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BIEE-012

B.TECH. ELECTRICAL ENGINEERING (BTELVI)

01411

Term-End Examination

December, 2013

BIEE-012 : ELECTRO-MECHANICAL ENERGY CONVERSION - II

Time : 3 hours *Maximum Marks : 70*

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

1. A 3-phase, 50 Hz, 8 pole alternator has a star-connected winding with 120 slots and 3 conductors per slot. The flux per pole is 0.05 Wb sinusoidally distributed. Determine the phase and line voltages. **10**

2. Derive the emf equation of an alternator incorporating distribution and pitch factors in it. Discuss the effects of these factors on output and performance. **10**

3. A 9 kVA, 208V, 1200 rpm, 3-phase., 60 Hz star. Connected generator has a field winding resistance of 4.5Ω. The armature winding impedance is $(0.3 + j5)\Omega$. per phase. When the alternator operates at its full load and 0.8pf lagging, the field winding current is 5A. The rotational loss is 500W. Determine : **10**
   (a) Voltage regulation
   (b) Efficiency
   (c) Torque applied by the prime mover.

4. Explain two important functions served by damper winding in a synchronous motor. Discuss with diagram, any one method of starting of a synchronous motor. **10**

5. The synchronous motor reactance per phase of a 3-phase, star-connected, 6600V synchronous motor is $10\,\Omega$. For a certain load, the input is 900 kW and the induced emf is 8900V (Line Voltage). Find the line current and power factor. Neglect resistance. **10**

6. Prove that the resultant field in case of :

   (a) 3-phase. induction machine is given by $\phi = \frac{3}{2}\,\phi max$, where ϕmax is the maximum flux in any one phase. **5**

   (b) Explain the term slip frequency, wound rotor and cage rotor. **5**

7. The open-circuit voltage across the slip rings of a 100 H.P. induction motor in 273V at stand still. What resistance in rotor circuit will reduce its full load speed by 25%. The full load slip is 2% with no additional rotor resistance. Assume rotor to be star-connected. **10**

8. Write short notes on : **5+5=10**

   (a) Star-delta starter for 3-phase induction motor.

   (b) Speed control of 3-phase induction motor.

9. The following data pertains to a 230V, 50Hz capacitor start single phase induction motor at stand still. Main winding excited alone = 100V, 2A, 40W. Auxiliary winding excited alone = 80V, 1A, 50W. Determine the value of capacitance for maximum starting torque. **10**

10. Write short notes on : **5+5=10**
    (a) Universal motor
    (b) Reluctance motor