

Code: EE5T3

**III B.Tech - I Semester – Regular/Supplementary Examinations
MARCH - 2021**

**UTILIZATION OF ELECTRICAL ENERGY
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

1.

- a) Mention two factors that govern the choice of a motor for a given service.
- b) Mention the significance of temperature rise in electric drives.
- c) List any two advantages of electric heating.
- d) State the principle of dielectric heating.
- e) Define Mean spherical Candlepower.
- f) Define Incandescence.
- g) Define specific energy output.
- h) List any two characteristics of speed time curves.
- i) Define plugging.
- j) Define tractive effort.
- k) List any two uses of polar curves.

PART – B

Answer any *THREE* questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) Explain different types of drives. 8 M

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 M

3. a) Discuss any one method of resistance welding in detail with the help of a neat sketch. 8 M

b) With a neat sketch explain the working principle of coreless type induction furnace. 8 M

4. a) Discuss inverse square law & cosine law of Illumination. 8 M

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:

i) the total light received

- ii) Average illumination of the disc
- iii) Average c.p. of the source 8 M
5. a) Discuss the merits and demerits of the D.C and 1 - ϕ A.C systems for the main and suburban line electrification of the railways. 8 M
- b) Draw the speed-time curve of a main line service and explain how it works. 8 M
6. 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 rotational inertia to be 4%, for the coaches and 15% for the locomotive. Maximum coefficient of adhesion is 0.2 and the tractive resistance is 5kg/tonne. 8 M
- 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. 8 M