

BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING EXAMINATION, 2018
 (3rd Year, 2nd Semester)
ELECTRICAL UTILIZATION AND ILLUMINATION ENGINEERING

Time: Three Hours

Full Marks: 100

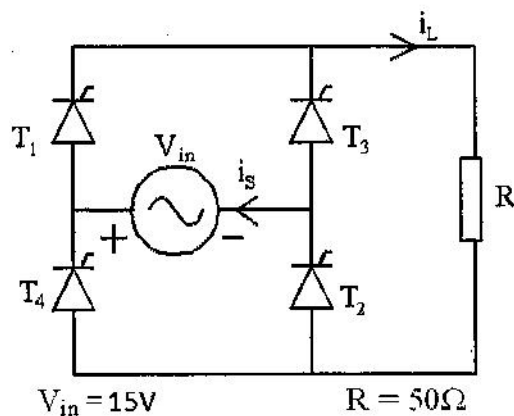
Use a separate Answer-Script for each part
PART – I (50 marks)

Question no. 1 is compulsory.

1. (a) Discuss the starting process of a salt bath furnace. 4
- (b) What are the differences between integral cycle control and integral control for a heating process? 4
- (c) In a single phase 220V resistance oven the wire temperature is controlled by series parallel combinations of two nichrome coils, each of 8.5 m length and 0.312 cm conductor dia. Determine the different option of oven temperature. Maximum temperature of the wire is 1175°C. Take, $K=0.57$, $e=0.95$, $\rho=1.09\mu\Omega\text{-m}$. 10

2. (a)

A 6 cell, 500Ah lead acid battery takes a ripple free charging current of 5A DC at 13.8V DC from its charging circuit. The charging circuit has a controlled bridge rectifier shown in the figure with an input transformer of 220/15V. Draw the waveform of the load current (i_L) and the source current (i_S) if T_1 , T_2 are triggered at 0° and T_3 , T_4 are triggered at 180° of the input sine wave. Also determine the average power, power factor, displacement factor and %THD of the source current. 7



- (b) How power factor gets deteriorated due to nonlinear loads? Discuss with example. 6

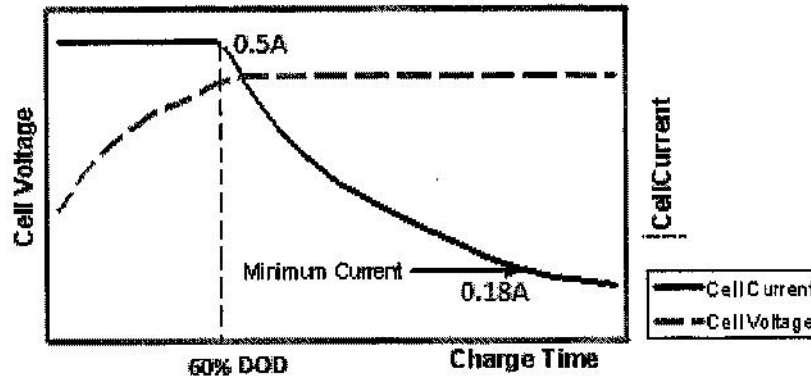
[Turn over

- (c) How a tuned LC filter installed by a consumer could be saved from being overloaded by neighbor's non-linear load consumption? 3

Or

3. (a) Write the principle and advantages of induction heating. 6
- (b) Explain the terms : float charge, boost charge and trickle charge 3
- (c) Draw the circuit diagram and explain principle of near unity power factor rectifier? 7
4. (a) What are the factors should we consider when we'll choose a battery for a particular purpose? 6
- (b) What is shedding in Lead-acid batteries? 3

Lithium Ion Charging Characteristics



A smart phone has a 3.8V, 3300m Ah Li-ion battery. Calculate the total charging time to charge the battery to its full from 90% DOD. The constant voltage phase takes 2 hour. Assume the current profile in the constant voltage phase to be linear.

7

5. (a) Discuss different type of materials used as electrode in an EAF? 3
- (b) Why reactors must be used in an EAF? 3
- (c) Determine the kVA, referred per unit resistance and reactance to the secondary, the p.f. of the 415/110 V transformer installed for an EAF which is operated at 4 kA current. Total voltage drop at the secondary side is 60V and the operating arc resistance is 12.5 mili-ohm. 10

B.E. ELECTRICAL ENGINEERING THIRD YEAR SECOND SEMESTER EXAMINATION-2018
(3rd Year 2nd Semester)

SUBJECT : ELECTRICAL UTILIZATION & ILLUMINATION ENGINEERING

Time : Three hours

Full Marks -100
(50 marks for each part)

Use separate answer-script for each part

No. of question	<p align="center">Part II <u>Answer all Questions</u> <u>For Question No 2 answer 2.(a) or 2.(b)</u> <u>For Question No 3 answer 3.(a) or 3.(b)</u></p>	Mark
1.	Correct and/or justify the following statements (Any Five): a) Detectors, sensors and meters are same in photometric measurement. b) S/P ratio of a light source should always be 1. c) $V(\lambda)$ correction of the detector is mandatory for all types of luxmeter. d) In an integrating sphere, the measurement of luminous flux is dependent on detector's position in the sphere surface. e) In practical lighting design Light Loss Factor (LLF) and Coefficient of Utilization (COU) of the luminaires are never being considered. f) Lighting Power Density (LPD) is a complete tool for energy assessment of an indoor lighting design. g) Spectral emissivity and emissivity are same for any thermal radiator. h) Luminance is same for any Lambertian surface regardless of viewing angle.	5 X 4 =20
2. a. i)	Compare different methods of luminous flux measurement of a light source.	10
	ii) Discuss different lamp selection parameters.	5
2. b.i)	<p align="center">or,</p> The spectral power distribution of a light source is shown in fig.1. Photopic spectral luminous efficiency function is assumed as in fig.2. Find the luminous flux output of this source. Consider the visible band scaled as $\theta=355$ nm to $2=755$ nm, with a linear interval.	10

[Turn over

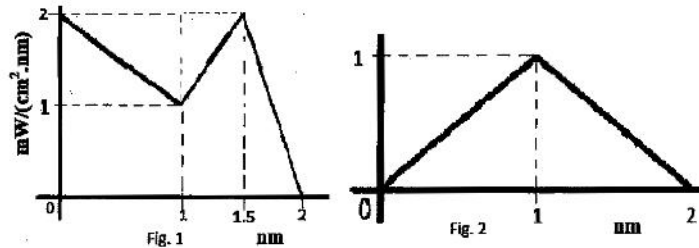
B.E. ELECTRICAL ENGINEERING THIRD YEAR SECOND SEMESTER EXAMINATION-2018
(3rd Year 2nd Semester)

SUBJECT : ELECTRICAL UTILIZATION & ILLUMINATION ENGINEERING

Time : Three hours

Full Marks -100
(50 marks for each part)

Use separate answer-script for each part



ii)	What is luminaire? Discuss different types of luminaire based on their light distribution properties.	5
3. a.i)	The filament of an incandescent lamp is 0.006 cm in diameter and 60 cm long. It consumes 100 watt. Assuming the filament as a blackbody radiator, find the operating temperature of the filament. At what wavelength does the maximum value of M_λ occur?	8
ii)	Write a short note on different photometric standards.	7
or,		
3.b.i)	<p>Design a general lighting scheme and draw the luminaire layout to achieve maintained average illuminance of 300 lux for an office room with the following data:</p> <p>Room dimension: 8m×5m×3m Luminaire Details: 1 X 36 W FTL, power consumption per luminaire: 40 Watt Lumen per lamp: 3250 Coefficient of utilization = 0.65 Maintenance Factor = 0.80.</p> <p>If all the luminaires are replaced point by point by 24 watt LED Tubelight & power consumption of each luminaire is 25 watt then identify the best option based on calculated lighting power density (LPD).</p>	8
ii)	What are the different types of Goniophotometer? Write down the significance of different co-ordinate systems in measurement of luminous intensity?	7