BIEE-012

B.TECH. ELECTRICAL ENGINEERING (BTELVI)

01033

Term-End Examination

December, 2012

BIEE-012 : ELECTRO-MECHANICAL ENERGY CONVERSION - II

Time : 3 hours *Maximum Marks : 70*

*Note : (i) Answer **any seven** questions out of **ten** questions.*
*(ii) All questions carry **equal** marks.*

1. What is pitch factor? Is it always less than or more than 1 ? Derive an expression for the pitch factor of a winding using coils short pitched by angle. What is the effect of fractional pitch on the magnitude and wave shape of voltage induced in an alternator ? **10**

2. A 3-phase, 16-pole, star-connected Alternator has 240 stator slots with 8 conductors per slot and the conductor of each phase are connected in series. The coil span is 144° Elec. Determine the phase and line emfs if the machine speed is at 375 rpm and the flux per pole is 6.1 megalines distributed sinusoidally in the airgap. **10**

3. Discuss the synchronous impedance and mmf methods of calculating regulation of an alternator. Why these methods give different result ? **10**

4. Explain the two-reaction theory of salient pole machines. Draw the phasor diagram as per this theory. How the regulation of an alternator can be calculated using this theory ? **10**

5. Draw the phasor diagram of synchronous motor when it takes power at : **10**

   (a) lagging

   (b) unity

   (c) leading power factor and show the emf induced is greater than the applied voltage when the motor takes power at leading power factor.

6. Derive an expressions for the torque developed in a 3-phase slip ring Induction motor and explain with the aid of sketches the manner in which the torque-slip curve changes for the following cases: **10**

   (a) When the applied voltage is halved ?

   (b) When the rotor resistance is doubled ?

   (c) When the applied voltage is held constant in magnitude but the frequency is changed from 50Hz to 60Hz ?

7. Estimate approximately the starting torque of a 3-phase Induction motor in terms of its full load torque when started by means of : **10**

   (i) an auto-transformer starter with 60% tapping and

   (ii) a star-delta starter. The motor draws 6 times the full-load current when switched on directly and its full load slip is 4%.

8. Explain the operation of a single-phase Induction motor on the basis of : **10**

   (a) double field revolving theory.

   (b) Cross field theory.

9. What is a universal motor? Draw its phasor diagram and discuss its operation. Bring out the effects of various emf induced in its armature. Find out an expression for ratio of speeds when operated on DC and AC. **10**

10. Write short notes on ***any two*** topics. **2x5=10**

    (a) Procedure of slip test on synchronous machine

    (b) Cogging and Crawling

    (c) Construction and operation of stepper motor.
