b. Design a solar PV system where in the load consists of CFL, TV, fan, refrigerator and computer. The system must allow the use of loads during non-sunshine hours. The details are given in the table. | 12 | 2 | 2 | 3 |

Load	Watts	H/day	Number	Watt-hour
CFL	9	5	2	90
Fan	60	8	1	480
TV	150	2	1	300
Refrigeration	150	8	1	1200
Computer	250	2	1	500
Wh/day				2570

Assume necessary conditions for a battery integrated isolated PV power system.

30. a. With neat sketch explain the various power quality issues related with grid the wind turbines. | 12 | 1 | 3 | 1 |

(OR)

b. With a neat block diagram, explain the various components in a horizontal components in a horizontal axis wind turbine system. | 12 | 1 | 3 | 1 |

31. a. Compare the various types of fuel cell with respect to chemical reactions, electrolytes and applications. | 12 | 1 | 4 | 1 |

(OR)

b. Design and analyze a perturb and observe MPPT scheme for a fuel cell stack of 200 W (10V, 20A) feeding a battery of 24V. | 12 | 2 | 4 | 2 |

32. a. Explain in detail the working of coordinated control system of a hybrid renewable energy system with PV, wind and battery. | 12 | 1 | 5 | 1 |

(OR)

b. Discuss in detail the economic, technical, sustainability issues involved in hybrid sources integration. | 12 | 1 | 5 | 1 |

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Reg. No.														

B.Tech. DEGREE EXAMINATION, JUNE 2023
Seventh Semester

18EEE405T – POWER ELECTRONICS IN RENEWABLE ENERGY SYSTEM
(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:
(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks) | Marks | BL | CO | PO
Answer **ALL** Questions

1. The major advantage of solar photovoltaic source over other renewable sources is | 1 | 1 | 1 | 1
   (A) Portable and scalable (B) Cleaner and greener
   (C) Continuous and reliable (D) Free of cost and replensihable

2. A typical horizontal axis wind turbine will have the efficiency of _____%. | 1 | 1 | 1 | 1
   (A) 69 (B) 59
   (C) 49 (D) 39

3. Repowering concept is related with _____. | 1 | 1 | 1 | 1
   (A) Photovoltaic plant connected with grid (B) Microgrid and smart grid
   (C) Upgrading the lower capacity wind turbines with higher rated one (D) Metal oxide fuel cell system

4. The standard emf generated in hydrogen-oxygen full cell is | 1 | 1 | 1 | 1
   (A) 3.23V (B) 2.23 V
   (C) 1.23 V (D) 0.63 V

5. In a PV panel, as the irradiation falling on the PV panel decreases then | 1 | 1 | 2 | 1
   (A) The open circuit voltage decreases (B) The bypass diodes get forward biased
   (C) The blocking diodes gets forward biased (D) The output PV current decreases

6. A 12V, 7Ah battery is capable of providing | 1 | 2 | 2 | 1
   (A) 14A in half an hour (B) 14A in one hour
   (C) 7A continuously for a full day, if the load is constant (D) 7A instantaneously irrespective of the load

7. Which of the following is a basic isolated dc-dc converter | 1 | 1 | 2 | 1
   (A) Buck converter (B) Flyback converter
   (C) Class B converter (D) Buck boost converter

8. When used at lower temperature, say less than 25°C the performance of the battery — 1 1 2 1
   (A) Will increase as the internal resistance increases
   (B) Will decrease as the internal resistance increases
   (C) Will decrease as the internal resistance decreases
   (D) Will not be affected as it is independent of temperature

9. Vertical axis machines are preferred where — 1 1 3 1
   (A) The wind speed is very high
   (B) The annual average wind speed is low
   (C) Yaw control is preferred
   (D) Pitch control is preferred

10. In grid interactive wind turbines, which of the following power quality issue occurs predominantly? — 1 1 3 1
   (A) Harmonic distortion
   (B) Under voltage
   (C) Over voltage
   (D) Swell

11. Adjusting the blade of the wind turbines to harness more power, this process is called as — 1 1 3 1
   (A) Yaw control
   (B) Repowering scheme
   (C) Pitch control
   (D) Grid side control

12. In present-day scenario, which of the following generator is preferred for higher capacity wind turbine? — 1 1 3 1
   (A) SEIG
   (B) DFIG
   (C) SCIG
   (D) Synchronous SEIG

13. A fuel cell is a device that uses _____ and _____ to produce electricity. — 1 1 4 1
   (A) Hydrogen and oxygen
   (B) Nitrogen and hydrogen
   (C) Oxygen and nitrogen
   (D) Oxygen and hydrogen

14. _____ Fuel cell uses a polymeric membrane as the electrolyte with platinum electrodes. — 1 1 4 1
   (A) PEM
   (B) MOFC
   (C) PAFC
   (D) AFC

15. The losses that usually occurs at the surface of the electrodes is known as — 1 1 4 1
   (A) Concentration losses
   (B) Hot spot losses
   (C) Activation losses
   (D) Inactivation losses

16. Which of the following is not an example of a fuel cell? — 1 1 4 1
   (A) Hydrogen oxygen cell
   (B) Methyl oxygen alcohol cell
   (C) Hexanone-oxygen cell
   (D) Propane – oxygen cell

17. In a hybrid system, usage of _____ only ensures reliable power supply. — 1 1 5 1
   (A) PV module
   (B) Fuel cell
   (C) Wind turbine
   (D) Batteries

18. The optimized power converter for hybrid renewable sources is _____. — 1 1 5 1
   (A) Multiport converter
   (B) Single port converter
   (C) Flyback port converter
   (D) Isolated port converter

19. MPPT in a hybrid renewable sources power system ensures _____. — 1 1 5 1
   (A) Constant power supply of either of power sources
   (B) Optimized power supply
   (C) Closed loop operation
   (D) Constant power supply of all the power source

20. Which of the following MPPT scheme will have power oscillations? — 1 1 5 1
   (A) Perturb and observe
   (B) Constant voltage method
   (C) Constant current method
   (D) Incremental conductance method

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

	Marks	BL	CO	PO

21. Explain how a typical hydrogen energy power source generate electricity. — 4 1 1 1

22. Two PV panels of 200W is connected in series. Each panel has a open circuit voltage of 22V and short circuit current of 11A. Draw the cumulative I-V and P-V curves and denote its X and Y intercepts. Assume necessary parameters. — 4 2 2 2

23. With neat diagrams, explain the yaw and pitch mechanism in horizontal axis wind turbine. — 4 1 3 1

24. Draw neat diagram of a typical PEM fuel cell and explain its working. — 4 1 4 1

25. Discuss the merits and demerits of hybrid renewable energy power system. — 4 1 5 1

26. Draw the flow chart of MPPT scheme which works on voltage approximation. — 4 2 2 2

27. Discuss about the working of matrix converter. — 4 1 3 1

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

	Marks	BL	CO	PO

28. a. Discuss the following: — 12 1 1 1
   (i) Issues associated with tapping of solar PV power.
   (ii) Wind resource assessment

(OR)

   b. Discuss in detail on the Indian renewable energy power scenario with respect to wind energy and photovoltaic deployment. — 12 1 1 1

29. a. Design and analyze a buck converter feeding a battery of 12 V from a PV panel of 100 W (17 V_{mp}, 5.88 I_{mp}) deduce necessary expressions. — 12 2 2 1

(OR)