Diploma in Electrical and Mechanical Engineering

Term-End Examination

December, 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** from the remaining questions. Use of calculator is allowed.*

1. (a) Select the correct answer from the given alternatives. $7 \times 1 = 7$

(i) The number of equations required to solve network by Mesh analysis is equal to the number of

(a) Loops
(b) Independent Loops
(c) Mesh
(d) Nodes

(ii) Superposition theorem is applicable for calculations of

(a) Voltage
(b) Current
(c) Power
(d) Both (a) and (b)

(iii) The emf generated by a given DC generator depends upon

(a) flux

(b) speed

(c) poles

(d) all of the above

(iv) The commutator segments of a DC machine are insulated from each other by a thin layer of

(a) Bakelite

(b) Mica

(c) PVC

(d) Hard rubber

(v) The flux involved in emf equation of a transformer has

(a) rms value

(b) average value

(c) total value

(d) maximum value

(vi) When the induction motor is standstill, the slip is

(a) Zero

(b) One

(c) Infinity

(d) Half

(vii) The effect of armature reaction in 3-phase alternator at zero power factor leading load is

(a) Magnetising

(b) Demagnetising

(c) Distortions

(d) No effect

(b) Write true or false for the following statements : $7 \times 1 = 7$

(i) Kirchhoff's laws are not applicable in AC circuits.

(ii) Principle of Superposition can be used for power calculations.

(iii) The maximum efficiency of transformer is obtained at rated load.

(iv) Constructional features of DC generator and motor are same.

(v) In DC shunt motor torque is proportional to armature current.

(vi) Maximum torque is obtained in induction motor when slip is $\left(s = \frac{R_2}{X_2} \right)$.

(vii) Synchronous motors are self starting.

2. (a) Differentiate between : 7

(i) Loop and Mesh

(ii) Lumped and Distributed Networks

(b) Calculate current I in network shown in Figure 1. 7

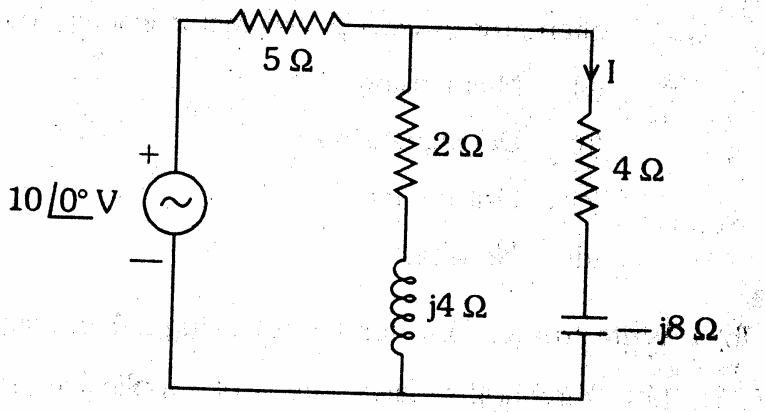

Figure 1

3. (a) State and explain Thevenin's theorem. 7

(b) Calculate current in 5 Ω resistor in the network shown in Figure 2 using Norton's theorem. 7

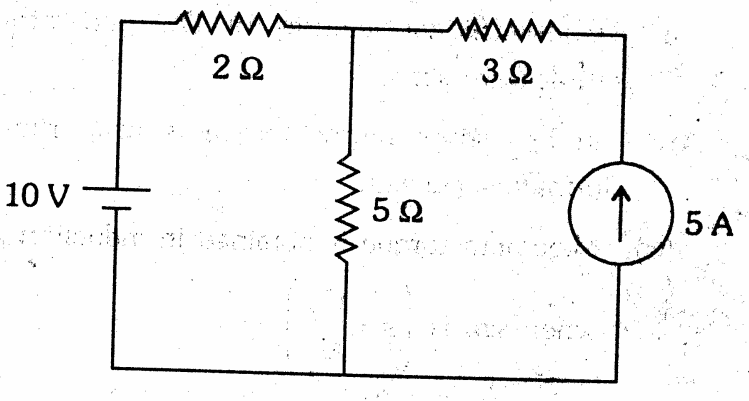

Figure 2

4. (a) Explain working of transformer at 0·8 power factor lagging load. Draw phasor diagram also. Assume all winding resistances and reactances are zero (negligible). 7

(b) A 10 KVA 1000 V/200 V single phase transformer is connected with 1000 volt supply. The primary winding delivers 0·2 ampere current at 0·1 power factor lagging. Calculate

(i) Iron loss

(ii) Energy component and magnetisation component of No Load Current. 7

5. (a) Write the material and function of the following parts of DC machines : 7

(i) Yoke

(ii) Armature

(iii) Commutator

(iv) Pole

(v) Pole shoe

(vi) Brushes

(vii) Bearings

(b) Write various speed control methods in DC motors. Discuss flux control method of speed control. 7

6. (a) A wave wound DC generator has 4 poles of flux 0·5 Wb per pole, rotating at 1000 rpm. If armature contains 72 conductors, then calculate

(i) emf per conductor

(ii) average emf induced 7

(b) Discuss constructional features and working of synchronous generator. 7

7. (a) Why does a synchronous motor have zero starting torque ? Discuss various methods of starting. 7

(b) Discuss different applications of synchronous motors and induction motors. 7

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

(a) Superposition theorem

(b) DC motor characteristics

(c) Efficiency of transformer

(d) Armature reaction in alternators

(e) Synchronous condenser