Code No:RT32023 **R13** SET - 1

III B. Tech II Semester Regular Examinations, April - 2016

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	"If a high degree of speed control is required, d.c. is preferable to a.c. for an electric drive" -Justify.	[4M]
	b)	What do you mean by Load Equalization?	[3M]
	c)	Give the classification of electric heating methods.	[3M]
	d)	Define: i) Mean spherical Candlepower, ii) Mean horizontal Candlepower.	[4M]
	e)	Why a series motor is preferred for the electric traction.	[4M]
	f)	What are the advantages of electric braking over mechanical braking	[4M]

PART -B

2	a)	Discuss the advantages and disadvantages of electric drive over other drives.	[8M]
	b)	A 200 V shunt motor has an armature resistance of 0.5 Ohm. It takes a current of 16 amps on full load and runs at 600 r.p.m. If a resistance of 0.5 ohm is placed in the armature circuit, find the ratio of the starting torque to the full load torque.	[8M]
3	a)	Explain in brief how heating is done in the following cases: i) Resistance heating, ii) Induction heating iii) Dielectric heating.	[8M]
	b)	A 20KW single-Phase, 220V resistance oven employs circular nichrome wire for its heating element, if the wire temperature is not to exceed 1227^0 and the temperature of the charge is to be 427^0C, calculate the size and length of the wire required. Assume emissivity = 0.9, radiating efficiency = 0.6 and specific resistance of wire = 1.09 X 10^{-6} Ω-m.	[8M]
4	a)	Explain the different measurement techniques used for luminous intensity.	[8M]
	b)	A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 metre in diameter. The illumination of the disc increases uniformly from 0.5 metre-candle at the edge to 2 metre-candle at the centre. Determine i. the total light received ii. Average illumination of the disc iii. Average c.p. of the source.	[8M]

5 a) Compare Tungsten filament lamp with Fluorescent tubes. [8M]

b) Explain the different types of lighting schemes.. [8M]

6 a) For a quadrilateral speed-time curve of an electric train, derive expression for the distance between stops and speed at the end of the coasting period [8M]

b) A train is required to run between stations 1.6kms apart at an average speed of 40km/hr. The run is to be made from a quadrilateral speed-time curve. The acceleration is 2km/hr/sec. The coasting and braking retardations are 0.16km/hr/sec and 3.2km/hr/sec respectively. Determine the duration of acceleration, coasting and braking and the distance covered in each period. [8M]

7 a) Briefly explain the a.c. motors used in traction. [8M]

b) The scheduled speed of a trolley service is to be 53km/hr. The distance between stops is 2.8km. The track is level and each stop is of 30 sec duration. Using simplified speed-time curve, calculate the maximum speed, assuming the acceleration to be 2km/hr/sec, retardation 3.2km/hr/sec, the dead weight of the car as 16 tonnes, rotational inertia as 10% of the dead weight and track resistance as 40 newtons/tonne. If the overall efficiency is 80%, calculate (i) the maximum power output from the driving axles (ii) the specific energy consumption in watt-hr/tonne-km. [8M]

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	" Torque in a shunt motor varies with the armature current" –Justify	[4M]
	b)	What are various types of electric braking used?	[4M]
	c)	Discuss the various losses that occur in insulating materials	[4M]
	d)	Define i)Mean hemispherical Candlepower ii) Mean spherical Candlepower.	[3M]
	e)	What is plugging.	[3M]
	f)	What is the principle of energy efficient motors.	[4M]

PART -B

2	a)	Compare and contrast the slip ring and squirrel cage induction motors from the application point of view.	[8M]
	b)	A series motor working on 500 V d.c supply runs at a speed of 1000 r.p.m. When The load current is 120 amp. The resistance of the motor 0.15 ohm, of which 0.04 ohm is the resistance of the field. Calculate the speed of the motor when the torque is half of the full load torque and the field winding is connected in parallel with a diverter of resistance 0.08 ohm, assuming an unsaturated magnetic circuit.	[8M]
3	a)	What are the causes of failure in heating elements?	[5M]
	b)	Six resistances each of 40 ohms are used as heating elements in furnace. Find the power of the furnace for various connections to a three phase 230V supply.	[6M]
	c)	An electric arc furnace consuming 5kW takes 15 minutes to just melt 1.5kg of aluminum, the initial temperature being 15^{o} C. Find the efficiency of the furnace. Specific heat of aluminum is 0.212, melting point 658^{o} C and latent heat of fusion is76.8 cal per gram.	[5M]
4	a)	State and explain laws of Illumination.	[8M]
	b)	A lamp of 500 candle power is placed at the centre of a room, 20m×10m×5m. Calculate the illumination in each corner of the floor and a point in the middle of a 10m wall at a height of 2m from floor.	[8M]
5		Give the construction and working of the following types of lamps: (a) Arc lamp (b) Neon lamp (c) Sodium lamp	[16M]

6 a) For a trapezoidal speed-time curve of an electric train, derive expression for maximum speed and distance between stops. [10M]

b) A train is to be run between two stations 5kms apart at an average speed of 50km/hr. If the maximum speed is to be limited to 70km/hr, acceleration to 2km/hr/sec, braking retardation to 4km/hr/sec and coasting retardation to 0.1km/hr/sec, determine the speed at the end of coasting, duration of coasting period and braking period. [6M]

7 a) Write short notes on sub-traction for single-phase A.C systems. [6M]

b) An electric locomotive is required to haul a train of 12 coaches each weighing 30 tonne on the main line service requiring an initial acceleration of 0.8km/hr/sec up a gradient of 1 in 100. Estimate the adhesive weight and hence the number of driving axles the locomotive must have, if the permissible axle loading is 20 tonne per axle. Assuming for rotational inertia to be 4%, for the coaches and 15% for the locomotive. Maximum coefficient of adhesion is 0.2 and the tractive resistance 5kg/tonne. [10M]

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Code No:RT32023 **R13** SET - 3

III B. Tech II Semester Regular Examinations, April - 2016

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Maximum Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	What do you mean by "Individual drive" and" Group drive".	[4M]
	b)	Define Horizontal polar curve and vertical polar curve.	[4M]
	c)	What are the advantages of radiant heating?	[3M]
	d)	Discuss inverse square law.	[3M]
	e)	What are the advantages and disadvantages of electrification of track?	[4M]
	f)	Discuss why a D.C series motor is ideally suited for traction services.	[4M]

PART -B

2	a)	Though a.c. is superior to d.c. for electric drives, sometimes d.c. is preferred. Give the reasons and mention some of the applications.	[8M]
	b)	A d.c. series motor drives a load, the torque of which varies as the square of the speed. The motor takes current of 30 amps, when the speed is 600 r.p.m. Determine the speed and current when the field winding is shunted by a diverter, the resistance of which is 1.5 times that of the field winding. The losses may be neglected.	[8M]
3	a)	What are various types of electric braking used?	[8M]
	b)	Explain how rheostatic braking is done in D.C. shunt motors and series motors.	[8M]
4		Write short notes on :	[8M]
	a)	High pressure mercury vapour lamp	
	b)	Mercury fluorescent lamp.	[8M]
5	a)	Explain the various types of lighting schemes with relevant diagrams.	[10M]
	b)	Briefly explain the various laboratory standards used in Illumination.	[6M]
6		Write a brief notes on the single phase a.c. series motor and comment upon it's suitability for traction services. How is it performance compared with the d.c. series motor?	[16M]
7	a)	Explain the specific energy consumption for given run.	[8M]
	b)	An electric train weighing 200 tonne has 8 motors geared to driving wheels, each wheel is of 80cms diameter. Determine the torque developed by each motor to accelerate the train to a speed of 48km/hr in 30seconds up a gradient of 1 in 200. The tractive resistance of 50newtons/tonne, the effect of rotational inertia is 10% of the train weight, the gear ratio is 4 in 1 and gearing efficiency is 80%.	[8M]

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Code No: RT32023 **R13** SET - 4

III B. Tech II Semester Regular Examinations, April - 2016

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	What are the various factors that govern the choice of a motor for a given service?	[3M]
	b)	What are different methods of heat transfer?	[4M]
	c)	Define: i) Luminous intensity, ii) Luminous Flux.	[4M]
	d)	Give some applications of induction heating.	[3M]
	e)	What are the requirements of an ideal traction system?	[4M]
	f)	Define specific energy output and specific energy consumption.	[4M]

PART -B

2	a)	Explain what do you mean by "Individual drive" and "Group drive ". Discuss their relative merits and demerits.	[8M]
	b)	A 500 V d.c. series motor runs at 500 r.p.m. and takes 60 amps. The resistances of the field and the armature are 0.3 and 0.2 Ohms, respectively. Calculate the value of the resistance to be shunted with the series field winding in order that the speed may be increased to 600 r.p.m., if the torque were to remain constant. Saturation may be neglected.	[8M]
3	a)	What are the factors to be considered for inductor design in induction heating?	[8M]
	b)	Give some applications of induction heating.	[8M]
4	a)	Explain with sketches the constructional features of a filament lamp.	[10M]
	b)	A lamp of 500 candle power is placed at the centre of a room, 20m x 10m x 5m. Calculate the illumination in each corner of the floor and a point in the middle of a 10m wall at a height of 2m from floor.	[6M]
5	a)	Discuss the flood lighting with suitable diagrams.	[6M]
	b)	Along the center of a line of a corridor, number of lamps is fitted with reflectors. The distance between the two adjacent lamps is 7.5cm and the height of each lamp from the floor is 5m. The candlepower of each lamp is 100 in all directions below the horizontal. Determine the maximum and minimum illumination along the centerline of the floor and draw a graph showing the variation of the illumination along this line between the two lamps.	[10M]

6 a) Draw the speed-time curve of a suburban service train and explain [8M]

b) A train accelerates to a speed of 48km/hr in 24sec. Then it coasts for 69sec under a constant resistance of 58 newton / tonne and brakes are applied at 3.3km/hr/sec in 11sec. calculate (i) the acceleration (ii) the coasting retardation (iii) the scheduled speed if station stoppage is 20secs. What is the effect of scheduled speed if station stoppage is reduced to 15sec duration, other conditions remaining same? Allow 10% for rotational inertia. [8M]

7 a) Explain dead weight, accelerating weight and train resistance referred to traction. [6M]

b) An electric locomotive of 100 tonne can just accelerate a train of 500 tonne (trailing weight) with an acceleration of 1km/hr/sec on an up gradient 1 in 1000. Tractive resistance of the track is 45 newton/tonne and the rotational inertia is 10%. If this locomotive is helped by another locomotive of 120 tonne, find [10M]

i) the trailing weight that can be hauled up the same gradient, under the same condition

ii) the maximum gradient, the trailing hauled load remaining unchanged. Assume adhesive weight expressed as percentage of total dead weight to be same for both the locomotives.

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