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BEE-031

DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination

00638

June, 2016

BEE-031 : ELECTRICAL TECHNOLOGY

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. **1** is **compulsory**. Attempt any **four** of the remaining questions. Use of scientific calculator is allowed.*

1. (A) Choose the correct answer of the following : *7×1=7*

(a) At resonance frequency the impedance of R-L-C series circuit is

(i) $Z = X_L$

(ii) $Z = X_C$

(iii) $Z = R$

(iv) $Z = 0$

(b) A reciprocal network consists of

(i) unilateral elements only

(ii) bilateral elements only

(iii) any type of network

(iv) None of the above

(c) Resistance of armature winding in a DC machine is approximately in the range of

(i) one ohm

(ii) 50 ohms

(iii) 1 kΩ

(iv) 100 ohms

(d) No-load current of a transformer is _____ % of the rated current.

(i) 5

(ii) 10

(iii) 20

(iv) 50

(e) A 3-phase induction motor normally operates equal to

(i) 4% slip

(ii) 10% slip

(iii) 50% slip

(iv) 100% slip

(f) In a 3-phase synchronous generator, voltage regulation is negative when the connected load is

(i) pure resistive

(ii) inductive

(iii) capacitive

(iv) no load

(g) Speed of rotor of a synchronous motor is
(i) same as synchronous speed
(ii) less than synchronous speed
(iii) above synchronous speed
(iv) None of the above

(B) State *true* or *false* for the following statements : $7 \times 1 = 7$

(a) Ideal independent voltage source has zero internal resistance.

(b) Using principle of superposition, power calculation is possible in DC networks.

(c) DC series motor never operates at no-load.

(d) Core of a transformer is made of copper.

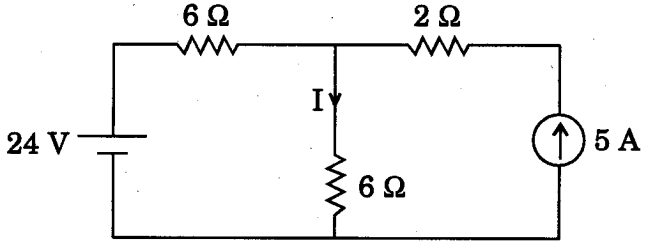
(e) Speed of rotor in an induction motor is synchronous speed.

(f) Synchronization of alternators is done by three dark lamps method.

(g) Over-excited synchronous motor operates as leading power factor load.

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

(b) Find the current I using superposition theorem. 7



3. (a) Discuss various methods used for speed control of a DC series motor. 7

(b) A 6-pole wave-wound DC generator has 2 parallel paths in armature, each path contains 1000 conductors. If the armature rotates at 500 rpm and flux per pole is 0·05 Wb, calculate the emf induced in the armature. 7

4. (a) Draw the equivalent circuit of a transformer. Also draw the simplified equivalent circuit by referred total resistance and reactance of two windings in any one winding. 7

(b) A 100 kVA transformer has 2 kW iron loss and 10 kW full load copper loss. Calculate the load at which the efficiency of the transformer is maximum. Also calculate the maximum efficiency. 7

5. (a) Draw a circuit diagram of a star delta starter used to start a 3-phase induction motor and explain its working. 7

(b) A 3-phase induction motor has the following data :

Power input to the stator = 20 kW

Stator losses = 1 kW

Mechanical losses = 1·5 kW

Slip = 5%

Calculate the output of the motor and its efficiency. 7

6. (a) Write the need of parallel operation of alternators. Explain any one method used for synchronization of two alternators. 7

(b) Explain the requirement and working of a synchronous condenser. 7

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

(a) 3-point starter of DC motor

(b) Auto-transformer and its applications

(c) Starting of synchronous motor

(d) Merits of three-phase system