Total No. of Questions : 8]

SEAT No. :

P-9197

[Total No. of Pages : 2

[6179]-330

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

ELECTRICAL AND ELECTRONICS ENGINEERING

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

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 diagrams must be drawn wherever necessary.*
4) *Assume suitable additional data, if necessary.*
5) *Use of non-programmable calculators is allowed.*

Q1) a) What is the back emf in a DC motor? Explain the significance of back emf in the operation of the motor. **[4]**

b) Derive the expression for the armature torque developed in a DC motor. **[6]**

c) The armature resistance of a 200 V DC shunt motor is 0.4 Ω and the no load armature current is 2 A. When loaded and taking an armature current of 50A, the speed is 1200 rpm. Find the no load speed. **[8]**

OR

Q2) a) Draw the cross sectional view of a DC motor and name important part of it. **[4]**

b) What is electrical braking in a DC motor? Explain regenerative braking for a DC shunt motor in detail. **[6]**

c) A 250 V DC shunt motor has armature circuit resistance of 0.2 Ω and field resistance of 125 Ω. it runs at 1500 rpm and draws a current of 50A on full load. Calculate the speed of motor at half load condition. **[8]**

Q3) a) Enlist any three applications of a three phase induction motor. **[3]**

b) Draw and explain the torque-slip characteristics of a 3 phase induction motor in details. **[6]**

c) A 24 pole. 50Hz star connected induction motor has rotor resistance of 0.016 Ω per phase and rotor reactance of 0.265 Ω per phase at standstill. It is achieving its full load torque at a speed of 247 rpm. Calculate the ratio of i) full load torque to maximum torque ii) starting torque to maximum torque. **[8]**

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OR

Q4) a) Explain the working principle of a three phase induction motor. **[3]**

b) What is the need of a starter for a three phase induction motor? Explain the operation of a star-delta with the help of neat diagram. **[6]**

c) A 4 pole,50 Hz. three phase induction motor runs at 1440 rpm while delivering the power output of 40kW. The stator losses at this load are equal to rotor losses and mechanical losses amount to 3500 W. **[8]**
Calculate :

i) slip
ii) mechanical power developed by rotor
iii) rotor cu loss
iv) rotor input
v) stator input and
vi) efficiency

Q5) a) List the significant benefits of use of an electric vehicle. **[4]**

b) Draw the block diagram of the structure of an electric vehicle and explain the function of any three major parts. **[6]**

c) Explain the configuration of a Battery Electric Vehicle (BEV) with the help of a diagram. **[8]**

OR

Q6) a) Write the challenges faced by EV technology in present days. **[4]**

b) Explain the Vehicle to Grid (V2G) technology with the help of a diagram. **[6]**

c) Explain the configuration of a Plug-in Hybrid Electric Vehicle (PHEV) with the help of a diagram. **[8]**

Q7) a) Explain the C - rate of a battery. **[3]**

b) Elaborate the factors used in the selection of an energy storage device in case of EVs. **[6]**

c) Explain the working of a three phase induction motor drive for EVs with the help of block diagram. **[8]**

OR

Q8) a) Calculate the capacity of a battery in Wh if a 2kW of constant power is discharged for the duration of 2.5 hours .**[3]**

b) What are supercapacitors? Explain the role of supercapacitors in the development of electric vehicles. **[6]**

c) Explain the construction and working of a BLDC motor drive using suitable diagram. **[8]**

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