Total No. of Questions : 8]

SEAT No. :

PA-1281

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[5925]-306

S.E. (Automobile &Mechanical/Mechanical Sandwich)

ELECTRICAL AND ELECTRONICS ENGINEERING

(2019 Pattern) (203156) (Semester - III)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Attempt Question 1 or 2, 3 or 4, 5 or 6, 7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Derive the emf equation of a DC machine and explain the significance of emf induced in a DC motor. **[6]**

b) A 220 V, DC shunt motor runs at 1000 rpm when the armature current is 25 A. Calculate the speed if the torque developed is doubled. Given that armature resistance is 0.25 Ω. **[6]**

c) Explain rheostatic control and field control methods of controlling speed of a DC shunt motor. **[6]**

OR

Q2) a) Draw and explain the characteristics of a DC shunt motor. **[6]**

b) A 230 V, 4 pole lap wound DC shunt motor takes no-load current of 4 A when running at 1200 r.p.m. The resistance of armature winding is 0.1 Ω and shunt field winding is 115 Ω. Total brush contact drop is 2 V. If it takes current of 60 A on full-load, calculate its full load speed. Assume that flux gets weakened by 5% on full-load condition due to armature reaction. **[6]**

c) What is braking in a motor? Explain regenerative braking of DC shunt motor with the help of neat diagrams. **[6]**

P.T.O.

Q3) a) Derive the expression for the torque developed in a three phase induction motor under running conditions. **[6]**

b) A 6 pole, 50 Hz, three phase induction motor running on full load with 4% slip develops a torque of 149.3 N-m at its pulley rim. The friction and windage losses are 200 W and the stator copper and iron losses equal 1620 W. Calculate i) output power ii) rotor copper losses and iii) % efficiency at full load. **[6]**

c) Explain the operation of star-delta starter for a three phase induction motor with neat schematic. **[5]**

OR

Q4) a) Draw and explain the torque-slip characteristics for the three phase induction motor. **[6]**

b) A 3 Φ, 6 pole, 50 Hz induction motor has a slip of 1% at no load, and 3% at full load. Determine : i) Synchronous speed ii) No load speed iii) Full load speed iv) Frequency of rotor current at standstill v) Frequency of rotor current at full load. **[6]**

c) Differentiate between slip ring and squirrel cage induction motor. **[5]**

Q5) a) State and explain the components and subsystems of Hybrid Electric Vehicle (HEV). **[6]**

b) Explain the configuration of a Parallel Hybrid EV. **[6]**

c) Draw and explain Vehicle to Grid (V2G) technology with the help of suitable block diagram. **[6]**

OR

Q6) a) Compare the series and parallel configurations of Hybrid Electric Vehicle (HEV). **[6]**

b) Differentiate between Battery EV and Plug-in EV. **[6]**

c) Elaborate the impact of usage of EV on power grid. **[6]**

Q7) a) Write voltage, specific energy, C-rate, cycle life, thermal runaway and applications of LFP battery. **[6]**

b) Draw the block diagram of Battery Management System (BMS) and explain the working of it. **[6]**

c) Explain the factors for selection of motors for an EV. **[5]**

OR

Q8) a) State advantages and disadvantages of LMO Battery. **[6]**

b) Explain the operation of a BLDC motor drive for an EV with the help of a block diagram. **[6]**

c) Elaborate the factors used in selection of a battery for an EV. **[5]**

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