B. Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)
Term-End Examination
June, 2017

00054

BIEE-011 : ELECTRICAL MACHINES – II

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Each question carries equal marks. Assume data, if any, wherever required. Use of scientific calculator is allowed.*

1. Explain the working principle and construction of a three-phase induction motor.   10

2. Explain the synchronous impedance method of determining the voltage regulation of an alternator. Comment on the merits and limitations of this method.   10

3. Draw and explain the phasor diagram of a salient-pole synchronous generator supplying full-load lagging current. Show that the power output per phase is given by

$$P = \frac{VE_j}{X_d} \sin \delta + \frac{V^2}{2}\left[\frac{1}{X_q} - \frac{1}{X_d}\right] \sin 2\delta$$

where symbols have their usual meanings.   10

4. A 400 V, 50 kVA, 0·8 power factor leading, delta-connected 50 Hz synchronous machine has a synchronous reactance of 3 Ω and negligible armature resistance. Its friction and windage losses are 2 kW and its core losses are 1·5 kW. Initially, the shaft load is 10 kW and the power factor of the motor is 0·8 leading.

   (a) Determine the line current, armature current and excitation voltage.

   (b) If the shaft load is increased to 20 kW, determine the new values of line current, armature current and the motor power factor.　　　　　*10*

5. What is a synchronous condenser ? Explain its operation with the help of a phasor diagram. What are its applications ?　　*10*

6. Distinguish between harmonic induction torque and harmonic synchronous torque developed in a 3-phase induction motor. What are their effects ?　*10*

7. The resistance and reactance (equivalent) values of a double cage induction motor for stator, outer and inner cages are 0·25, 1·0 and 0·15 ohms resistance and 3·5, zero and 3·0 ohms reactance respectively. Find the starting torque if the phase voltage is 250 V and the synchronous speed is 1000 rpm.　*10*

8. What are the differences in the behaviour of a variable reluctance type stepper motor and a permanent magnet type stepper motor ? *10*

9. Describe the construction of a permanent magnet dc motor. What are the advantages and disadvantages of permanent magnet dc motors compared with conventional shunt dc motors ? *10*

10. Write short notes on any *two* of the following : *2×5=10*

    (a) Starting of Single-Phase Induction Motors

    (b) Parallel Operation of two Alternators

    (c) Shaded-pole Motor

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