

Exam. Code: 0933  
Sub. Code: 6657

2123  
B.E. (Electrical and Electronics Engineering)  
Third Semester  
PC-EE-302: Electrical Machinery - I

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Assume suitable missing data, if any.*

x-x-x

- Q1.a.** What is the function of auxiliary winding in single-phase induction motor? (2)
- b.** Draw the phasor diagram of a single-phase transformer at no-load. (2)
- c.** Draw the circuit arrangement for conducting open-circuit test on a single-phase transformer. (2)
- d.** Why speed-torque characteristics of a dc shunt motor is different than dc compound motor? (2)
- e.** Why starting torque of a single-phase induction motor is zero? Also draw its torque speed characteristics. (2)

**Part-A**

- Q2.** Starting from exact equivalent circuit of a single-phase transformer, develop the approximate equivalent circuit of this transformer referred to primary and secondary including no-load branch in both the cases. (2,4,4)
- Q3.a.** Analyse the delta/star configuration of three-phase transformer with appropriate phasor diagrams. (5)
- b.** A 230-V dc series motor has an armature circuit resistance of 0.2 ohms and field resistance of 0.1 ohms. At rated voltage, the motor draws a line current of 40 amps and runs at a speed of 1000 rpm. Find the speed of the motor for a line current of 20 A at 230 V. Assume that the flux at 20 A line current is 60 % of the flux at 40 A line current. (5)
- Q4.a.** Explain the working of a 4-point starter for a dc shunt motor with proper diagrammatic representation. (7)
- b.** With appropriate mathematical expressions, develop and draw the speed-current characteristics of a dc compound motor. (3)

P.T.O.



(2)

- Q5.a.** A 10 kW, 420-V, 3-phase, 4-pole, 50 Hz, delta connected squirrel cage induction motor gave the following data for blocked rotor test: (10)  
210 V, 20 A, 5 kW  
Stator core-loss at rated voltage and frequency is 300 watts. The dc resistance measured between two stator terminals is 0.6 ohms. Determine the starting torque at rated voltage and frequency.
- Q6.** A 230-V, 50 Hz, 4-pole single-phase induction motor has following equivalent circuit parameters: (10)  
Main-winding impedance =  $2.2 + j3.1$  ohms.  
Rotor winding impedance =  $4.5 + j2.6$  ohms. (referred to stator-side)  
Magnetizing inductance =  $j80$  ohms.  
The friction, windage and core losses of this motor are 40 Watts.  
For a slip of 0.04 pu, calculate (i) input current, (ii) power factor, (iii) developed power, (iv) output power and (v) efficiency.
- Q7.** Write short notes on following:  
a. Working of Induction generator in grid-connected mode. (5)  
b. Centrifugal switch of single-phase induction motor. (5)

x-x-x