Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER 2014

Subject Code: 180902 **Date: 31-05-2014**

Subject Name: Electrical Power Utilization

Time: 10:30 am TO 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	State the main requirements for an ideal traction system. Give merits and demerits of electric traction over steam engine traction.	**07**
	(b)	Explain different methods of controlling speed of three phase induction motors.	**07**
Q.2	**(a)**	Suggest suitable A.C. and D.C. drives for following applications. Give reasons for the same. 1. Pump 2. Blower 3. Hoist 4. Excavator	**07**
	(b)	Derive expression for heating curve for temperature rise of motor	**07**
		OR	
	(b)	A motor fitted with a flywheel supplies a load of torque 900 N-m for 2 seconds. During no-load period the flywheel regains its original speed. The motor torque is required to be limited to 450 N-m. Determine the moment of inertia of flywheel. The no-load speed of the motor is 500 r.p.m. and its full load slip is 10%	**07**
Q.3	**(a)**	Using the simplified trapezoidal speed time curve, derive an expression for the maximum speed in km/h in terms of acceleration, retardation, distance between stops and actual time of run between stops.	**07**
	(b)	A train is required to run between two stations 2 km apart at an average speed of 40 km/h. The run is to make to simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 60 km/h, acceleration to 2 km/h/s and coasting and braking retardations to 0.15 km/h/s and 3 km/h/s respectively, determine the duration of acceleration, coasting and braking.	**07**
		OR	
Q.3	**(a)**	Deduce the expression for : (i) The tractive effort transferred to the driving wheel in terms of wheel diameter, motor torque, gear ratio and efficiency of transmission. (ii) The tractive effort for propulsion of train up and down the gradient.	**07**
	(b)	A 25 H.P,400V,4 pole ,50Hz star connected Induction motor has following impedance per phase in ohms referred to the stator side: Rs=0.641Ω, Rr=0.332Ω, Xs=1.106Ω, Xr=0.464Ω and Xmag=26.30Ω Rotational losses are assumed constant and are 1.1KW and core losses are assumed negligible. If the slip is 2.2% at rated voltage and frequency, Find (i) speed (ii)Stator current (iii)Power factor (iv)Output and input power (v)Efficiency of motor.	**07**

Q.4	**(a)**	A 27KW, 400V, 3 phase resistance oven employs nickel-chrome strip 0.25mm thick for its heating elements. If the wire temperature is not to exceed 1000˚ C and the temperature of the charge is to be 600˚ C ,calculate the suitable width of strip .Assume radiating efficiency as 0.5 and emissivity as 0.9 and specific resistance of nickel chrome alloy as 1.016×10^{-6} Ω -m.	**07**
	(b)	Explain principle and working of a indirect core type furnace	**07**

OR

Q.4	**(a)**	Explain design procedure of heating element with necessary expressions.	**07**
	(b)	Describe with help of neat sketches various types of electric arc welding in detail.	**07**
Q.5	**(a)**	Explain temperature rise of electrical drives with necessary expression.	**07**
	(b)	Explain the terms used in electrolytic process (i) Current efficiency (ii) Energy efficiency Also explain Faraday's laws of electrolysis.	**07**

OR

Q.5	**(a)**	Explain following terms with reference to illumination (i) Luminous intensity (ii) Illumination Also explain laws of illumination.	**07**
	(b)	The illumination of drawing office 30 m × 20 m is to have a value of 250 lux and is to be provided by filament lamps fitted 5m height. If the utilization factor is 0.4 and maintanance factor is 0.9, determine the number of lamps and size of lamp required. The efficiency of each lamp is 12 lumens per watt.	**07**

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