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**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, December 2017**

**Program : B.Tech - Electrical Engineering Semester – VII**  
**Subject (Course): Electrical Power Utilization & Traction Max. Marks : 100**  
**Course Code : ELECG 471 Duration : 3 Hrs**  
**No. of page/s : 2**

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**Section A ( Attempt All questions)**

1.	Write short notes on : (i) Electrical characteristics (ii) Mechanical characteristics of an electric motor .	[4]	CO1
2.	What are the advantages of composite system of traction employing 25 kV A.C. supply and D.C. traction motors	[4]	CO2
3.	Mention the advantages and application of dielectric heating	[4]	CO3
4.	What is the fundamental difference between electric arc welding and resistance welding ?	[4]	CO3
5.	A small assembly shop 16 m long , 10 m wide , and 3 m upto trusses is to be illuminated to a level of 200 lux . The utilization and maintenance factors are 0.74 and 0.8 respectively Calculate the number of lamps required to illuminate the whole area if the lumen output of the lamp selected is 3000 lumens	[4]	CO4
<b>SECTION B</b>			
6.	Explain the speed-time curves of a train running on main line . Define ‘crest speed’ , average speed’ and ‘schedule speed’ . Derive an expression for Maximum speed ( $V_m$ ) How to get the value of acceleration ( $\alpha$ ) and retardation ( $\beta$ ) if $V_a$ and Distance travelled (D) are given .	[10]	CO2
7.	A 4 – pole 250 V series motor takes 20 A and runs at 900 r.p. . Each field coil has got a	[10]	CO1

	resistance of $0.025 \Omega$ and the armature is of $0.1\Omega$ . At what speed the motor will run developing the same torque with $5 \Omega$ resistance in parallel with the armature . Assume unsaturated magnetic operation .		
8.	A 100 kg of tin is to be smelted during an hour in a smelting furnace . Determine the suitable rating of the furnace , if smelting temperature of tin = $235^{\circ} \text{C}$ , specific heat = $0.055$ , latent heat of liquidification = $13.3 \text{ k cal/kg}$ . Take the initial temperature of the metal as $35^{\circ}\text{C}$	[10]	CO3
9.	Discuss the various factors which have to be considered while designing any lighting scheme .	[10]	CO4
OR	OR		
9	A lamp of 500 candle power is placed at the centre of a room $20 \text{ m} \times 10 \text{ m} \times 5 \text{ m}$ .Calculate the illumination in each corner of the floor and a point in the middle of a $10 \text{ m}$ wall at a height of $2 \text{ m}$ from floor .	[10]	CO4
<b>SECTION C (Attempt any Two Questions)</b>			
10(a)	Explain how an induction motor is brought to stop by (a) plugging and (b) dynamic braking	[5+5]	CO1
10(b)	A $10 \text{ kW}$ motor has a heating time constant and cooling time constant of $45$ and $70 \text{ min}$ respectively . The final temperature attained is $60^{\circ} \text{C}$ . Find the temperature of motor after $45 \text{ min}$ full-load run and then switched off for $30 \text{ min}$		CO1
11(a)	Explain construction and working of Sodium Vapour Lamp with neat diagram .	[10]	CO4
11(b)	Discuss the methods of temperature control of resistance ovens	[10]	CO3
12	Write in short (i) main elements of Refrigeration systems (ii) Continuous maximum rating of motor . (iii) speed control of Induction motor by injecting e.m.f. into rotor circuit. (iv) Electrical Seam welder used in steel industry	[5X4]	CO3 CO1 CO1 CO3

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<b>Program</b>	: <b>B.Tech - Electrical Engineering</b>	<b>Semester – VII</b>
<b>Subject (Course):</b>	: <b>Electrical Power &amp; Utilization</b>	<b>Max. Marks : 100</b>
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<b>Section A ( Attempt All questions)</b>			
1.	Explain various factors that effect the final temperature rise of the motor on load .	<b>[4]</b>	<b>CO1</b>
2.	Enumerate the desirable properties of Traction Motors .	<b>[4]</b>	<b>CO2</b>
3.	Discuss the relative merits and demerits of direct and indirect arc furnace .	<b>[4]</b>	<b>CO3</b>
4.	Define squeeze time , weld time , hold time in relation to electric welding process .	<b>[4]</b>	<b>CO3</b>
5.	Define following terms with reference to lighting scheme Illumination , lumens , utilization factor and space height ratio .	<b>[4]</b>	<b>CO4</b>
<b>SECTION B</b>			
6.	A 75 kW , 415V , 4-pole , 3 – phase , 50 Hz induction motor is delivering rated torque at 5 % slip driving a pump load . The motor delivers maximum torque at 10 % slip . A 3 – phase A.C. regulator controls the r.m.s. supply voltage to effect limited speed control .Assume the torque speed characteristics of the motor in the stable region to be linear . Calculate the r.m.s. voltage at which motor runs at 1350 r.p.m. ( For pump load assuming that the torque varies as the speed)	<b>[10]</b>	<b>CO1</b>
7.	A suburban train runs with an average speed of 36 kmph between two stations 1.8 km apart . Values of acceleration and retardation are 1.8km/h/s and 3.6 km/h/s . Calculate the maximum speed of the train assuming trapezoidal speed-time curve .	<b>[10]</b>	<b>CO2</b>
8.	What are the factors which decide the frequency and voltage of the dielectric heating ? Derive an expression for the heat produced in a dielectric material .	<b>[10]</b>	<b>CO3</b>
9.	(i) State the laws of Illumination . (ii) Derive the relation to find the illumination at any point on the plane surface due to	<b>[5+5]</b>	<b>CO4</b>

	light source suspended at height h from the plane surface ..		
OR			
9.	Two similar lamps having uniform intensity 500 CP in all directions below the horizontal are mounted at a height of 4 m . What must be the maximum spacing between the lamps so that the illumination on the ground midway between the lamps shall be at least one-half the illuminations directly under the lamps .	[10]	CO4
<b>SECTION C (Attempt any Two Questions)</b>			
10.(a)	Draw the heating and cooling curves of a motor and give the meaning of heating and cooling time constants .	[10]	CO1
10(b)	A 4 – pole 250 V series motor takes 20 A and runs at 900 r.p. . Each field coil has got a resistance of 0.025 $\Omega$ and the armature is of 0.1 $\Omega$ . At what speed the motor will run developing the same toque when a field diverter of resistance 0.2 $\Omega$ is connected in parallel with the series field . Assume unsaturated magnetic operation .	[10]	CO1
11(a)	Explain construction and working of High Pressure Mercury Vapour Lamp with neat diagram	[10]	CO4
11(b)	A 20 kW , 3 – phase , 400 V resistance oven is to employ nickel-chrome strip 0.254 mm thick for the three star – connected heating elements . If the wire temperature is to be 1100 $^{\circ}$ C and that of charge to be 700 $^{\circ}$ C , estimate a suitable width for the strip . Assume emissivity = 0.9 and radiating efficiency to be 0.5 and resistivity of the strip material is 101.6 X 10 $^{-8}$ $\Omega$ m	[10]	CO3
12	Write in short (i) main characteristics feature of an air-refrigeration system . (ii) Short time rating and Intermittent rating of motor (iii) Characteristics of 3-phase , wound rotor induction motor . (iv) Electrical Spot welding.	[5 X 4]	CO3 CO1 CO1 CO3

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