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BIEE-012

B.Tech. – VIEP – ELECTRICAL ENGINEERING

(BTELVI)

00096

Term-End Examination

June, 2014

BIEE-012 : ELECTRO-MECHANICAL ENERGY CONVERSION – II

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. Describe no load and Blocked rotor test for 3-phase induction motor. *10*

2. Consider a double cage induction motor whose impedance of the rotor of inner and outer cages at standstill condition are (0·02 + j0·6) ohm and (0·06 + j0·2) ohm respectively. Assume negligible starter impedance. Find the ratio of torques due to two cages when running with a slip of 4%. *10*

3. Explain the terms air-gap power (P_g), internal mechanical power developed (P_m) and shaft power (P_{sh}). How are these terms related with each other ? *10*

4. A 3-phase, 400 V induction motor gives the following test readings :
No load : 400 V, 1250 W, 9 A
Short circuit : 150 V, 4000 W, 38 A
Draw the circle diagram. If the normal rating is 20·27 HP (metric), find from the circle diagram, the full load current, power factor and slip. *10*

5. Discuss the method of speed control of 3-phase induction motor by changing the number of poles. Also mention its advantages, limitations and application areas. *10*

6. A 3-phase, star-connected, 1000 kVA, 11 kV alternator has rated current of 52·5 A. The ac resistance of winding per phase is 0·45 ohm. The test results are given as :

OC Test : Field current = 12·5 A

Line voltage = 422 V

SC Test : Field current = 12·5 A

Line current = 52·5 A

Determine the full load voltage regulation of the alternator at

(i) 0·8 P.F. lagging.

(ii) 0·8 P.F. leading. *10*

7. Explain the following : *10*

(i) Why does a synchronous motor hunt ? How is the hunting avoided ?

(ii) What is an auto-synchronous motor ? How is high starting torque obtained in case of a synchronous motor ?

8. A synchronous motor absorbing 50 kW is connected in parallel with a factory load of 200 kW having a lagging p.f. of 0·8. If the combination has a p.f. of 0·9 lagging, how many leading KVAR are to be supplied by the motor ? What is its power factor ? *10*

9. Describe briefly various starting methods of single phase induction motor. *10*

10. A 30 kW rated output, 400 V, 3-phase, delta connected, 4 pole, 50 Hz induction motor has full load slip of 5%. If the ratio of standstill reactance to resistance per phase of rotor is 4, estimate the plugging torque at full speed. Ignore starter leakage impedance and magnetizing reactance. *10*