S - 2142

Seat No.	

Total No. of Pages : 3

B.E. (Electrical) (Part - IV) (Semester - VIII) Examination, November - 2015

ELECTRICAL UTILIZATION AND TRACTION

Sub. Code : 49428

Day and Date : Monday, 30 - 11 - 2015 **Total Marks : 100**

Time : 10.00 a.m. to 1.00 p.m.

Instructions : 1) Attempt any Three questions from each section.

2) Figures to right indicate full marks.

SECTION - I

Q1) a) Derive equation for speed at end of coasting in case of quadrilateral speed-time curve. **[8]**

b) A train is required to run between 2 stations 2 km apart at schedule speed of 36 km/h, duration of stops being 20 secs. Braking retardation is 2.7 km/h/s. Assuming trapezoidal speed-time curve, calculate acceleration if ratio of maximum speed to average speed is 1.2. **[8]**

Q2) a) Derive expression for total tractive effort required for propulsion of train. **[8]**

b) Electric train has average speed of 42 km/h on level track between stops 1.4 km apart. It is accelerated at 1.7 km/h/s and is braked at 3.3 km/h/s. Assuming tractive resistance as 50 N/t, allowing 10% for rotational inertia, and efficiency of motors 85%: **[8]**

i) Estimate specific energy consumption.

ii) Draw speed-time curve.

P.T.O.

Q3) Write short notes on any three : [18]

a) Speed-time curves.

b) Current collectors.

c) Multiple unit control.

d) Negative booster.

Q4) a) What is load equalization? How it is done with fly-wheel design? [8]

b) A 6-pole, 50 Hz, 3-phase wound rotor induction motor has flywheel coupled to its shaft. The total moment of inertia is 900 kg-m^2. Load torque is 900 Nm for 10 seconds followed by no-load period which is long enough for motor to reach its no-load speed. Motor has slip of 5% at torque of 450 Nm. Calculate : [8]

i) Maximum torque developed by motor.

ii) Speed at end of deceleration period.

SECTION - II

Q5) a) Explain suitability of d. c. Series motors for electric traction. [8]

b) Explain series-parallel control. Also find t_s, t_p and efficiency of starting using 2 d. C. motors. [8]

Q6) a) Explain different modes of heat transfer. [4]

b) Explain in brief methods of electric heating. [6]

c) Derive equations to find dimensions of heating element made of wires of circular cross-section as well as rectangular conducting ribbons. [6]

Q7) a) Explain principle of dielectric heating and its applications. [8]

b) A slab of insulating material 130 cm^2 in area and 1 cm thick is to be heated by dielectric heating. Power required is 380 W at 30 MHz. Material has relative permittivity of 5 and p.f. of 0.05. Absolute permittivity = 8.854×10^{-12} F/m. Determine necessary voltage. [8]

Q8) a) 27 kW, 3-phase, 400 V resistance oven is to employ nickel-chrome strip 0.25 mm thick for three star-connected heating elements. If temperature of strip is to be 1000°C and that of charge be 600°C estimate suitable width for strip. Assume emissivity = 0.9 and radiating efficiency to be 0.5 and resistivity of strip material is 101.6×10^{-8} Ωm. **[9]**

b) 500-tonne train travels down a gradient of 1 in 70 for 120 secs. during which period its speed is reduced from 80 km/h to 50 km/h by regenerative braking. Find energy returned to lines if tractive resistance is 49 N/tonne and allowance for rotational inertia is 7.5%. Overall efficiency of motor is 80%. **[9]**

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