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BIEE-011

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

Term-End Examination

00893

December, 2016

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 terms coil-span factor and distribution factor in connection with alternator armature windings and deduce the e.m.f. equation of an alternator incorporating the effects of these factors. *10*

2. Explain the phenomena of armature reaction when an alternator is delivering a load current at (a) purely lagging p.f., (b) unity p.f., (c) purely leading p.f. *10*

3. Explain the terms direct-axis synchronous reactance and quadrature-axis synchronous reactance of a salient pole alternator. Upon what factors do these values depend ? *10*

4. A 400 V, 6-pole, 3-phase, 50 Hz, star connected synchronous motor has a resistance and synchronous impedance of 0·5 Ω and 4 Ω per phase respectively. It takes a current of 15 A at unity power factor when operating with a certain field current. The load torque is increased till the line current reaches 60 A, the field current remaining unchanged. Calculate the gross torque developed and the new power factor. *10*

5. Explain the effect of varying excitation on armature current and power factor in a synchronous motor. Draw V-curves and state their significance. *10*

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

7. A double-cage induction motor has the following equivalent circuit parameters, all of which are phase values referred to the primary :

   Primary : $R_1 = 1{\cdot}0\ \Omega$ $X_1 = 2{\cdot}8\ \Omega$

   Outer Cage : $R_{2o}' = 3{\cdot}0\ \Omega$ $X_{2o}' = 1{\cdot}0\ \Omega$

   Inner Cage : $R_{2i}' = 0{\cdot}5\ \Omega$ $X_{2i}' = 5{\cdot}0\ \Omega$

   The primary is delta connected and supplied from 440 V. Calculate the starting torque, when running at a slip of 4%. The magnetizing branch can be assumed connected across the primary terminals. *10*

8. Draw the circuit diagram of a capacitor-start capacitor-run single-phase induction motor and explain its working. Where is such type of motor commonly used ? *10*

9. Draw and explain a typical torque – speed characteristic of a reluctance motor. Compare a reluctance motor with an equivalent induction motor. *10*

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

    (a) Stepper Motors

    (b) Speed Control of 3-ϕ Induction Motors

    (c) Parallel Operation of two Alternators