DIPLOMA IN ELECTRICAL AND MECHANICAL ENGINEERING (DEME)

Term-End Examination

June, 2006

` BEE-031 : ELECTRICAL TECHNOLOGY

Time : 2 hours   *Maximum Marks : 70*

Note : *Answer **five** questions in all. Question number 1 is **compulsory**. Attempt any **four** of the remaining questions. Use of calculator is allowed.*

1. (a) Select the correct answer from the given four alternatives.   *1×7=7*

   (i) Maximum power from a source having internal resistance R_i is delivered to the Resistive Load R_L if

   (a) $R_i = R_L$

   (b) $R_i > R_L$

   (c) $R_i < R_L$

   (d) $R_i = R_L^2$

(ii) Three resistances of R Ω each are connected in delta. Its equivalent star will comprise resistance of value

(a) 3R each

(b) $\dfrac{R}{3}$ each

(c) R each

(d) 3R, R, $\dfrac{R}{3}$

(iii) Energy stored in an inductor is

(a) $\dfrac{1}{2} L I^2$

(b) $\dfrac{1}{2} I L^2$

(c) $L I^2$

(d) $L I$

(iv) Power factor of an AC circuit is equal to

(a) $\dfrac{R}{X_L}$

(b) $\dfrac{R}{X_C}$

(c) $\dfrac{R}{Z}$

(d) $\dfrac{Z}{R}$

(v) Emf induced in each conductor of a d.c. machine is

    (a)   an alternating emf

    (b)   a direct emf

    (c)   a pulsating emf

    (d)   any wave shape

(vi) A transformer has maximum efficiency at $\frac{3}{4}$ full load. The ratio of its iron loss and full load copper loss is

    (a) $\frac{16}{9}$

    (b) $\frac{4}{3}$

    (c) $\frac{3}{4}$

    (d) $\frac{9}{16}$

(vii) An induction motor has synchronous speed of 1500 rpm. What will be the slip, if it is running on a speed of 1450 rpm ?

    (a)   3·33%

    (b)   3%

    (c)   5%

    (d)   6%

(b) Write **true** or **false** for the following statements :

$1 \times 7 = 7$

(i) If the area of plates of a capacitor is doubled and distance between plates is halved then capacitance becomes 4 times.

(ii) When temperature is decreased the resistance of carbon is increased.

(iii) If a source is delivering maximum power to load, then efficiency of the circuit is 50%.

(iv) An emf of 8 V is induced in a coil of inductance 4 H, then the rate of change of current is 0·5 A/s.

(v) Average value of sinusoidal alternating voltage is $\dfrac{1}{\sqrt{2}}$ times of its maximum value

(vi) The construction of DC generator and DC motor is slightly different.

(vii) The core of transformer is made of insulating material.

2. (a) State superposition theorem. Explain using a practical problem. 7

(b) Find the value of R_L in network shown in figure necessary to obtain maximum power in it. Also calculate current in R_L.   7
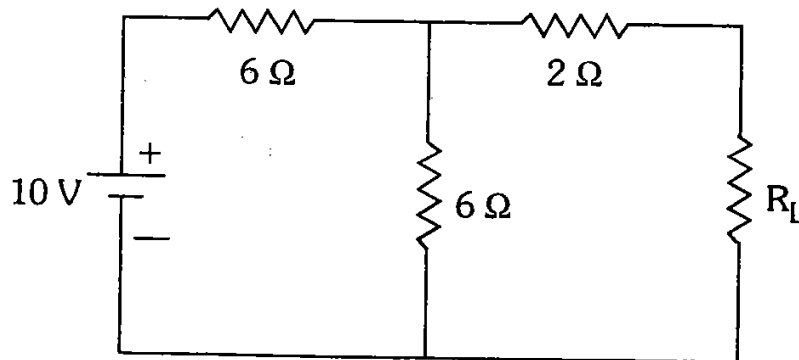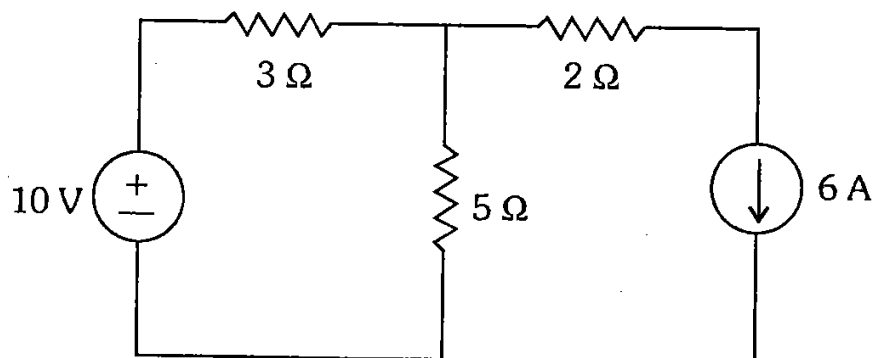

3. (a) Define the following terms :   7

    (i)   KVL

    (ii)   KCL

    (iii)   Mesh & loop

    (iv)   Linear and active networks

(b) Calculate current in 5 Ω resistor in network shown in figure :   7

4. (a) Deduce the emf equation for a single phase transformer. 7

(b) A 100 KVA transformer has 2 KW iron loss and 5 KW full load copper loss. Calculate its maximum efficiency when it delivers load at unity power factor. 7

5. (a) Explain constructional features and working of a 3-phase induction motor. 7

(b) A 3-phase, star-connected alternator has 72 slots in stator, each slot contains 10 conductors, the stator winding is wound for 6 poles. Calculate voltage induced at terminals of alternator if speed of rotor is 1000 rpm and flux per pole is 0·5 Wb. 7

6. (a) Draw different characteristics of 7

　　(i) DC series motor

　　(ii) DC shunt generator

(b) Write need of starter for DC motors. Explain working of three point starter. 7

7. (a) How is an induction motor different from a synchronous motor ? Write their applications. 7

(b) A synchronous motor is not a self-starting motor. Discuss different methods of its starting. 7

8. Write short notes on any **two** of the following :   *2×7=14*

    (i)   Thevenin's theorem

    (ii)   Voltage build-up in DC shunt generator

    (iii)   Three phase rotating magnetic field

    (iv)   Voltage regulation in alternator

    (v)   Equivalent circuit of transformer