

**ADVANCED LEVEL CERTIFICATE COURSE  
IN ELECTRICAL ENGINEERING /  
DIPLOMA IN ELECTRICAL ENGINEERING /  
(ACELVI / DELVI)**

**Term-End Examination**

**December, 2013**

**BIEE-027 : ELECTRICAL MACHINES - I**

*Time : 2 hours*

*Maximum Marks : 70*

*Note : All questions carry equal marks. Q. No. 1 is compulsory. Attempt any four out of the remaining questions.*

1. Choose the correct alternative out of the given :  $2 \times 7 = 14$
- (a) The armature of a dc machine is made up of laminated sheets in order to :
- (i) reduce armature copper loss
  - (ii) reduce eddy-current loss
  - (iii) reduce hysteresis loss
  - (iv) increase the dissipation of heat from the armature surface.
- (b) Which of the following equations does not apply to a shunt wound dc generator.
- (i)  $I_{sh} = \frac{V}{R_{sh}}$
  - (ii)  $I_L = I_a - I_{sh}$
  - (iii)  $E = V + I_a R_a$
  - (iv)  $V = E + I_a R_a$

- (c) The emf induced in a coil rotating in a uniform magnetic field is maximum when,
- (i) the flux linkage by the coil is minimum
  - (ii) the flux linkage by the coil is maximum
  - (iii) the rate change of flux linkage by the coil is minimum
  - (iv) the coil is at right angles to the magnetic field
- (d) The core of a transformer is assembled with laminated sheets so to reduce.
- (i) hysteresis loss
  - (ii) copper loss
  - (iii) magnetic noise
  - (iv) eddy-current loss
- (e) Cooling of transformers is required so as :
- (i) to increase the efficiency
  - (ii) to reduce the losses
  - (iii) to reduce humming
  - (iv) to dissipate heat generated in winding
- (f) If the full load iron loss a transformer is 100W, what will be its iron loss at half load ?
- (i) 100 W
  - (ii) 200 W
  - (iii) 50 W
  - (iv) 25 W
- (g) Two three-phase transformers need be connected in parallel because :
- (i) the load on the transformer reduces
  - (ii) the power factor of the load increases
  - (iii) the load on the transformer increases
  - (iv) the power factor of the load decreases

2. (a) Name the main parts of a dc machine and state the material of which each part is made. 7
- (b) Explain why a commutator and brush arrangement is necessary for the operation of a dc machine. 7
3. (a) Draw the power flow diagram of a dc generator and explain it. 7
- (b) A 4-pole 1200 rpm dc generator has a lap wound armature having 65 slots and 12 conductors per slot. If the flux per pole is 0.02 Wb, determine the emf induced in the armature. 7
4. Explain how can you control speed of a dc shunt motor. Give two methods. Compare these methods. 14
5. (a) Explain the construction and principle of working of a transformer. 7
- (b) Define voltage regulation of a transformer. Deduce expression for voltage regulation. 7
6. A 100 kVA transformer has 400 turns on the primary and 80 turns on the secondary winding. The primary and secondary resistances are  $0.3 \Omega$  and  $0.1 \Omega$  respectively. The primary leakage reactance is  $1.1 \Omega$  and the secondary leakage reactance is  $0.035 \Omega$ . Calculate the equivalent impedance referred to the primary side. 14

7. Explain how a 3-phase supply be converted into a 12-phase supply. **14**
8. Write notes on **any four** of the following : **3.5x4=14**
- (a) Armature wave winding of a dc machine.
  - (b) Armature reaction.
  - (c) Indian standards for conducting and reporting tests on DC machines.
  - (d) Starting of DC shunt motors.
  - (e) Parallel operation of 1-phase transformers.
  - (f) Improving commutation.
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