00751

B.Tech. IN ELECTRICAL ENGINEERING (BTELVI)
Term-End Examination
December, 2013

BIEE-016 : ELECTRO-MECHANICAL ENERGY CONVERSION–III

Time : 3 hours   *Maximum Marks : 70*

*Note :   Answer **any seven** questions and each question carries **equal** marks.*

1. What are the advantages of per unit system in   **10**
    the generalized machine theory ? Elaborate this
    with examples of two coils.

2. Derive the transformations for currents between   **10**
    a rotating balanced 2 - phase (α, β) winding and
    a pseudo - stationary two phase (d, q) winding.
    Assume equal turns on all coils.

3. Why is it important to investigate the transient   **10**
    behaviour of synchronous generators ? Discuss
    the effect of rotor oscillations on the performance
    of synchronous machine.

4. Draw the generalized mathematical model of a   **10**
    polyphase induction machine. Write down the
    voltage equations for this model.

5. Show, from the polyphase induction motor equivalent circuit, that the slip at maximum torque is given by **10**

$$S_{mt} = \frac{r_2}{\sqrt{Re^2 + (x_2 + x_e)^2}}$$ where $Re + jxe$ is the

Thevnin's equivalent circuit impedance.

6. Explain how the equivalent circuit parameters of a single-phase induction motor can be determined experimentally from no-load and blocked rotor test. State various assumption made. **10**

7. A 230 V, 4 pole , 50Hz , single - phase induction motor has the following constants and losses : **10**
$r_1 = 2.3\ \Omega$ $x_1 = 3.2\ \Omega$
$r_2 = 4.2\ \Omega$ $x_2 = 3.2\ \Omega$
$X_m = 74\ \Omega$
Core loss = 98 watts
friction and windage loss = 30 watt if this motor is running with a slip of 5% at rated voltage and frequency then compute the stator current, pf, power output, torque and efficiency with its auxiliary winding open.

8. Describe with appropriate sketches, a 2-phase 8/4-pole permanent magnet stepping motor. **10**

9. Explain the generalized model for 3-phase induction machine. **10**

10. Write short notes on **any two** of the following :
    (a) AC and DC servo motor   **2x5=10**
    (b) Repulsion motor
    (c) Scherage motor

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