

(3 Hours)

QP Code : 5600  
[Total Marks : 80]

**Instructions:** Question No: 1 is compulsory.  
Answer any three from the remaining six questions.

- | Q. 1  | Marks     |
|---|-----------|
| (a) Define inrush current in three-phase transformer  | 20        |
| (b) Explain the Dd0 phasor group of three phase transformer connection alongwith connection diagram and phasor diagram  | 05        |
| (c) Name the different methods of starting of single phase induction motor and explain any one  | 05        |
| (d) Explain the working principle of three phase induction motor  | 05        |
| <b>Q.2</b>  | <b>20</b> |
| (a) A three phase, star connected, 400V, 50Hz, 4 pole induction motor has the following per phase constants in ohm referred to stator<br>$R_1=0.15$ , $X_1=0.45$ , $R_2=0.12$ , $X_2=0.45$ , $X_m=28.5$<br>Fixed losses (core and friction and windage losses) = 400 w. compute stator current, rotor speed, output torque and efficiency when motor is operated at rated voltage and frequency at a slip of 4% |           |
| (b) Explain star-delta starter for a 3 phase induction motor. Derive the expression for starting current and starting torque.   | 10        |
| <b>Q.3</b>  | <b>20</b> |
| (a) Explain the necessity of controlling voltage along with frequency for speed control of an induction motor for v/f control method. Also draw torque-speed characteristic for constant v/f ratio at different frequencies.  | 10        |
| (b) Explain double field revolving theory for a single phase induction motor.   | 10        |
| <b>Q.4</b>  | <b>20</b> |
| (a) Two three phase transformers rated at 500 KVA and 450 KVA respectively are connected in parallel to supply a load of 1000 KVA at 0.8 p.f. lagging. The per phase leakage resistance and reactance of the first transformer is 2.5% and 6% respectively and of second transformer 1.6% and 7% respectively. Calculate the KVA load and p.f. at which each transformer operates.                              | 10        |
| (b) Conditions required for successful parallel operation of three phase transformers   | 10        |
| <b>Q.5</b>  | <b>20</b> |
| (a) Draw & explain torque-speed characteristics of 3 phase induction motor at variable rotor resistance.  |           |
| (b) "Induction motor takes 30 to 40% for rated current at no load" justify the statement.   |           |
| <b>Q.6</b> Write a short note on (any two)  | <b>20</b> |
| (a) Excitation phenomenon in 3 phase transformer  |           |
| (b) Oscillating neutral   |           |
| (c) Double cage induction motor   |           |