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BIEE-027

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

00094

Term-End Examination

June, 2014

BIEE-027 : ELECTRICAL MACHINES – I

Time : 2 hours *Maximum Marks : 70*

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

1. Choose the correct alternative out of the given ones. *2×7=14*

(a) The purpose of having a commutator and brush arrangement in a dc motor is

(i) to produce unidirectional torque

(ii) to produce unidirectional current in armature

(iii) to help in changing the direction of rotation of the armature

(iv) None of the above

(b) The number of parallel paths in the armature winding of a four-pole wave connected dc generator having 28 coil sides is

(i) 28

(ii) 14

(iii) 4

(iv) 2

(c) A dc series motor should always be started with load because

(i) at no load it will rotate at dangerously high speed

(ii) at no load it will not develop high starting torque

(iii) it cannot start without load

(iv) it draws a small amount of current at no load

(d) The core of a transformer is made of

(i) annealed copper

(ii) silicon steel

(iii) seasoned wood

(iv) aluminium

(e) The emf induced in the winding of a transformer

(i) lags behind core flux by $\pi/2$

(ii) is in phase with the core flux

(iii) is out of phase with the core flux

(iv) None of the above

(f) If the full-load copper loss of a transformer is 100 W, what will be its copper loss at half-load ?

(i) 100 W

(ii) 200 W

(iii) 50 W

(iv) 25 W

(g) Two three-phase transformers need to 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) Explain why the air gap between the pole pieces and the armature is kept very small in case of a dc machine. *7*

(b) Enumerate the various losses that occur in a dc machine. *7*

3. (a) Draw the power flow diagram for a dc motor and explain it. *7*

(b) The induced emf in a dc machine while running at 500 rpm is 180 V. Assuming constant flux per pole, calculate the induced emf when the machine runs at 600 rpm. *7*

4. Describe how a self excited dc shunt generator builds up its terminal voltage when it is run by a prime mover. *14*

5. (a) Deduce the emf equation of a transformer. 7

(b) Draw the equivalent circuit of a transformer. Show how this equivalent circuit can further be simplified without introducing much error. 7

6. The primary and secondary windings of a 30 kVA, 6000 V/230 V transformer have resistances of 10 Ω and 0·016 Ω respectively. The total reactance of the transformer referred to the primary side is 23 Ω. Calculate the percentage regulation of the transformer when supplying full load current at a power factor of 0·8 lagging. *14*

7. Explain how a 3-phase supply be converted into a 2-phase supply. Illustrate with the help of a phasor diagram. *14*

8. Write short notes on any ***four*** of the following : $3\frac{1}{2} \times 4 = 14$

(i) Armature lap winding of dc machine
(ii) Improving commutation
(iii) Parallel operation of dc shunt generators
(iv) Testing of dc shunt motor
(v) Parallel operation of 3-phase transformers
(vi) Armature reaction