[Time: 3 Hours] **Total Marks: 80**

Note: 1. Question No. **1** is **Compulsory**
2. Solve any **3** questions out of remaining questions
3. Assume suitable data if necessary.

Q. 1 Attempt **any four** of the following:
a) What is the significance of B_{60} in Induction machine design? (5)
b) Enlist the types of 1-Φ Induction motors and their applications. (5)
c) Why 1-Φ induction motor is not self starting? Draw its torque –slip characteristics. (5)
d) Why the induction motor is called as a poor power factor machine? Also explain why it is called as a generalised transformer? (5)
e) What do you mean by electric loading? (5)

Q. 2 a) Derive the output equation of 3 phase Induction motor in terms of main dimensions. (10)
b) What is frame and frame size in case of Induction motor? Draw a figure showing structural dimensions of standard frame? (10)

Q. 3 a) Explain the torque speed characteristics of 3 phase induction motor in braking, motoring and generating regions. (10)
b) Discuss the effects of dispersion coefficient on maximum power factor and on overload capacity of 3 ph Induction motor. (10)

Q. 4 a) Is it possible to change the direction of rotation in shaded pole type induction motor? Justify. (10)

b) Determine the main dimensions, turns per phase, number of slots of a 250 Hp, 3ph, 50Hz, 400V, 1410rpm, slip ring induction motor. Assume B_{av} = 0.5 Wb/ m^2, ac = 30000 A/m, efficiency = 0.9 and power factor = 0.9, winding factor = 0.955, current density = 3.5 A/mm^2. The slot space factor is 0.4 and the ration of core length to pole pitch is 1.2. The machine is delta connected. (10)

Q. 5 a) Explain Double field revolving theory. (10)
b) Explain the effect of voltage and frequency variations on Induction motor performance. (10)

Q. 6 Write short note on **(any TWO)** (20)
i) Methods of starting of 3 –Φ Induction motor
ii) Explain cogging and crawling in 3–Φ Induction motor
iii) Calculation of leakage reactance of parallel sided slots

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