BIEE-012

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

ΠΠ813   December, 2016

BIEE-012 : ELECTRO-MECHANICAL ENERGY CONVERSION – II

Time : 3 hours   *Maximum Marks : 70*

Note :

(i)   Attempt any five questions.

(ii)   All questions carry equal marks.

(iii) Assume the missing data suitably (if any).

(iv)   Use of scientific calculator is allowed.

1. (a) Derive the e.m.f. equation of an alternator.   7

    (b) With the help of neat sketches, discuss the significance of pitch factor and distribution factor.   7

2. (a) Derive the expression for power developed by a salient pole synchronous motor.   7

    (b) Discuss the effect of load on synchronous motor.   7

3. (a) Discuss the no load and blocked rotor test on a 3-phase induction motor. 7

   (b) A 6-pole, 50 Hz, 3φ induction motor running on full load develops a useful torque of 150 N-m at a rotor frequency of 1·5 Hz. Calculate the shaft power output, if the mechanical torque lost in friction be 10 N-m. Also, determine :

   (i) the rotor copper loss,

   (ii) the input to the motor, and

   (iii) the efficiency.

   The total stator loss is 700 W. 7

4. (a) Draw the torque-slip characteristics of a 3-phase induction motor at fixed terminal voltage. Also explain the various associated torques. 7

   (b) A 6-pole, 50 Hz slip ring induction motor has a rotor resistance of 0·25 Ω and a maximum torque of 180 N-m, while it runs at 860 rpm. Calculate 7

   (i) the torque at 4·5% slip, and

   (ii) the resistance to be added in the rotor circuit to obtain the maximum torque at starting.

5. (a) What are the various starting methods of 1-φ induction motor ? Explain any one method in detail. 7

   (b) With the help of a neat diagram, explain the working principle of universal motor. 7

6. (a) What are the various causes of hunting in synchronous motors ? How will it affect the operation of synchronous motors ? 7

   (b) A 220 V, single phase induction motor gave the following test results :

   Blocked rotor test : 120 V, 9·6 A, 460 W

   No-load test : 220 V, 4·6 A, 125 W

   The stator winding resistance is 1·5 Ω and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also find the core, friction and windage loss. 7

7. Write short notes on any *two* of the following : 2×7=14

   (a) Stepper motor

   (b) V-curves of synchronous motor

   (c) Power flow equations of Cylindrical and Salient pole machines