

**BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING
(EVENING) EXAMINATION 2018**

(4th Year, 1st Semester)

ELECTRICAL UTILIZATION & ILLUMINATION ENGINEERING

Time: Three hours

Full Marks: 100

(50 marks for each Part)

Use a separate Answer-Script for each Part

PART-I

Answer any *three* questions

Two marks are for neat and well organized answer

1. a) Define Power Factor and show that its value depends on both the current Harmonics as well as the Displacement Factor. 4
- b) Explain how a non-linear load is responsible for generating voltage harmonics on the supply bus, inspite of the generated voltage at the source being sinusoidal. 4
- c) Derive to show that for a non-sinusoidal current in the presence of a sinusoidal voltage, only the fundamental component contributes to active power. 8
2. a) What are the advantages of Electric Heating over methods using other types of fuels? Justify. 4
- b) Explain the principle and applications of Dielectric Heating. 4
- c) Write short note on how Electric Heating is implemented in practice through a 3-phase AC Arc Furnace. 8
3. a) How are passive filters used to remove current harmonics from the line and how are they tuned ? 8
- b) Sketch and explain the principle of SCR (thyristor) based Static VAr Compensators. 8

4. a) Write short note on storage battery capacity, discharge limits and methods of charging.

8

b) Sketch and explain using block schematics, the different types of ac UPS systems.

8

5. Write short note on any two:

a) The principle, application and implementation of Induction Heating.

b) Operating principles of Active Power Corrected 1-phase Rectifier with schematic circuit and waveforms.

c) The principle, application and implementation of Resistive Heating.

8 + 8

B.E.E.(Evening) 4th Year 1st Semester Examination 2018
Subject: Electrical Utilization & Illumination Engineering

Time: 3 hours

Use Separate Answer script for each part
(50 marks for each Part)

Full Marks:100

Part-II

ANSWER ANY THREE QUESTIONSQuestion No. 1 carries 18 marks

Q.1. A) State the Wien's displacement law related to blackbody radiation. How this law can be applied to explain the variation of luminous efficacy of a tungsten filament lamp with wattage?

B) A 23W LED lamp system is suspended over center of a circular table (radius 1 m) at a height of 1.0 m. The luminous efficacy of the LED lamp system is 90 lumen/watt. Calculate

i) its Mean Spherical Luminous Intensity(MLSI), if emitted lumen is confined only within down hemisphere.

ii) illuminance at the center and at the edge of the table

C) Define the following parameters with corresponding SI unit-

i) Luminous Intensity ; ii) Luminance ; iii) Illuminance

6x3=18

Q.2. A) What do you understand by Mesopic vision?

B) Write down the differences between the Photopic and the Scotopic vision.

C) Calculate the luminous efficacy of a 40W filament lamp using the following spectral power distribution data –

λ (nm)	<400	400-450	450-500	500-550	550-600	600-650	650-700	>700
M_λ (W/nm)	0.71	0.42	0.51	0.67	0.91	0.94	1.27	68.3
V_λ	0.000	0.008	0.110	0.780	0.910	0.320	0.020	0.000

D) Derive the general expression for Inverse Square Cosine cube law of illuminance with suitable diagram.

2+4+5+5 =16

Q.3. A) What is the light generation principle for a light emitting diodes? How warm white and cool white light is generated from it?

B) Why ballast is necessary for the operation of any gas discharge lamp?

C) Briefly discuss on electrical and photometric parameters of an electric lamp.

4+4+8=16

Q.4. A) What is five plane photometry? Derive the expression of average luminous intensity for this photometric system.

B) Compute the light output of a luminaire from the following data using zonal lumen method-

Angular zone (degree)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110
Average I (candela)	1356	1323	1278	1137	933	632	378	221	128	96	31

6+10=16

Q.5. Write down short notes on any two from the followings-

8x2=16

i) Construction and working of a Luxmeter;

ii) Construction and working of an Integrating sphere

iii) Lumen formula and Indoor general lighting design

iv) Indoor lighting design parameters.