

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-Vth Examination December 2010****Subject code: 150906****Subject Name: Electrical Power Utilization and Traction****Date: 21 /12 /2010****Time: 03.00 pm - 05.30 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) Why electrical drive is preferred over mechanical drive? Discuss the factors governing selection of an electric motor for a particular service. **07**
- (b) State the main requirements for an ideal traction system. Give merits and demerits of electric traction over steam engine traction. **07**

- Q.2** (a) Explain different methods of speed control of d.c. shunt motor **07**
- (b) A motor fitted with a flywheel supplies a load of torque 1000 N-m for 2 seconds. During no-load period the flywheel regains its original speed. The motor torque is required to be limited to 500 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**

OR

- (b) Derive expression for heating curve for temperature rise of motor. **07**

- Q.3** (a) Using the simplified trapezoidal speed time curve, derive an expression for the maximum speed in kmph 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 1.6 km apart at an average speed of 40 kmph. The run is to make to simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 64 kmph, acceleration to 2 kmphs and coasting and braking retardations to 0.16 kmphs and 3.2 kmphs respectively, determine the duration of acceleration, coasting and braking. **07**

OR

- Q.3** (a) Deduce the expression for : **07**
- (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.
- (b) An electric train weighing 200 tonne has eight motors geared to driving wheel, each wheel is of 90 cm in diameter. Determine the torque developed by each motor to accelerate the train to a speed of 48 kmph in 30 seconds up a gradient of 1 in 200. The tractive resistance is of 5 newtons per tonne, the effect of rotational inertia is 10% of train weight, the gear ratio is 4 to 1 and gearing efficiency is 80%. **07**

- Q.4** (a) State and explain advantages of electrically produced heat. What are the essential properties of resistance heating elements. **07**
- (b) Describe with help of neat sketches various types of resistance welding in detail. **07**

OR

- Q.4 (a)** Explain with diagram vertical core type induction furnace **07**
(b) Explain eddy current heating and its application. **07**
- Q.5 (a)** Explain following terms with reference to illumination **04**
 (i) Luminous intensity
 (ii) Illumination
- (b)** State and explain laws of illumination **04**
- (c)** The illumination of drawing office $30\text{ m} \times 10\text{ m}$ is to have a value of 250 lux and **06**
 is to be provided by number of 300 watt filament lamps. If the utilization factor is 0.4 and depreciation factor is 0.9, determine the number of lamps required. The efficiency of each lamp is 14 lumens per watt.
- OR**
- Q.5 (a)** Explain the terms used in electrolytic process **04**
 (i) Current efficiency
 (ii) Energy efficiency
- (b)** State and explain Faraday's laws of electrolysis. **04**
- (c)** Explain electro-deposition processes and discuss various factors governing the **06**
 electro deposition processes.
