Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Code : 14EE3052 **Semester : 2016-17 ODD**
Sub. Name : PV SYSTEM DESIGN AND INSTALLATION **Duration : 3hrs**
Max. marks : 100

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	List the current and emerging opportunities in the field of PV technology.	CO1	5
	b.	Draw the schematic of DC- PV system with storage batteries. State its operation.	CO1	5
	c.	Design a 48V System with Sixteen 12V, 5A PV Panels. A battery bank has to be constructed with each battery of rating 6V, 360Ah. Calculate the number of batteries required. Show the complete wiring diagram including charge controller.	CO2	10
		(OR)		
2.	a.	Mention different strategies to calculate panel tilt.	CO1	5
	b.	What do you mean by "Solar Window"? Mention the usefulness of "Sun Chart."	CO1	5
	c.	Load estimation is an important aspect. For a PV design engineer, energy conservation is more important. Justify.	CO1	10
3.	a.	The data sheet of a typical PV panel is given below. (i) Find the FF for all the panels BLD240-60P….. BLD210-60P at STC. Comment about the result. (ii) The open circuit voltage of BLD240-60P is 36.72 volts at STC. Find the voltage at 50^{O} C. Mention the data used by you for the calculation. (iii) Explain the reason for shift in I-V curve due to variation in solar radiation.	CO1	5
	b.	If 24 numbers of BLD210-60P PV panels are connected in series-parallel configuration (6 strings, 4/string), draw the I-V characteristics of the combination at STC.	CO1	5
	c.	Discuss about different PV cell technologies. Bring out their relative merits and demerits	CO2	10

Polycrystalline 210W-240W

Module Type	BLD240-60P	BLD230-60P	BLD225-60P	BLD220-60P	BLD215-60P	BLD210-60P
Peak Power	240 Wp	230 Wp	225 Wp	220 Wp	215 Wp	210 Wp
Max. Power Voltage (Vmp)	30.18 V	29.82 V	29.52 V	29.34 V	29.70 V	28.70 V
Max. Power Current (Imp)	7.96 A	7.72 A	7.63 A	7.50 A	7.48 A	7.32 A
Open Circuit Voltage (Voc)	36.72 V	36.10 V	36.30 V	36.56 V	36.50 V	36.48 V
Short Circuit Current (Isc)	8.99 A	8.73 A	8.62 A	8.48 A	8.46 A	8.28 A
Cell Efficiency	16.50 %	16.00 %	15.75 %	15.25 %	15.00 %	14.50 %
Module Efficiency	14.66 %	14.05 %	13.74 %	13.44 %	13.13 %	12.82 %
Maximum System Voltage	DC 1000 V					
Temp. Coeff. of Isc	+0.045 %/K					
Temp. Coeff. of Voc	−0.34 %/K					
Temp. Coeff. of Pmax	−0.47 %/K					
Series Fuse Rating	15 A					
Cells	6x10 pieces polycrystalline solar cells series (156 mm x 156 mm)					
Junction Box	with 3 bypass diodes					
Front Glass	toughened safety glass 3.2 mm					
Cell Encapsulation	EVA (Ethylene-Vinyl-Acetate)					
Back	composite film					
Frame	anodized aluminium profile					
Dimensions	1650x992x50mm (LxWxH)					
Weight	19.3 kg					
Max. Surface Load Capacity	tested up to 5,400 Pa: IEC 61215					
Hail	maximum diameter of 25 mm with impact speed of 23 ms-1					
Temperature Range	−40 °C to +85 °C					

		(OR)		
4.	a.	Compare Nickel-Cadmium and Lithium ion batteries.	CO1	5
	b.	List the important specifications of Batteries. Mention their significance.	CO1	5
	c.	A typical mechanical workshop has a total connected load of 5kW. Out of which 60% loads are critical. Size the battery bank. Each battery rating is 12V, 350Ah. Use proper battery sizing table and draw the connection diagram.	CO2	10
5.	a.	List the roll of IREDA, MoP and MoEF in developing Renewable Energy in India.	CO2	5
	b.	A client wishes to simultaneously power three 12 volt DC lights (30 watts) and a 12 volt DC television (14 watts) using a 12 volt PV array. Three modules are wired in parallel and used in the system. Each module has a peak current of 2.95 amps and a short circuit current of 3.28 amps. How will you size the controller?	CO2	5
	c.	Discuss the main and auxiliary functions of a PV controllers.	CO2	10
		(OR)		
6.	a.	List all the features of a typical inverter.	CO2	5
	b.	A customer wants to feed AC loads at 230 volts, 50Hz with his 12 volt battery system. Following are the loads. Electric tool 300 watts Water pump ¼ hp (2 numbers) Desktop Computer 250 watts Electric Lighting 100 watts (Total) One water pump and 60% of lighting have to run simultaneously. How will you size the inverter for this application?	CO3	5
	c.	Compare different types of inverters (based on their function) used for PV. Mention their applicability.	CO2	10
7.	a.	Tabulate the strengths and weaknesses of the Renewable Energy sector in India.	CO2	10
	b.	Draw the functional schematic of Solar Energy Interconnection System.	CO2	10
		(OR)		
8.	a.	Draw a sample wiring diagram for residential PV system.	CO2	10
	b.	Discuss the main factors to be considered in the design of a utility connected PV system.	CO2	10
		Compulsory:		
9.	a.	List the factors to be considered for PV array and Battery installations.	CO2	5
	b.	Write the possible causes and remedial actions for the symptoms ‘improper disconnection of loads’ and ‘photocontrol malfunctioning.’	CO3	15

ALL THE BEST