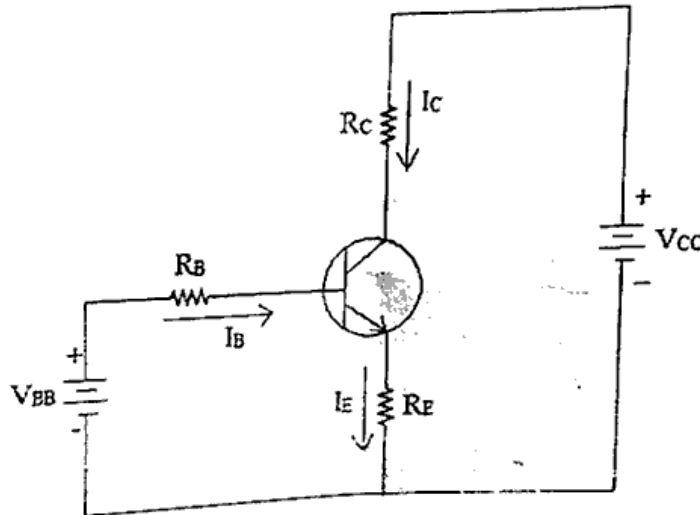
(Long Answer Type Questions)

Answer any two of the following.

10×2=20

6. A half wave rectifier is having a diode of internal resistance of  $50\ \Omega$  and load resistance of  $1.5\ \text{k}\Omega$  uses a voltage supply of 220V (rms). Calculate (i) DC current, (ii) DC output power, (iii) ripple factor, (iv) conversion efficiency, (v) percentage regulation. <http://www.makaut.com> 2×5=10

7. (a) What is Q-point for a common emitter configuration of BJT? How it is related to the DC load line?
- (b) For this circuit  $V_{CC} = 14$  Volts,  $\beta = 100$ ,  $I_B = 1\text{mA}$ ,  $R_B = 1.2\text{ k}\Omega$ ,  $V_{BE} = 0.7$  Volt,  $R_E = 1\text{ k}\Omega$  and  $V_{CE} = 6$  Volts. Calculate (i)  $I_C$  (ii)  $I_E$  (iii)  $R_C$  (iv)  $V_{BB}$ .  
(2+2)+1+2+1.5+1.5=10



8. Write short notes on any two of the following:

5×2=10

- (a) Varactor Diode
- (b) Avalanche Breakdown
- (c) Junction Diode
- (d) Zener diode as a voltage regulator