Ref No. : EX /PG/ILLUTD/T/122A/2024

M.TECH. IN ILLUMINATION TECHNOLOGY & DESIGN EXAMINATION, 2024
(1st Year, 2nd Semester)

RENEWABLE ENERGY BASED LIGHTING SYSTEM

Time: Three Hours | Full Marks: 100

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

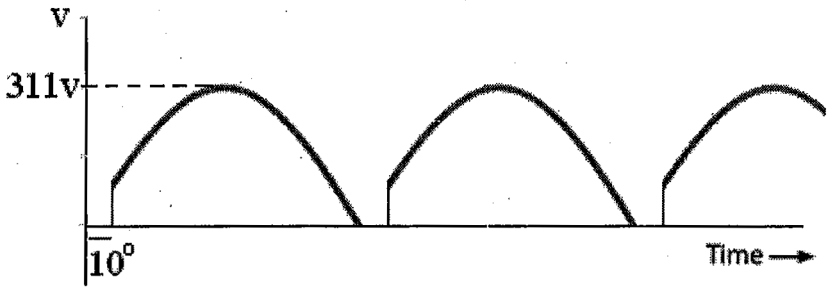
Answer any three questions. Question no. 2 carries the highest marks.

1.(a)	How behavioral factors affects the selection of a battery.	**4**
(b)	What is memory effect in case of a rechargeable battery?	**3**
(c)	Name the electrodes used in Lead-acid battery.	**2**
(d)	A smart solar photovoltaic system has a 48V, 10 kAh Battery bank. The Charge controller cum inverter connected to the battery sets a float voltage of 52.8V at the normal ambient temperature (27° C). Calculate the float voltages required for incorporating the temperature compensation in the charge controller when the battery will be used in Jaisalmer during the summer (52° C) and in Pahalgam during winter (-25°C). According to the manufacturer the compensation required is -3.6 mV/°C/cell.	**7**
2.(a)	Any discharge lamp has negative resistance characteristics – justify.	**3**
(b)	What type of problem does a discharge lamp face due to this type of characteristics?	**3**
(c)	How the problem is overcome?	**3**
(d)	Discuss the operation of EM ballast of a florescent lamp.	**9**
3.(a)	Draw the circuit diagram and explain the operation of a Boost Chopper	**8**

(b) A boost chopper has input voltage of 24V and output voltage of 48V. If the non-conducting time of the SCR is 150μs compute the pulse width of the output voltage.
In case the pulse width is halved for constant frequency operation, find the new output voltage. **8**

4. (a) Derive the expression of output (DC) voltage of a single phase full controlled full-wave rectifier as a function of triggering angle. Draw the necessary waveforms also. **8**

(b)



The voltage waveform from a SCR based dimming circuit is shown. What will be the power consumption of a 220V, 40W lamp (resistive) connected to this voltage? To reduce the power consumption by 20% what should be the triggering angle? **8**

5. (a) At least two types of power electronic converters are required for the electronic ballast of any discharge lamp – justify **4**

(b) A DC-DC converter requires at least one inductor- justify **4**

(c) Write a short note on pulse width modulation (PWM) used for power converters. **8**

Form A: Paper-setting Blank *Ref. No. Ex* PG/IlluTD/T/122A/2024

M Tech in Illumination Tech. & Design, 2nd sem **EXAMINATION, 20** 24

(1st/2nd Semester/~~Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual~~)

SUBJECT Renewable Energy based lighting Systems
(Name in full)

PAPER .....

Time : ~~Two hours~~/Three hours/~~Four hours/Six hours~~

Full Marks ~~30~~/ 100
(~~15~~/50 marks for each part)

Use a separate Answer-Script for each part

No. of questions	~~Part I~~ / Part II Answer any three from the following. Two marks for neatness.	Marks
Q1		
a)	Write briefly about aerodynamics in case of wind turbine, with elaborations about Lift & Drag in case of a typical airfoil.	10+6
b)	Discuss the properties desired in semiconductors for solar cell use.	
Q2		
a)	With neat block diagram explain the operation of a solar PV system.	6+10
b)	Define the following term i) solidity ii) Tip speed ratio iii) Pitch	
Q3		
a)	Sketch the diagram of a HAWT and explain the functions of its main components.	10+6
b)	Explain the principle of wind energy conversion.	
Q4		8+8
a)	With neat diagram explain the process of gasification in a Fluidized-Bed type gasifier.	
b)	Derive the expression for power developed due to wind	
Q5	Explain in details the following I) Down Draft Gasifier with neat diagram II) V-I and P-V Characteristic Solar Photo Voltaic System.	8+8