

Total No. of Questions : 8]

SEAT No. :

PD4162

[6402]-123

[Total No. of Pages : 3

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

- Q1)** a) Draw a neat sketch of a 4-Pole DC machine. Label main parts of it. State the function of any three parts. [6]
- b) A 210V, DC shunt motor runs at 1200 rpm when the armature current is 20 A. Calculate the speed if the torque developed is doubled. Given that armature resistance is 0.25Ω . [6]
- c) Explain regenerative braking of a DC shunt motor with the help of neat diagrams. [6]

OR

- Q2)** a) Explain any one method of speed control of DC shunt motor with neat diagram. [6]
- b) Draw and explain the characteristics of a DC shunt motor. [6]
- c) A 220 V DC shunt motor with armature resistance of 0.5Ω runs at 800 rpm on full load and draws an armature current of 20 A. If resistance of 1Ω is added in series with armature winding, find the speed at half load condition. Assume that the flux is maintained constant. [6]

P.T.O.

Q3) a) Differentiate between a squirrel cage and a slip ring induction motor; writing any six points. [6]

b) Draw and explain the Torque-Slip characteristics of a 3-phase induction motor with respective mathematical expressions. Clearly mark the two regions and point of maximum torque and starting torque. [6]

c) A 3-phase, 8 pole, 50 Hz induction motor has a slip of 1% at no load and 2% at full load. Determine : [5]

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

OR

Q4) a) Derive the expression for the torque developed in a three phase induction motor under running conditions. [6]

b) State different types of starters used for starting a three phase Induction motor and explain any one of them with the help of neat diagram. [6]

c) The output of a three phase induction motor running at 4% slip is 38 KW. Find the rotor copper loss and motor efficiency if the stator losses and mechanical losses are 3500W and 1300W respectively. [5]

Q5) a) Draw the block diagram of an Electric Vehicle (EV) structure and explain the function of major parts in it. [6]

b) Differentiate between Battery EV and Hybrid EV. [6]

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

OR

Q6) a) Enlist and explain the subsystems of an Hybrid Electric Vehicle (HEV) with suitable diagram. [6]

b) Explain the configuration of a parallel Hybrid EV with suitable sketch. [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) Explain the factors for selection of motors for an EV. [6]

c) What is a supercapacitor? How can it be useful in the making of an EV? [5]

OR

Q8) a) Explain the operation of a three phase induction motor drive for an EV with the help of a block diagram. [6]

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

c) Explain the use of hydrogen fuel cell in EVs. [5]

