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**Reg No.:**

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**Question Paper Code: 57303**

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Seventh Semester

Electrical and Electronics Engineering

15UEE703- ELECTRIC ENERGY UTILIZATION

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In braking, the motor works as a generator developing a \_\_\_\_\_ torque which opposes the motion CO1- R  
(a) Positive (b) Negative (c) Zero (d) None of the above
2. The drawbacks of rectifier fed dc drives includes CO1- R  
(a) High initial cost (b) Higher noise (c) Low power factor (d) Large weight
3. Polar curves represents the CO2- R  
(a) Luminous intensity (b) MHCP (c) Candle power (d) Luminous flux
4. The Lamberts cosine law is given by CO2- R  
(a)  $E_1/E_2=r_2^2/r_1^2$  (b)  $(I/d^2)*\text{Cos } \theta$  (c)  $r_2/r_1$  (d)  $r\text{cos}\theta$
5. Induction heating can be done using CO3- R  
(a) DC Supply (b) AC supply (c) AC and DC supply (d) Natural heating
6. The heat produced for the welding is given by CO3- R  
(a)  $IRt$  (b)  $IR$  (c)  $I^2Rt$  (d)  $I^2r$
7. The cost which depends upon maximum demand but is independent of units generated. CO4- R  
(a) Running cost (b) Total cost (c) Fixed cost (d) Semi fixed cost

8. By improving the power factor of the system, the kilowatts delivered by the generating station is CO4- R
- (a) Decreased                      (b) Increased                      (c) Remains constant                      (d) None of the above
9. The BLDC in Electric vehicle is preferred due to CO5- R
- (a) Decreased cost                      (b) Reliability                      (c) Low power range                      (d) Low speed
10. The Ultra capacitors finds application in switching in CO5- R
- (a) LV Lines                      (b) HVDC lines                      (c) EVs and HEV lines                      (d) DC lines

PART – B (5 x 2= 10 Marks)

11. What are the essential features (electrical) of an ideal traction motor? CO1- R
12. What are the requirements of lighting system? CO2- R
13. What is the basic principle of induction heating? CO3- R
14. What is Synchronous condenser? CO4- R
15. Illustrate the necessity of hybrid Electric drive CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) Draw a typical speed-time curve and explain its salient features. CO1-Ana (8)
- (ii) An electric train is accelerated at 1.5 kmphps and is braked at 3 kmphps. The train has an average speed of 45 kmph on a level track of 1500 meters between stations. Determine the maximum speed and distance traveled before applying brakes CO1-Ana (8)
- Or
- (b) (i) Compare the different types of supply systems used for electric traction. CO1-Ana (8)
- (ii) A locomotive accelerates a 350 tonne train up a gradient of 1 in 100 at 0.8 kmphps. Assuming coefficient of adhesion to be 0.25 determine the minimum adhesive weight of the locomotive. Assume train resistance 44.5 Newtons/tonne and allow 10% for rotational inertia. CO1-Ana (8)
17. (a) (i) State the Lamberts cosine law of illumination. CO2- U (8)
- (ii) A lamp of 500 C.P. is hung at the centre of a room 8 x 6 m<sup>2</sup> at a height of 3m from the floor. Calculate the maximum and minimum illumination produced and mention the places where it occurs. CO2- U (8)

Or

- (b) Explain the working of a sodium vapour lamp with in a neat sketch. CO2- U (16)
18. (a) A 5KW, 440volts, 3 phase resistance oven is to have a 3star connected nichrome strip of 0.3mm thick heating element. If the wire temperature is to be 1500°C and that of the charge 1000°C, estimate the suitable width of the strip. Resistivity of nichrome alloy is  $1.016 \times 10^{-6}$  .Assume the radiating efficiency and emissivity of the element as 0.6 and 0.91 respectively. CO3- U (16)

Or

- (b) Explain coreless type induction furnace in detail with suitable diagram. CO3- U (16)
19. (a) Write short notes on CO4- U (16)
- (i) Two-part tariff
  - (ii) Power factor tariff.
  - (iii) Three-part tariff.

Or

- (b) A factory takes a load of 200 kW at 0.85 p.f. lagging for 2500 hours per annum. The tariff is Rs 150 per kVA plus 5 paise per kWh consumed. If the p.f. is improved to 0.9 lagging by means of capacitors costing Rs 420 per kVAR and having a power loss of 100 W per kVA, calculate the annual saving effected by their use. Allow 10% per annum for interest and depreciation CO4- U (16)
20. (a) Explain the Traction motor characteristics of Electric vehicles. CO5- U (16)

Or

- (b) Illustrate the compressed and cryogenic liquid hydrogen storage systems. CO5- U (16)

