B.Tech. DEGREE EXAMINATION, MAY 2024
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)
Answer ALL Questions

		Marks	BL	CO	PO

1. For the same size of PV module, _____ PV is capable of giving more power. — Marks 1, BL 2, CO 1, PO 1
   (A) Dye sensitized
   (B) Mono crystalline
   (C) Polycrystalline
   (D) Thin film

2. As temperature increases in a PV cell, the open circuit voltage _____ — Marks 1, BL 2, CO 1, PO 1
   (A) Increases
   (B) Remains constant
   (C) Decreases
   (D) Increases to 0.6 V then remains constant

3. Pitch angle control in wind turbines is related with _____ — Marks 1, BL 2, CO 1, PO 1
   (A) Blade positioning
   (B) Nacelle positioning
   (C) Grid synchronization
   (D) Battery management system

4. The loss of voltage at no load in a fuel cell is called as — Marks 1, BL 1, CO 1, PO 1
   (A) Resistance loss
   (B) Capacitance loss
   (C) Activation loss
   (D) Mass transport loss

5. MPPT stands for — Marks 1, BL 1, CO 2, PO 1
   (A) Maximum power point tracking
   (B) Maximum potential point tracking
   (C) Maximum point potential tracking
   (D) Maximum power potential transfer

6. A 12V, 7 Ah battery can provide _____ A for half an hour. — Marks 1, BL 2, CO 2, PO 1
   (A) 7
   (B) 21
   (C) 3.5
   (D) 14

7. Battery storage will be a part of _____ — Marks 1, BL 2, CO 2, PO 1
   (A) Stand alone PV system
   (B) Grid connected PV system
   (C) Non isolated PV system
   (D) Transformerless PV system

8. In a boost converter, the output voltage equation is given by   1   1   2   1
   (A) $V_0 = V_{in}.\delta$
   (B) $V_0 = \dfrac{V_{in}}{\delta - 1}$
   (C) $V_0 = \dfrac{V_{in}}{1 - \delta}$
   (D) $V_0 = \dfrac{V_{in}}{\delta}$

9. Yaw control is relevant to changing the angles of _____   1   1   3   1
   (A) Blades of the turbine   (B) Nascelle structure
   (C) Hub   (D) Wind vane

10. The speed of wind can be measured using   1   1   3   1
    (A) Fluke speedometer   (B) Anemometer
    (C) Pyranometer   (D) Heliometer

11. During the generating mode in an induction generator, the slip is   1   2   3   1
    (A) Zero   (B) Negative
    (C) Positive   (D) Infinity

12. In a horizontal axis machine, for high power generation, the wind speed   1   1   3   1
    range need to be
    (A) 20-30 m/s   (B) 15-25 m/s
    (C) 10-15 m/s   (D) 25-35 m/s

13. Which of the following is continuously replaced in a fuel cell?   1   1   4   1
    (A) Electrolyser   (B) Oxidiser
    (C) Electrodes   (D) Catalysts

14. Among the following _____ is not a fuel cell.   1   1   4   1
    (A) Methyl oxygen alcohol cell   (B) Hydrogen oxygen cell
    (C) Propare oxygen cell   (D) Hexanone oxygen cell

15. The standard emf in a hydrogen-oxygen fuel cell is   1   1   4   1
    (A) 1.86   (B) 0.58
    (C) 2.54   (D) 1.23

16. Fuel cell uses _____ as a fuel in most cases.   1   1   4   1
    (A) Oxygen   (B) Propare
    (C) Hydrogen   (D) Hexanone

17. To get a constant DC bus voltage in a hybrid renewable system,   1   2   5   2
    _____ is mandatory.
    (A) Wind turbine   (B) Battery storage
    (C) Photovoltaic   (D) Geothermal

18. For synchronizing renewable sources with grid _____ should get   1   1   5   1
    matched.
    (A) V, f, ϕ (B) I, ϕ, f
    (C) V, I, f   (D) f, V, δ

19. Hybrid system improves the
    (A) Power quality   (B) Reliability
    (C) Harmonics   (D) Surge impact

1 2 5 1

20. Diesel generators are hybridized with PV system and here the optimized power delivery is ensured by
    (A) The grid tie inverter in PV system   (B) The grid tie inverter in diesel generator
    (C) The governor in diesel generator   (D) Net metering concept

1 2 5 1

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

| | Marks | BL | CO | PO |

21. Draw the power flow channels in a PV grid tied system with netmeter installed.

4 1 1 1

22. A PV panel is of 200 W. Draw a PV system layout for 2kW. The inverter assist only series parallel connection.

4 2 2 1

23. Compare DFIG with IG.

4 1 3 1

24. Explain the working of a hydrogen energy fuel cell system.

4 1 4 1

25. Discuss flux additive dc-dc converter.

4 1 5 1

26. Assume renewable sources like biomass, PV, wind, fuel cell, which two sources may be preferably blended for hybrid renewable sources aided stand alone systems. Justify.

4 2 5 1

27. Assume 3 panels are connected in series. Each panel is of 200W (20 V_{mp}, 10 I_{mp}), 20 W (50 V_{mp}, 4 I_{mp}), 200 W(40 V_{mp}, 5 I_{mp}). What will be the cumulative voltage, current and power? Justify the answer.

4 2 2 2

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

| | Marks | BL | CO | PO |

28. a. Discuss in detail the renewable energy scenario in India. With necessary date. Write about the measures taken to mitigate global climate change.

12 1 1 1

(OR)

b. Elaborate the following
   (i) Photovoltaic power system with net metering
   (ii) Site selection considerations for wind turbine

12 1 1 1

29. a. A PV panel of 100W(20V_{mp}, 5I_{mp}) need to charge a battery of 12 V, 10 Ah. Construct a suitable MPPT charging circuit and explain its functionalities.

12 2 2 1

(OR)

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b. Compare isolated and non isolated dc-dc converters for PV aided applications with necessary circuits.   12   2   2   1

30. a. Discuss how active and reactive injection happens in DFIG aided grid tied WECs.   12   1   3   1

(OR)

b. Describe the following
   (i)   Working of horizontal axis wind turbine with yaw control   6   1   3   1
   (ii)   Matrix converter   6

31. a. With a flow chart, explain the power tracking schemes in fuel cell systems.   12   1   4   1

(OR)

b. Explain with necessary diagrams, the working of high temperature fuel cell power system.   12   1   4   1

32. a. What is multiport converter? Apply a multiport converter and explain its working for a PV, fuel cell and battery hybrid sources system.   12   1   5   1

(OR)

b. With relevant diagrams, explain any five power quality issues pertaining to grid tied hybrid renewable energy system.   12   1   5   1

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