

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: MTECH
BRANCH: EEE**

**SEMESTER : II
SESSION : SP/2025**

SUBJECT: EE583R1 RENEWABLE SOURCES OF ELECTRICAL ENERGY & GRID INTEGRATION

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a)	Explain the advantages and challenges or disadvantages due to a greater reliance on renewable energy sources for a power system network.	[5]	1	I
Q.1(b)	Explain the I-V and P-V characteristics of the solar cell with the proper explanation and mention incremental conductance method in brief for tracking maximum power.	[5]	1	II
Q.2(a)	With proper equations and block diagrams, describe the complete control strategies to generate proper switching signals for boost converter in MPPT mode.	[6]	2	V
Q.2(b)	How does the DC link voltage is controlled for grid tied inverter? Why it is so important for the stability of the whole grid tied inverter system.	[4]	2	IV
Q.3(a)	Mention the advantages of d-q control. Derive the transformation matrices for converting single phase current to d-q components.	[3]	3	III
Q.3(b)	Develop switching pulses (approximate is acceptable) for grid tied inverter considering the frequency of the grid is 49 Hz. Consider the grid tied inverter is working as grid supportive mode and the switching frequency of carrier signal is 1kHz. Also, draw the block diagram.	[7]	3	VI
Q.4(a)	Explain the power coefficient for wind turbine power and its dependency on wind velocity, pitch angle and tip speed.	[4]	4	III
Q.4(b)	Explain the control of PMSG in d-q reference frame for acquiring the maximum wind power.	[6]	4	V
Q.5(a)	Mention different feedstocks for Bio-mass and Hydrogen gas with reasons of selecting.	[5]	5	I
Q.5(b)	Describe the working process of hydrogen fuel cell with proper diagram and equation.	[5]	5	III

:::29/04/2025:::E