

**III B.Tech II Semester Supplementary Examinations, Apr/May 2006**  
**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 advantages and disadvantages of electric drive over other drives. [8]  
(b) A 220 V, 10 h.p. (metric) shunt motor has field and armature resistances of 120 Ohms 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. [8]
2. (a) Discuss the various losses that occur in insulating materials and how they can be reduced. [6]  
(b) A motor has the following load cycle:  
Accelerating period 0 -15 sec Load rising uniformly from 0 to 1000 h.p  
Full speed period 15-85 sec Load constant at 600 h.p.  
Decelerating period 85-100 sec H.p. returned to line falls uniformly from 200 to zero  
Decking period 100-120 sec Motor is stationary.  
Estimate the size of the motor. [10]
3. (a) What are the causes of failure in heating elements? [8]  
(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. [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) 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) Enumerate various factors which have to be considered while designing any lighting scheme [7]  
(b) Six lamps are used to illuminate a certain room. If the luminous efficiency of each lamp is 11 lumens/watt and the lamps have to emit a total flux of 10,000 lumens, calculate [9]
  - i. the mean spherical luminous intensity
  - ii. the cost of energy consumed in 4hours if the charge for electrical energy is 50 paise per unit.

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) 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  $0.8 \text{ km/hr/sec}$  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  $5 \text{ kg/tonne}$ . [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  $48 \text{ km/hr}$  in 30seconds up a gradient of 1 in 200. The tractive resistance of  $50 \text{ newtons/tonne}$ , 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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