

QP Code : NP-19764

(3 Hours)

[Total Marks : 80

- N.B. (1) Question No. 1 is compulsory.
 (2) Attempt any three questions from the remaining questions.
 (3) Assume suitable data if required and mentioned it.
 (4) Figures to right indicate full marks.



1. Attempt any four questions from the following :—
- (a) Derive the emf equation of dc generator. 5
- (b) Explain speed control of dc shunt motor by means of variation of flux. 5
- (c) Define slip. Why an induction motor cannot run at synchronous speed. 5
- (d) Show that the driving torque in a moving iron instrument is given by — 5
- $$T_d = \frac{1}{2} i^2 \frac{dL}{d\theta}, \text{ where the symbols have their usual meaning.}$$
- (e) What is swamping resistance ? 5
2. (a) Explain how a rotating magnetic field is produced in 3 ϕ induction motor. 10
- (b) A 440 volts, 4 pole, 3 ϕ , 50 Hz induction motor develops 25 H.P. inclusive of mechanical losses, when running at 440 rpm. The motor p.f. is 0.82 lagging, calculate : 10
- (i) slip
- (ii) rotor copper loss
- (iii) total input if stator losses are 1800 W,
- (iv) line current
- (v) overall efficiency if mechanical losses are 750 W.
3. (a) Explain double field revolving theory of 1 ϕ induction motor. 10
- (b) Explain starting methods of 3 ϕ inductions motor. 10
4. (a) Explain torque slip characteristics of 3 ϕ induction motor. 10
- (b) Derive torque equation of dc motor and draw T_a & N , T_a & I_a characteristics for dc shunt and series motor. 10
5. (a) A 250 V, dc shunt motor on no load runs at speed of 1000 rpm and takes a current of 5 A. The armature and shunt field resistances are 0.2 Ω and 250 Ω respectively. Calculate the speed when the motor is on load and is taking a current of 50 A. Assume that the armature reaction weakens the field by 3%. 10
- (b) Write short note on Megger. 10
6. (a) Explain the working of 1 ϕ induction type energy meter with neat diagram and derive the torque equation. 10
- (b) The four arms of balanced bridge network are made up as 10
- AB - Resistance 50 Ω in series with inductance 0.1 H.
- BC - Resistance 100 Ω
- CD - Unknown resistance in parallel with unknown capacitance
- DA - Resistance 1000 Ω
- The supply frequency 50 Hz maintained between A and C and a variation galvanometer is connected between B and D. Find unknown resistance and capacitance and draw phasor diagram.