Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: UTILIZATION OF ELECTRICAL ENERGY [ELE 435]

REVISED CREDIT SYSTEM

Time: 3 Hours   08 December 2015   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ANY FIVE FULL** questions.

❖ Missing data may be suitably assumed.

1A.	Explain the main features of an ideal traction system. Also, list the different types of traction systems.	**4**
1B.	Compare DC and AC systems of railway electrification from the perspective of a suburban line railway service.	**3**
1C.	Derive an expression for the total time of run in seconds for a simplified quadrilateral speed-time curve of an urban service.	**3**
2A.	An electric train is to have acceleration and braking retardation of 0.8 km/hr/sec and 3.2 km/hr/sec respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds, find the schedule speed for a run of 1.5 km. Assume a simplified trapezoidal speed-time curve.	**3**
2B.	With suitable figures explain the essential driving mechanism of an electric locomotive and derive the tractive effort for propulsion of train.	**4**
2C.	An electric train weight 250 tonne has 10 motors geared to driving wheels, each wheel is 80 cm diameter. Determine the torque developed by each motor to accelerate the train to a speed of 50 km/hr in 30 seconds up a gradient of 1 in 300. The traction resistance is of 40 N/tonne, the effect of rotational inertia is 10% of the train weight, the gear ratio is 5 to 1 & gear η is 80%.	**3**
3A.	Describe the various factors affecting energy consumption in propelling the train	**4**

3B.	Define the following:
	  i. Dead weight
	  ii. Accelerating weight
	  iii. Adhesion weight.
		3

3C.	500 tonne goods train is to be hauled by a locomotive up a gradient of 2% with an acceleration of 1.2 km/hr/sec., coefficient of adhesion is 25%, track resistance is 40 N/tonne & effective rotating masses 10% of dead weight. Find the weight of the locomotive & no of axles if load is not to exceed 20 tonnes.	**3**

4A. With suitable diagram, explain the field control method used for starting & controlling speed of d.c series motors. **3**

4B. Describe the various types of current collectors used for overhead contact system. **4**

4C. With the line diagram for duplicate transmission system, explain how the continuity of supply is ensured for an electric traction. **3**

5A. Explain with relevant diagrams, how the booster transformer using return feeder and the negative booster can be used to reduce the interference effect on telecommunication circuits. **4**

5B. What is electro deposition? Explain the various factors which effect the appearance & quality of the deposited surface. **4**

5C. A rectangular metal plate having 5 cm x 4 cm x 1 cm as its dimensions is to be electroplated with nickel. Calculate the time required to deposit a layer of 0.1 mm thickness with a current of 4.3 amperes flow through the circuit? E.C.E of nickel is 0.000304 gm/coulomb, density of nickel is 8.6 gm/c.c. **2**

6A. With neat figures, explain the butt and flash welding processes and also list their applications. **3**

6B. Explain the following with suitable figures.
   i. principle of dielectric heating
   ii. Working of indirect arc furnaces **4**

6C. Bring out the advantages and applications of the following.
   i. Dielectric heating
   ii. Direct and indirect furnaces **3**