MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
END SEMESTER ON-LINE PROCTORED EXAMINATIONS
DECEMBER 2021- JANUARY 2022
SOLAR PHOTOVOLTAICS [ELE 4304]

REVISED CREDIT SYSTEM

Time: 75 Minutes + 10 Minutes **Date: 01 January 2022** **Max. Marks: 20**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Time: 75 minutes for writing + 10 minutes for uploading.

1A. Describe & Compare the different types of Solar Photo Voltaic Cells & Describe the Solar photovoltaic cell working principle with a neat diagram. ***(04)***

1B. Determine the sunset hour angle & day length at a location latitude of 32^0 on April 15 & at a location latitude of 36^0 on May 20. Comment on the result. ***(03)***

1C. Estimate the payback period of 5 HP Solar Water Pump, if solar panel cost is Rs 12,000/ per solar panel & if conventional motor with a same capacity runs for 5 hours/day (consider 1 HP=750 Watts & solar panel wattage is 300 watts/panel & cost of grid power is Rs,6/unit). And also describe the working principle of Solar water pump with a neat diagram ***(03)***

2A. The following electrical loads are connected in the house, & required 12 V, 120 W solar panel system.

i. LED lamp of 20 W working for 04 hours per day.
ii. A refrigerator of 80 W for 12 Hours per day.
iii. One Fan of 60W for 8 hours/day. Find the number of solar panels, rating and sizing of charge controller if I_{sc} is 10 Amps, Inverter rating & 12 V batteries rating required 3 Days of Autonomy. ***(03)***

2B. Compare the following:

i. Mismatch in Parallel-connected & Mismatch in series - connected PV Modules
ii. Bypass diode & Blocking diode connected in PV Panel ***(04)***

2C. Compare & describe the following with a neat diagram

i. Grid connected PV System with Battery Storage
ii. Grid connected PV System without Battery Storage ***(03)***