Code No: RR320206 **Set No. 1**

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
UTILISATION OF ELECTRICAL ENERGY
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (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. [8]
   (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. [8]

2. (a) Derive an expression for the time-dependent temperature as the electrical apparatus cools, in terms of the cooling time constant. [8]
   (b) A 60 h.p. motor has a final temperature rise of 45 degrees C on continuous full load. Its heating and cooling time constants are 100 and 150 minutes, respectively. The load cycle is as follows:
   20 minutes at a certain load and 40 minutes on no-load.
   Find the rating of the motor. [8]

3. (a) Explain about various losses in Resistance oven. Write the expression for efficiency of resistance oven. [8]
   (b) A 50KW, 3 phase, 440V, resistance oven is to provide nichrome strip 0.3mm thick for the three phase star connected heating elements. If the temperature of the wire is to be 1500^0C and that of charge is to be 1000^0C, calculate the suitable width of the strip. Assume emmissivity=0.91 and radiation efficiency = 0.6. [8]

4. (a) Explain how rheostatic braking is done in case of induction motors and shunt motors. [8]
   (b) Give the characteristics of D.C. shunt motors used in traction. [8]

5. (a) Compare a tungsten filament lamp with fluorescent lamp in detail. [8]
   (b) Explain with sketches the constructional features of a filament lamp. [8]

6. (a) Discuss about street lighting. [8]
   (b) Compare in detail the various features of industrial lighting and domestic lighting. [8]

7. (a) Discuss relative merrits of [8]
      i. 1500 Volts D.C

ii. 25 KV
single phase 50 Hz rectifier locomotive system for the main line electrification of a railway in an industrial belt where a grid net work exists.

(b) Describe briefly with the help of neat sketch the single and double cater many over head line construction for railways. [8]

8. (a) An electric locomotive is required to haul a train of 12 coaches each weighing 30 tonnes 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 tonnes 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. [8]

(b) An electric train weighing 200 tonnes 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%. [8]

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Code No: RR320206 **Set No. 2**

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
UTILISATION OF ELECTRICAL ENERGY
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) " If a high degree of speed control is required, d.c. is preferable to a.c. for an electric drive" -Justify. [6]
   (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 stalling torque to the full load torque.And derive the expression used. [10]

2. (a) Draw and explain the output vs. time characteristics of any three types of loads. [8]
   (b) A motor has the following duty cycle:
   Load rising from 200 to 400 h.p. — 4 minutes
   Uniform load 300 h.p. — 2 minutes
   Regenerative braking h.p. Returned to supply from 50 to zero —1 minute.
   Remains idle for 1 minute.
   Estimate the h.p. of the motor. [8]

3. (a) What are the different types of heating? Write advantages of electric heating. [8]
   (b) A low frequency induction furnace whose secondary voltage is maintained constant at 12Volts takes 300Kw at 0.65p.f. When the heat of the charge and reactance remains constant, find the height upto which the hearth should be filled to obtain maximum heat. [8]

4. (a) What are the requirements of an ideal traction system? [8]
   (b) What are the advantages and disadvantages of electric traction? [8]

5. (a) Explain how the determination of Mean horizontal luminous intensity and polar curve is made. [8]
   (b) Find the height which a light having uniform spherical distribution should be placed over a floor in order that the intensity of horizontal illumination at a given distance from its vertical line may be greatest. [8]

6. (a) Define [8]
      i. Luminous intensity.
      ii. Point source
      iii. Lumen and
      iv. Uniform point source

(b) Prove that Luminous intensity of a point source is equal to the luminous flux per unit solid angle. [8]

7. (a) Discuss relative merrits of [8]
   i. 1500 Volts D.C
   ii. 25 KV
   single phase 50 Hz rectifier locomotive system for the main line electrification of a railway in an industrial belt where a grid net work exists.

   (b) Describe briefly with the help of neat sketch the single and double cater many over head line construction for railways. [8]

8. (a) An electric locomotive is required to haul a train of 12 coaches each weighing 30 tonnes 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 tonnes 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. [8]

   (b) An electric train weighing 200 tonnes 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%. [8]

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Code No: RR320206 **Set No. 3**

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
UTILISATION OF ELECTRICAL ENERGY
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss the various factors that govern the choice of a motor for a given service. [8]
   (b) A 6 pole, 50 Hz slip ring induction motor with a rotor resistance per phase of 0.2 Ohm and a standstill reactance of 1.0 Ohm per phase runs at 960 r.p.m. at full load. Calculate the resistance to be inserted in the rotor circuit to reduce the speed to 800 r.p.m., if the torque remains unaltered. [8]

2. (a) Derive an expression for the temperature rise of an equipment in terms of the heating time constant. [8]
   (b) At full load of 10 h.p., the temperature rise of a motor is 25 degrees C after one hour, and 40 degrees C after 2 hours. Find the final temperature rise on full load. Assume that the iron losses are 80% of full load copper losses. [8]

3. (a) Give relative advantages and disadvantages of direct and indirect electric arc furnaces. [8]
   (b) An electric arc furnace consuming 5KW takes 15 minutes to just melt 1.5Kgs of aluminum, the initial temperature being 15^oC. Find the efficiency of the furnace. Specific heat of aluminum is 0.212, melting point 658^oC and latent heat of fusion is76.8Cal per gram. [8]

4. (a) What are the requirements of good electric braking? [6]
   (b) Explain the method of rheostatic braking. [10]

5. (a) State the laws of Illumination. [6]
   (b) Explain the laws with the help of suitable diagrams, and derive an equation of the same. [10]

6. (a) Discuss about flood lighting in detail. [8]
   (b) A drawing hall $30m \times 13m$ with a ceiling height of 5m is to be provided with a general illumination of 120 lux. Taking a coefficient of utilization of 0.5 and depreciation factor of 1.4, determine the number of fluorescent tubes required, their spacing mounting height and total wattage. Taking luminous efficiency of fluorescent tube as 40 lumens/watt for 80watt tube. [8]

7. (a) Review the various systems of traction work. [8]
   (b) Write short notes on sub-traction for single-phase A.C systems. [8]

8. (a) A train maintains the scheduled speed of V_s= 40km/hr while running the distance of 3.2km with 30sec stops. It accelerates at 2.4 km/hr/sec and brakes at 3.6km/hr/sec.
Assuming a simplified trapezoidal speed-time curve, calculate [8]
   i. the maximum speed
   ii. average energy output of the motor in watt-hr/tonne-km,
   if the tractive resistance averages 45newtons/tonne and additional rotational inertia 8%.

   (b) Derive expression for the specific energy output for a trapezoidal speed-time run of an electric train. Also write the factors affecting specific energy consumption. [8]

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Code No: RR320206 **Set No. 4**

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
UTILISATION OF ELECTRICAL ENERGY
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Compare and contrast the slip ring and squirrel cage induction motors from the application point of view. [6]
   (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 amps. 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. [10]

2. (a) Discuss the various modes of heat dissipation. [6]
   (b) A motor driving a load has to deliver a load rising uniformly from zero to a maximum of 2000 h.p. in 20 sec during the acceleration period, 1000 h.p. for 40 sec during the full speed period and during the deceleration period of 10 sec when regenerating braking is taking place the h.p. returned to the supply falls from 330 to zero. The interval for decking before the next load cycle starts is 20 sec. Estimate the horse power rating of the motor. [10]

3. (a) Explain the principle of Induction heating, What are the applications of induction heating? [8]
   (b) With a neat sketch explain the working principle of coreless type induction furnace. [8]

4. (a) What are various types of electric braking used? [8]
   (b) Explain how rheostatic braking is done in D.C. shunt motors and series motors. [8]

5. (a) Discuss inverse square law & cosine law of Illumination. [6]
   (b) A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 metres 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 [10]
      i. the total light received
      ii. Average illumination of the disc
      iii. Average c.p. of the source

6. (a) Explain in detail the inverse square law. [6]

(b) What are the various types of lighting schemes. Explain with relevant diagrams. [10]

7. (a) What are the advantages and disadvantages of track electrification. [8]

   (b) Discuss why a D.C series motor is ideally suited for traction services. [8]

8. (a) Derive expression for the tractive effort for a train on a level track. [8]

   (b) The maximum speed of a suburban electric train is 60km/hr. Its scheduled speed is 40km/hr and duration of stops is 30sec. If the acceleration is 2km/hr/sec and distance between stops is 2kms, determine the retardation. [8]

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