BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

(EVENING) EXAMINATION, 2017

(4th Year, 1st Semester, Supplementary)

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 reserved for neat and well organized answer

1. a) Derive the expressions for Average Power consumed by fundamental current, its harmonics and its dc components in the presence of a sinusoidal voltage. State the definition of Power Factor (PF) and show the effect of harmonics and dc components on PF.   12

   b) What is Displacement Factor (DF) ? Derive to show the effect of both current THD as well as DF on the Power Factor.   4

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 an Arc Furnace.   8

3. a) Explain how non-linear loads connected to a source of sinusoidal voltage supply, create voltage harmonics on the supply bus.   4

   b) Explain the use of passive filters to remove current harmonics from the line.

                                                                              6

   c) Sketch block schematics and briefly explain, the principle of operation of an Active Power Filter.   6

4. a) Write short note on storage battery capacity, discharge limits and methods of charging.   8

b) Sketch and explain the principle of Active Power Factor corrected 1-ph rectifie circuit using high frequency switching   8

5. Write short note on any two:

   a) Induction Heating.

   b) 1-phase ac UPS systems.

   c) Static VAR compensation using SCRs.

                                                                    8 + 8

B.E.E.(Evening) 4thYear 1st Semester Supplementary Examination 2017
Subject: Electrical Utilization & Illumination Engineering

Time: 3 hours   Use Separate Answer script for each part   Full Marks:100
(50 marks for each Part)
Part-II
ANSWER Q.No. (1) AND ANY TWO QUESTIONS
Question No. 1 carries 20 marks

Q.1. A) Define the following radiometric parameters with SI unit –
   i) Radiant Intensity; ii) Radiance; iii) Irradiance
B) Write down the photometric parameters corresponding to the above radiometric parameters with SI Unit.
C) State and explain Inverse Square Cosine Law of illuminance with suitable diagram.

(10+4+6 =20)

Q.2. A) What do you understand by Five-plane photometry?
B) How zonal lumen is related to average zonal intensity?
C) How DLOR and ULOR are estimated from measured luminous intensity database?

(4+4+7=15)

Q.3. A) Compare white light emitting diode and white fluorescent lamp on the basis of the followings-
   i) Spectral Power Distribution; ii) CCT; iii) general CRI; iv) Burning hour and v) Cost
B) Explain the operation of the magnetic ballast driven fluorescent lamp circuit with proper circuit diagram.

(8+7=15)

Q.4. A) A 100 Watt filament lamp is suspended at height of 1.0m on a centre of a circular table with dia 0.50m. Calculate
   i)illuminance at the centre of the table; ii) illuminance at the edge of the table.
   iii)average illuminance on the table top. iv)average illuminance on the table top when the lamp is kept within a reflector which reflects 70% of lumen uniformly on table top.
(Assume lamp efficiency 12 lm/W).
B) Estimate the Lumen output from a Luminaire from its I-table as given below-

Zonal Angle (deg)	0-10	10-20	20-30	30-40	40-50	50-60
Avg. I (cd)	615	507	397	227	103	32

(8+7=15)

Q5.A) A general lighting scheme is to be designed for a class room (8m x 6m x 3m). Estimate the number of lamps and luminaires using the Lumen formula and propose a suitable luminaire layout to achieve uniformity of illuminance on horizontal working plane.
Input information are given below-
   • maintained average illuminance >=500 Lux with overall uniformity >=0.70
   • Luminaire: Mirror optic reflector type, 2x36W T8 FTL, CCT-6500K, CRI-83; Electronic ballast; system power = 74W, 240V AC; lumen per lamp=3250 lm.
   • Coefficient of utilization = 0.60; Maintenance Factor =0.75
Estimate Lighting Power Density(LPD) of the proposed design.

(15)

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