S.E. Sem 4 Electrical Machine & Instruments. 24/12/08

P4/RT-Ex-08-267 EtrX

Con. 5068–08. RC–6102.

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **suitable** data wherever **required** and state **clearly**.
(4) **Figures** to the **right** indicate **full** marks.
(5) Illustrate answers with **sketches** wherever **required**.

1. Answer any **four** :– 20
   (a) Explain the operation of a meggar.
   (b) What is the need of starters in d.c. motors ? Explain four point starter.
   (c) Draw and explain Torque-slip characteristics of a three phase Induction Motor.
   (d) Explain the stepper motor characteristics.
   (e) The secondary winding of a Current Transformer while in use should never be kept open. Why ?

2. (a) Explain the characteristics of D. C. Motors and state the applications. 10
   (b) A 200 V d.c. shunt motor takes a total current of 100 A and runs of 750 rpm. The resistance of the armature winding and of shunt field winding is 0·1Ω and 40 Ω respectively. Find out (i) the torque developed by the armature and (ii) the Copper losses. If the friction and iron losses are 1500 W. Calculate (iii) shaft power (iv) shaft torque (v) efficiency. 10

3. (a) Classify three phase Induction Motors and explain the principle of operation. 8
   (b) A 4 pole, 3 phase required cage Induction Motor with a star connected stator winding runs on a 50 Hz supply with 220 V between the lines. The rotor resistance and stand still reactance per phase are 0·1Ω and 0·8 Ω respectively. The ratio of rotor to stator turns is 0·65. Calculate (i) the rotor current at 5% slip (ii) rotor input (iii) total torque at 5% slip (iv) total mechanical power at 5% slip (v) rotor current at maximum torque (vi) rotor input corresponding to maximum torque (vii) maximum torque (viii) speed at maximum torque and (ix) maximum mechanical power. 12

4. (a) Explain the working of a single phase induction type energymeter. 10
   (b) Explain the principle of operation of frequency meter. 10

5. (a) How is Kelvin Double Bridge different from Wheatstone's Bridge ? Explain. 10
   (b) Derive the condition of balance of Anderson's Bridge with proper circuit diagram and phasor diagram. 10

6. (a) Explain any one type of A.C. Potentiometer. 10
   (b) Explain the methods of speed control of D.C. Shunt Motors. 10

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(b) Explain the methods of speed control of D.C. Shunt Motors. **10**

7. (a) Derive Torque equation of D.C. Motor. **6**

(b) Explain speed control of Induction Motor. **6**

(c) The coil of a moving coil instrument is wound with 80 turns. The coil is 5 cm long and 3 cm wide. The flux density in the airgap is 0·5 Wb/m^2. The control spring exerts a torque of 2×10^{-4} Nm when the deflection is 100 decisions on full scale. Estimate the resistance which must be connected in series with the coil to give 2 V per division. The resistance of the instrument coil may be neglected compared with the series resistance to be connected. **8**
