

**DIPLOMA IN MECHANICAL ENGINEERING  
(DME)**

00815 **Term-End Examination**  
**December, 2014**

**BEE-031 : ELECTRICAL TECHNOLOGY**

*Time : 2 hours*

*Maximum Marks : 70*

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**Note :** Attempt **five** questions in all. Question no. 1 is **compulsory**. Use of scientific calculator is permitted.

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1. (A) Choose the most correct answer from the following questions :  $8 \times 1 = 8$

- (i) The induced voltage across a stationary conductor in a stationary magnetic field
- (a) reverses in polarity
  - (b) is zero
  - (c) is increased
  - (d) is decreased

- (ii) An electromagnetic field exists only when there is
  - (a) increasing voltage
  - (b) decreasing voltage
  - (c) voltage
  - (d) current
  
- (iii) A transformer
  - (a) changes a.c. to d.c.
  - (b) changes d.c. to a.c.
  - (c) steps up d.c. voltages
  - (d) steps up or steps down a.c. voltages
  
- (iv) The armature of d.c. machine is laminated to reduce
  - (a) eddy current loss
  - (b) hysteresis loss
  - (c) copper loss
  - (d) friction and windage losses
  
- (v) Reduction in the capacitance of a capacitor motor results in reduced
  - (a) noise
  - (b) speed
  - (c) starting torque
  - (d) armature reactions

(vi) The starting torque in a \_\_\_\_\_ is proportional to the square of the armature current.

- (a) DC shunt motor
- (b) Stepper motor
- (c) 2-phase servo motor
- (d) DC series motor

(vii) The maximum power factor for a given excitation in synchronous motor is developed when the power angle is equal to

- (a)  $0^\circ$
- (b)  $45^\circ$
- (c)  $60^\circ$
- (d)  $90^\circ$

(viii) The efficiency of a transformer is mainly dependent on

- (a) copper losses
- (b) core losses
- (c) stray losses
- (d) dielectric losses

(B) Write *true* or *false* for the following statements : 6×1=6

- (i) In a step-up transformer if the voltage is stepped up, the current is stepped down.
- (ii) Electrons in a conductor have no motion in the absence of a potential difference across it.
- (iii) Copper and iron losses together are called stray losses.
- (iv) Voltmeter is always connected in parallel with the circuit.
- (v) The field winding of an alternator is d.c. excited.
- (vi) A commutator in a d.c. machine reduces power loss in armature.

2. (a) Explain the working principle of three-phase induction motor. 7

(b) Derive the expression of torque produced in a d.c. motor. 7

3. (a) Explain the characteristics of DC motors. Also give their applications. 9

(b) Discuss three-phase connection of a transformer. 5

4. (a) A shunt generator has an induced e.m.f. of 254 volt. When the generator is loaded, the terminal voltage is 240 volt. Neglecting armature reaction, find the load current if the armature resistance is 0.04 ohm and the field circuit resistance is 24 ohms. 8
- (b) Discuss the parallel operation of transformer with the help of a diagram. 6
5. (a) Derive the EMF equation of a transformer. 6
- (b) Write the procedure of starting a synchronous motor. Compare the synchronous motor with an induction motor. 8
6. (a) How does autotransformer work ? Discuss. 7
- (b) Explain the working principle of repulsion motor. 7
7. Write short notes on any *two* of the following :  $2 \times 7 = 14$
- (a) Effect of slip on rotor parameter
- (b) Norton theorem
- (c) Maintenance of transformer
- (d) Torque-slip characteristics of three-phase induction motor
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