No. of Printed Pages : 3

BIEE-012

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

Term-End Examination

June, 2015

00386

BIEE-012 : ELECTRO-MECHANICAL ENERGY CONVERSION – II

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions out of ten questions. All questions carry equal marks. Assume data wherever required. Use of scientific calculator is allowed.*

1. Explain the synchronous impedance method of determining the voltage regulation of an alternator. Comment on the merits and limitations of this method. Why is this method considered as pessimistic method ? *10*

2. A 3-phase, 11,000 V, star-connected turbo-alternator, having synchronous reactance of 6 Ω per phase and negligible resistance has an armature current of 200 A at unity power factor when operating on constant frequency and constant voltage bus bars. If the steam admission remains the same and the emf is raised by 25%, determine the new values of current and power factor. *10*

3. A 3-phase synchronous motor has 80% synchronous reactance and negligible resistance. When connected to bus bars at rated voltage and the excitation adjusted for an emf of 120%, the machine draws an input kVA of 100%. Find the mechanical power delivered by the motor, neglecting all losses. If for the same load on the motor, the excitation is reduced to generate an emf of 100%, what would be the input kVA ? *10*

4. A 500 kVA, 11 kV, 3-phase star-connected alternator has the following data :

Friction and windage loss	=	1500 W
Oper-circuit core loss	=	2500 W
Effective armature resistance per phase	=	40 ohm
Field copper loss	=	1000 W

Find

(a) Alternator efficiency of half-full load and at 0·8 power factor lagging.

(b) Maximum efficiency of the alternator. *10*

5. Explain the Potier-triangle method of determining the voltage regulation of an alternator. *10*

6. A 6-pole, 50 Hz 3-phase wound rotor induction motor has its maximum torque of 250 percent of full-load torque at 18 percent slip. The rotor resistance per phase is 1·0 Ω at 50 Hz. The input supply voltage is subject to large fluctuations. Determine the minimum voltage that could be impressed so that the motor can still supply its rated torque. Also determine the resistance to be inserted in the rotor circuit so that the motor will develop full-load torque at starting at this reduced voltage. Assume that the magnetic circuit is unsaturated. *10*

7. Explain the production of torque in a 3-phase slip-ring induction motor when the rotor is running with a slip s. Hence introduce the concept of load angle. *10*

8. What is the purpose of using deep-bar cage rotors ? Explain the construction and working of a deep-bar cage motor. *10*

9. Write short notes on any ***two*** of the following : *5+5=10*

   (a) Capacitor motors

   (b) Shaded-pole motor

   (c) Universal motor

10. Draw and explain the equivalent circuit of a single-phase induction motor. How can the performance of motor be analysed ? *10*
