

Total No. of Questions: 8]

SEAT No. :

PA-1209

[5925]-231

[Total No. of Pages : 3

S.E. (Electrical Engineering)
ELECTRICAL MACHINES-I
(2019 Pattern) (Semester-IV) (203146)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of non-programmable calculator is allowed.

- Q1)** a) Give any two points of comparison between LAP winding and WAVE winding for DC machine. [4]
- b) Draw the power stage diagram of DC motor. Clearly indicate various losses along with respective formulae for the losses. [6]
- c) A DC Shunt motor develops output power of 7355 watt and runs at 700 rpm. It is connected across 400 volt DC supply and draws a current of 23 Ampere. The mechanical and iron losses are 735.5 Watt. [8]
- Determine-
- i) Efficiency of Motor
 - ii) Armature resistance of motor

OR

- Q2)** a) The armature of 4-pole DC shunt motor has LAP winding which is accommodated in 60 slots, each slot carries 20 conductors. [4]
- If the useful flux per pole is 23 milli Weber, determine the total torque developed by motor in Newton meter. The armature current is 50 Ampere. [6]
- b) What is meant by back emf in DC motor? State the equation of back emf. Also explain how back emf acts as a regulating mechanism when load on DC motor changes. [8]
- c) Draw the connection diagram of shunt, series DC motors. State their current & voltage distribution equations.

P.T.O.

- Q3)** a) State any one application of- [3]
- i) DC shunt
 - ii) Series &
 - iii) Cumulative compound motor
- b) Sketch & explain the Torque- Armature current characteristics of [6]
- i) DC shunt motor
 - ii) Series motor.
- c) A 250 V DC Shunt motor takes a current of 6 Ampere and runs at 1200 rpm. The armature resistance is 0.05 Ohm and shunt field resistance is 250 Ohm. Determine the speed of motor when it is loaded and taking a current of 31 Ampere. [8]

OR

- Q4)** a) What is meant by reactance voltage in case of commutation in DC machine? [3]
- b) Draw the circuit diagram & explain the speed control of DC shunt motor by armature voltage control also draw the nature of graph (Armature voltage Vs. speed). [6]
- c) Draw the connection diagram of 3 point starter used for DC shunt motor & explain the function of [8]
- i) Hold on coil &
 - ii) Over load coil
- Q5)** a) Draw the power flow diagram of 3-ph Induction motor. [4]
- b) A 6 pole, 3 phase induction motor is connected to 400 volt, 50 Hz ac supply. Calculate-
- i) the speed of rotating magnetic field of the motor
 - ii) Speed of motor at 3% slip
 - iii) the rotor emf frequency at 3% slip [6]
- c) Draw and explain torque-Slip characteristics of 3 phase induction motor with respective mathematical expressions. Clearly mark the two regions and point of maximum torque and starting torque [8]

OR

- Q6)** a) Derive the condition for maximum starting torque of 3 phase induction motors with usual notations. [4]
- b) With suitable diagram explain constructional details of 3 phase slipring induction motor [6]
- c) The input to 3 phase, 6 pole, 50 Hz, induction motor is 47 kWatt at certain load. The stator losses are 1.5 kWatt and mechanical losses are 1k Watt. Determine the HP output power of motor when it runs at 970 rpm. (Take 1 HP = 746 watt) [8]

- Q7)** a) State the types of starters used for induction motors. [3]
- b) With suitable circuit diagram explain no load and blocked rotor test on 3 phase induction motor. Also write respective formulae involved in calculation part for determining the respective parameters [6]
- c) Draw the connection diagram of star-delta starter used for 3-ph induction motor & explain its working [8]

OR

- Q8)** a) Obtain the approximate equivalent circuit diagrams fo 3-ph induction motor step by step. Label it & state the meaning of each nomenclature used. [7]
- b) Using data from No load & Blocked rotor test on 3-ph induction motor; Draw the circle diagram & write the procedure to find full load slip, locate the points for slip = 0, 1 [10]

