Code :R7420201 **1**

IV B.Tech II Semester(R07) Regular Examinations, April 2011
UTILIZATION OF ELECTRICAL ENERGY
(Electrical & Electronics Engineering)

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

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain what you mean by "Individual drive" and "Group drive". Discuss their relative merits and demerits.
   (b) A 500V series motor runs at 500 r.p.m. and takes 70amps. Resistances of field and armature are 0.3 and 0.2 ohms respectively. Calculate the value of the diverter resistance so as to give speed of 600 rpm for the load conditions when torque remains constant and magnetic field remains unsaturated.
2. (a) Explain the principle of Induction heating. What are the applications of induction heating?
   (b) With a neat sketch explain the working principle of coreless type induction furnace.
3. (a) Describe with a neat sketches the various methods of electric resistance welding. Give merits and demerits with respect to arc welding.
   (b) What are the important components of DC and AC welding sets and explain their working.
4. (a) What do you understand by polar curves as applicable to light source? Explain.
   (b) Explain the measurement techniques used for luminous intensity.
5. (a) State and describe various types of lighting schemes.
   (b) What do you understand by discharge lamp? Explain the construction and working of high pressure mercury lamp.
6. (a) Explain why a DC series motor is ideally suited for traction purposes.
   (b) State the condition under which regenerative braking with DC series motor is possible. With the aid of diagrams of connection, explain the various methods of providing regeneration.
7. (a) Draw the speed-time curve of a main line service and explain.
   (b) A train has a scheduled speed of 40km/hr. between two stops, which are 4km apart. Determine the crest speed over the run, if the duration of stops is 60 sec and acceleration and retardation both are 2km/hr/sec each. Assume simplified trapezoidal speed-time curve.
8. (a) Define specific energy output and specific energy consumption.
   (b) An electric locomotive of 100 tonnes can just accelerate a train of 500 tonnes (trailing weight) with an acceleration of 1km/hr/sec on an up gradient 1 in 1000. Tractive resistance of the track is 45 newtons/tonne and the rotational inertia is 10%. If this locomotive is helped by another locomotive of 120 tonnes, find
      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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Code :R7420201 **2**

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

Answer any FIVE questions
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1. (a) Discuss the advantages and disadvantages of electric drive over other drives.
   (b) A 220v, 10 h.p (metric) shunt motor has field and armature resistances of 120 hms and 0.25 ohm, respectively. Calculate the resistance to be inserted in the armature circuit to reduce the speed to 700 r.p.m from 950 r.p.m if the full load efficiency is 80% and the torque varies as the square of the speed.

2. (a) Give relative advantages and disadvantages of direct and indirect electric arc furnaces.
   (b) An electric arc furnace consuming 5KW takes 15 minutes to just melt 1.5 kgs of aluminum, the initial temperature being 15^0C. Find the efficiency of the furnace. Specific heat of aluminum is 0.212, melting point 658^0C and latent heat of fusion is 76.8 cal per gram.

3. (a) What are the advantages and disadvantages of electric welding processes.
   (b) Describe with a neat sketches, various methods of electric resistance welding.

4. (a) State the laws of illumination. Explain the laws with the help of suitable diagrams, and derive an equation of the same.
   (b) A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 meters in diameter. The illumination of the disc increases uniformly from 0.5 metrecandle at the edge to 2 metercandle at the centre. Determine.
      i. The total light received.
      ii. Average illumination of the disc
      iii. Average C.P of the source.

5. (a) Explain with connection diagram the operation of the fluorescent lamp and state its advantages.
   (b) Enumerate the various factors, which have to be considered while designing any lighting scheme.

6. (a) What are the advantages and disadvantages of track electrification.
   (b) Discuss why a D.C series motor is ideally suited for traction services.

7. (a) What do you understand by speed-time curves? What is its use in practice?
   (b) Derive a simple expression for the maximum power output of traction motors in terms of tractive effort, maximum speed and efficiency of transmission gear.

8. (a) Derive an expression for specific energy output on level track using a simplified speed-time curve. What purpose is achieved by this quantity?
   (b) A 400 tonne goods train is to be hauled by a locomotive up a gradient of 2% with acceleration of 1km/hr/sec. coefficient of adhesion 20% track resistance 40 newtons/tonne and effective rotating masses 10% of the dead weight. Find the weight of the locomotive and the number of axles if the axle load is not to increase beyond 22 tonnes.

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Code :R7420201 **3**

IV B.Tech II Semester(R07) Regular Examinations, April 2011
UTILIZATION OF ELECTRICAL ENERGY
(Electrical & Electronics Engineering)

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

Answer any FIVE questions
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1. (a) Discuss various factors that govern the choice of a motor for a given service.
   (b) A three phase 400v, 50 c.p.s, 4 pole induction motor, stator and rotor star connected, has rotor resistance of 0.3 ohm and standstill reactance of 1 ohm. Ratio of stator to rotor turns is 1.25. If the full load slip is 4% calculate the following.
   a). Torque developed b) h.p developed c) Ratio of
      i. Starting torque to maximum torque
      ii. Maximum torque to full load torque
      iii. Starting torque to full load torque
      iv. Speed at which maximum torque takes place.

2. (a) What are the applications of high frequency eddy current heating ? Also explain the principle of high frequency eddy current heating.
   (b) A 20 K/N single phase 220v resistance oven employs a circular nichrome wire for its heating element. If wire temperature is not to exceed 1170^0C and temperature of charge is to be 500^0C. Calculate diameter and the length of wire. Take K=0.57, e=0.95, and s=1.09μ ohm-m. What would be the temperature of the element when charge is cold.

3. (a) Compare AC welding processes with DC welding processes.
   (b) What is the fundamental difference between electric arc welding and resistance welding? Explain with a neat sketch how the spot welding is carried out spot welding machine.

4. Define:
   (a) Luminous flux
   (b) Illumination
   (c) Luminance
   (d) Luminous intensity.

5. (a) Discuss the flood lighting with suitable diagrams.
   (b) Prove that in a filament lamp the diameter of the filament is directly proportional to $I^{2/3}$, where I is the current flowing in the filament.

6. Write a brief note on the single phase AC series motor and comment upon its suitability for traction derives. How does it compare in performance with the DC series motor?

7. (a) For a quadrilateral speed-time curve of an electric train, device expression for the distance between stops and speed at the end of the coasting period.
   (b) Draw the speed time curve of a main line service and explain how it works.

8. (a) Derive an expression for tractive effort for a train on a level track.
   (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.

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Code :R7420201 4

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1. (a) Discuss the various factors that govern the choice of a motor for a given service.
   (b) A $3-\theta$, 400v, 50 C.P.S., 4 pole induction motor, stator and rotor star connected, has rotor resistance of 0.3Ω and stand still reactance of 1Ω . Ratio of stator to rotor turns is 1.25. if the full load slip is 4% calculate the following.
   a. Toque developed.
   b. H.P developed.
   c. Ratio of
      i. Starting torque to maximum torque
      ii. Maximum torque to full load torque
      iii. Starting torque to full load torque
      iv. Speed at which maximum torque takes place.
2. (a) What are the different types of heating? Write advantages of electric heating.
   (b) What are different methods of heat transfer? Explain in brief.
   (c) Describe the various types of electric heating equipment.
3. (a) What are the basic components of AC and DC welding sets and explain their working?
   (b) Describe briefly the various types of are welding processes used in industry.
4. (a) Explain how the determination of mean horizontal luminous intensity and polar curve is made.
   (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.
5. (a) Compare a tungsten filament lamp with fluorescent lamp in detail.
   (b) Explain with sketches the constructional features of a filament.
6. Describe how plugging. Rheostatic braking and regenerative braking are employed with DC series motor.
7. (a) 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.
   (b) 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.
8. (a) Derive an expression for specific energy output on level tracks using a simplified speed-time curve. What purpose is achieved by this quantity?
   (b) A 400 tonne goods train is to be hauled by a locomotive up a gradient of 2% with acceleration of 1km/hr/sec, co-efficient of adhesion 20% tracks resistance 4 newtons/tonne and effective rotating masses 10% of the dead weight. Find the weight of the locomotive and the number of axles if the axle load is not to increase beyond 22 tonnes.

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