

**III B.Tech II Semester Supplementary Examinations,
November/December 2005
UTILISATION OF ELECTRICAL ENERGY
(Electrical & Electronic Engineering)**

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

**Answer any FIVE Questions
All Questions carry equal marks**

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. Write short notes on
(a) High pressure mercury vapour lamp [8]
 - i. M.A Type
 - ii. M.T.Type
(b) Mercury fluorescent lamp [8]
6. (a) Discuss about street lighting. [8]
(b) Compare in detail the various features of industrial lighting and domestic lighting. [8]

7. State the condition under which regenerative braking with d.c. series motor is possible and explain with the help of circuit diagram. Also explain the various methods of providing regeneration. [16]
8. (a) For a trapezoidal speed-time curve of an electric train, derive expression for maximum speed and distance between stops. [8]
- (b) A mail 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. [8]

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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) 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) 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°C . Find the efficiency of the furnace. Specific heat of aluminum is 0.212, melting point 658°C and latent heat of fusion is 76.8 Cal per gram. [8]
4. (a) What are the various types of motors used for electric traction? [8]
(b) What are the criteria followed for selection of motors for electric drive? [8]
5. Define [4x4=16]
 - (a) Mean spherical Candlepower
 - (b) Mean horizontal Candlepower
 - (c) Mean hemispherical Candlepower
 - (d) Luminous flux.
6. (a) Discuss about street lighting. [8]
(b) Compare in detail the various features of industrial lighting and domestic lighting. [8]

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) Draw the speed-time curve of a main line service and explain how it works. [8]
(b) A train has a scheduled speed of 40km/hr between two stops, which are 4 kms 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]

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1. (a) Why and where is an individual drive recommended. [8]
(b) The speed of a 15 h.p. (Metric) 400 V d.c. Shunt motor is to be reduced by 25% by the use of a controller. The field current is 2.5 amps and the armature resistance is 0.5 Ohm. Calculate the resistance of the controller, if the torque remains constant and the efficiency is 82%. [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) Explain in brief how heating is done in the following cases? [8]
 - i. Resistance heating,
 - ii. Induction heating
 - iii. Dielectric heating.
(b) 90Kg of tin is to smelt during an hour in smelting furnace. Determine the suitable rating of the furnace, if smelting temperature = 230°C , specific heat = 0.055, latent heat of liquidification is 13.3 Kcal/Kg. Take the initial temperature of the metal as 35°C . [8]
4. (a) Why electric traction is preferred to other types of traction? [6]
(b) Explain the following electric braking methods. [10]
 - i. Plugging
 - ii. Rheostatic braking
 - iii. Regenerative braking.
5. (a) Explain the measurement techniques used for luminous intensity. [8]
(b) Write short notes on: [8]
 - i. Bunsen photometer head
 - ii. Lummer - Brodherm photometer head

iii. Flicker photometer head.

6. (a) What are the various types of lighting schemes? Explain with a neat sketch. [8]
 (b) Discuss the various factors that determine the design considerations for any lighting installation. [8]
7. (a) Write short notes on Rheostatic braking of D.C series motor. [8]
 (b) A 525 V series traction motor has the following characteristics. [8]

CURRENT(A)	50	70	80	90
SPEED (K.M.P)	33.8	26.9	25.1	23.8
TORQUE(NW-M)	216	344	422	500

Plot its characteristics & determine the current when working as a generator at 30 kmp & located with $250\ \Omega$ resistor. The resistance of the motor is 0.25Ω .

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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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) 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
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(b) Write short notes on: [8]
 - i. Bunsen photometer head
 - ii. Lummer - Brodherm photometer head
 - iii. Flicker photometer head.
6. (a) Compare between filament lamp & Fluorescent tube. [8]
(b) The candle power of a lamp in all directions below the horizontal is 200. If this lamp is suspended 2mts above the center of a square table of 1 m side, determine the maximum and minimum illumination. [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) 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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