

Total No. of Questions : 8]

SEAT No. :

P9087

[6179]-212

[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) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of Non-Programmable calculator is allowed.*

Q1) a) Related to DC machine winding define the following terms. **[4]**

- i) Pole Pitch
- ii) Coil Pitch
- iii) Conductor
- iv) Back Pitch

b) An 8-pole armature has 96 slots with 8 conductors per slot. It is driven at 600 rpm. **[6]**

The useful flux per pole is 10mWb. Calculate the induced e.m.f. in the armature winding when

- i) Lap connected and
- ii) Wave connected.

c) Draw and explain the connection diagram of DC shunt, and DC series motors. Write their current and voltage equations. **[8]**

OR

Q2) a) State the significance of back emf. Write down its equation. **[4]**

b) Derive the EMF equation of the DC generator by usual notations. State clearly the meaning of each term used in derivation. Write the EMF equation for LAP winding and WAVE winding. **[6]**

c) A 200V, 4 pole, lap wound, DC shunt motor has 800 conductors of armature winding. Armature and field winding resistances are 0.5ohm and 200ohm respectively. The motors take 21Amp & flux per pole is 30mWb. Find the speed and torque developed. **[8]**

P.T.O.

- Q3) a)** Draw the following characteristics of a series motor- [3]
i) Torque Vs. armature current
ii) Speed Vs armature current
iii) Speed Vs Torque

b) A 500V, 6 pole, DC shunt motor has armature and field winding resistance of 0.5ohm and 250ohm respectively. It draws a full load current 20 A from the supply. If rotational losses are 900W calculate the efficiency motor. [6]

c) Draw and explain the three-point starter used for the DC motor. Write the function of the HOLD ON coil and OVERLOAD coil. [8]

OR

Q4) a) Write a short note on the functions of interpoles in DC machines. [3]

b) List the various speed control methods of the DC shunt motor. Explain any one with a suitable diagram. [6]

c) A 250V DC shunt motor has an armature resistance of 0.5ohm and field resistance of 125ohm. It drives a load at 1000 rpm and draws a current of 25Amp. Calculate the armature current drawn and speed of the motor if field resistance is increased up to 150ohms and load is kept constant.[8]

Q5) a) Draw the power flow diagram of the 3-ph Induction motor. [4]

b) Compare squirrel cage induction motor with slip ring induction motor (6 points). [6]

c) Derive Torque equation of 3 3-phase induction motor by usual notations. Also find. Full load torque, Starting torque, and Condition for maximum torque. [8]

OR

Q6) a) With a suitable diagram explain the constructional details of the 3-phase slip ring induction motor. [4]

b) Draw and explain the torque slip characteristics of the 3-phase induction motor. Mark the starting torque, pull-out torque, maximum torque, and full load torque in the same. [6]

c) A 3-phase induction motor having 6 pole star connected stator winding runs on 240V, 50Hz supply. The rotor resistance and standstill reactance are 0.12 ohms and 0.85 ohms per phase. The ratio of the stator to rotor turns is 1:8. Full load slip is 4%. Calculate the developed torque at full load, maximum torque, and speed at maximum torque. [8]

- Q7)** a) Draw the phasor diagram of a 3-phase induction motor. [3]
- b) State the types of starters used for induction motors. Explain the rotor resistance starter with a suitable diagram. [6]
- c) What data is required to plot the circle diagram of the 3-phase induction motor? Plot the circle diagram of the 3-phase induction motor and indicate the following quantities in it. [8]
- i) No Load Current,
 - ii) No load Power Factor angle,
 - iii) Constant loss,
 - iv) Stator copper loss,
 - v) Rotor copper Loss,
 - vi) Torque line,
 - vii) Output line,
 - viii) Full load current

OR

- Q8)** a) Name the various tests carried out on 3-phase induction motors as per IS 325 and IS 4029. [3]
- b) Compare a three-phase induction motor with a three-phase transformer. [6]
- c) With a suitable circuit diagram explain the No load and Blocked rotor test carried out on a 3-phase induction motor. What information is obtained from these tests? [8]

