CENTRAL INSTITUTE OF TECHNOLOGY, KOKRAJHAR
(Deemed to be University)
KOKRAJHAR :: B.T.A.D. :: ASSAM :: 783370

END – SEMESTER EXAMINATION
PG

Session: July-December, 2024 Semester: 1st Time: 3Hrs. Full Marks: 100

Course Code: MGE103 Course Title: Electric Vehicle Technology

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ANSWER ANY FIVE QUESTIONS:

1. a. What is vehicle automation? What are the different levels of automation? Explain with examples 10

   b. Explain the architecture of electric vehicle. 10

2. a. State the advantages of 3-phase Induction motor. 4

   b. Give a comparison between Squirrel cage and Slip-ring Induction motor. 6

   c. A separately excited DC motor is supplied from a 230V,50 Hz source through a single phase half wave controlled converter. Its field is fed through a 1-phase semi converter with zero degree firing angle delay. Motor resistance r_a=0.7Ω and motor constant is 0.5 V-sec/rad. For rated load torque of 15nm at 1000rpm and for continuous ripple free currents, determine-

      i. firing angle delay of the armature converter

      ii. rms values of thyristor and freewheeling diode currents

      iii. input power factor of the armature converter 10

3. a. Calculate the emf generated by a 6 pole DC generator having 480 conductors and driven at a speed of 1200 rpm. The flux per pole is 0.012 Wb. Assume the generator to be (a) Lap wound, (b) Wave wound. 4

   b. A wave connected armature winding has 19 slots with 54 conductors per slot. If the flux per pole is 0.025 Wb and number of poles is 8, find the speed at which the generator should be run to give 513 V. Also find the speed if the armature is lap connected. 6

   c. The armature of a 4-pole, 600 rpm, lap wound generator has 100 slots. If each coil has 4 turns, calculate the flux per pole required to generate an emf of 300 V. 4

d. A 6-pole, lap wound armature rotated at 350 rpm is required to generate 300 V. The useful flux per poles is 0.05 Wb. If the armature has 120 slots; calculate the no. of conductors per slot. 6

4. a. What is vehicle dynamics? State the degrees of freedom in a car. 2+3=5

b. What are the loads and moments in a vehicle? 5

c. Explain the domains of vehicle dynamics. 10

5. a. What is SMPS? Explain any one configuration of SMPS. 10

b. What is UPS? Explain the working of short and no break UPS. 10

6. a. What is a chopper? Derive the input output relation of buck and boost chopper. 8

b. A step up chopper has an input voltage of 150V. The voltage output needed is 450V. Given, that the thyristor has a conducting time of 150μseconds. Calculate the chopping frequency. 6

c. For a type A chopper dc source voltage is 230V, loadresistance is 10Ω. Voltage drop across the chopper is 2V when it is on. For a duty cycle of 0.4 calculate - 6

(i) average and rms values of output voltage

(ii) chopper efficiency

7. Write short notes on- 10X2=20

a. Lead acid battery

b. Battery charging circuit