

(Time: 3 Hours)

Total Marks: 80

- NB:** (1) Question No. 1 is **compulsory**
 (2) **Answer** any **THREE** questions out of the remaining **FIVE** questions.
 (3) Assume suitable data if **necessary** and **justify** them
 (4) **Figure** to the **right** indicates **mark**
1. (a) How a rotating magnetic field is created in a 3 phase induction motor? 5
 (b) What is B_{60} ? State its significance. 5
 (c) Draw torque-speed characteristics of three phase induction motor in braking, motoring and generating regions. 5
 (d) A 3-phase, 50 Hz, 400 V, induction motor has the following parameters:- 5
 $X_1 = X_2' = 0.1 \Omega$, $R_1 = R_2' = 0.02 \Omega$. It is to be operated at one half of its rated voltage and 25 Hz frequency. Calculate the starting torque at this condition in terms of its normal value.
 2. (a) Illustrate with neat diagrams the working principle of 3 phase induction motor 10
 (b) Draw the equivalent circuit of 3 phase induction motor and state the relevance of each parameter. Write the equation for the mechanical power developed. 10
 3. (a) Illustrate with speed torque characteristics the V/f control of induction motor 10
 (b) Illustrate working of star- delta starter with neat diagram. State its function. 10
 4. (a) Illustrate double field revolving theory of single phase induction motor and hence prove that single phase induction motor is not self starting. 10
 (b) A 230 V, 50 Hz, 4 pole single phase induction motor has the following equivalent circuit parameters. 10
 $R_1 = 2.4 \Omega$, $R_2 = 4.7 \Omega$, $X_{1m} = 3.2 \Omega$, $X_2' = 2.8 \Omega$, $X_M = 90 \Omega$
 Friction and windage losses = 50 W, $s = 0.03$ p.u.
 Calculate input current, power factor, developed power, output power and efficiency.
 5. (a) State the factors affecting the choice of specific electric and magnetic loadings of a 3 phase induction motor. Justify the statements. 10
 (b) Write a short note on Carter's coefficient. 10
 6. (a) Explain the calculation of leakage reactance for parallel sided stator slot of induction motor 10
 (b) Illustrate with phasor diagram the working of capacitor start single phase induction motor. 10