

**DIPLOMA IN MECHANICAL ENGINEERING
(DME)**

Term-End Examination

December, 2016

00022

BEE-031 : ELECTRICAL TECHNOLOGY

Time : 2 hours

Maximum Marks : 70

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

1. (A) Choose the correct answer of the following :

7×1=7

(a) In a three-phase AC system, the three voltages have a phase difference of

- (i) 0°
- (ii) 90°
- (iii) 120°
- (iv) 240°

(b) Under maximum power transfer condition, the efficiency of a circuit is

- (i) 50%
- (ii) zero
- (iii) 100%
- (iv) 200%

- (c) In Rolling mills, which of the following motors is most suitable ?
- (i) DC series motor
 - (ii) DC shunt motor
 - (iii) AC motor
 - (iv) DC compound motor
- (d) For an ideal transformer, voltage regulation will be
- (i) Zero
 - (ii) 50%
 - (iii) 100%
 - (iv) None of the above
- (e) In a 3-phase Induction motor, Rotor copper losses are
- (i) same as Rotor input power
 - (ii) s (Rotor input power)
 - (iii) s (Rotor output power)
 - (iv) None of the above
- (f) The form factor for sinusoidal emf is
- (i) 4.44
 - (ii) 3.33
 - (iii) 2.22
 - (iv) 1.11

(g) Which of the following motors can operate as leading power factor load ?

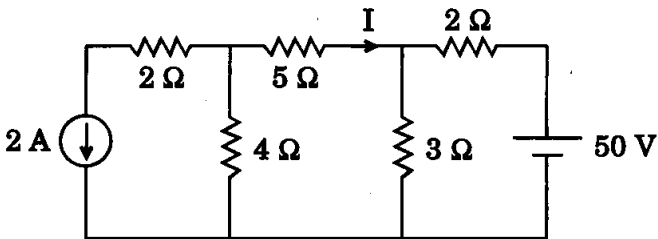
- (i) 3-phase induction motor
- (ii) Overexcited synchronous motor
- (iii) Underexcited synchronous motor
- (iv) DC motor

(B) State *True* or *False* for the following statements :

7×1=7

- (a) Resonance in an RLC series circuit is voltage resonance.
- (b) In AC circuits, for maximum power transfer, $Z_L = Z_S^*$.
- (c) Three-point starter is used for DC series motor.
- (d) Potential transformer is used to measure large currents.
- (e) In a three-phase induction motor, the magnetic flux produced by stator winding current rotates at synchronous speed.
- (f) Salient pole rotor type alternators operate with steam turbines only.
- (g) A synchronous motor has zero starting torque.

2. (a) Find the current I using Node Voltage Analysis. 7



- (b) State and prove the maximum power transfer theorem in DC circuits. 7

3. Explain the following in brief: $4 \times 3 \frac{1}{2} = 14$

- (a) Speed control of DC shunt motor
- (b) Working of DC generator
- (c) Characteristics of DC series motor
- (d) Torque equation of DC motor 7

4. (a) Explain open circuit and short circuit tests conducted on transformers. 7

- (b) A single-phase transformer has a core, whose cross-sectional area is 150 cm^2 , it operates at a maximum flux density of 1 Tesla at 50 Hz. The secondary winding has 66 turns. Determine the output in kVA when connected to a load of 5Ω impedance. 7

5. (a) Explain the concept of rotating magnetic field and working of a 3-phase induction motor. 7
- (b) Draw and explain the torque – slip characteristic of a 3-phase induction motor. Discuss the effect of rotor resistance on torque – slip curves. 7
6. (a) A 4-pole 50 Hz star-connected alternator has a flux per pole of 0.12 Wb. It has 4 slots per pole per phase and conductors per slot being 5. Winding coil span is 150°. Calculate the emf induced between two phases. 7
- (b) Explain the working principle of a synchronous motor. 7
7. Write short notes on any *two* of the following : $2 \times 7 = 14$
- (a) Parallel Operation of Alternators
 - (b) Synchronous Condenser
 - (c) Speed Control of 3-phase Induction Motor
 - (d) Autotransformer Starting of 3-phase Induction Motor
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