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

CLASS: BTECH **SEMESTER : VI**
BRANCH: EEE **SESSION : SP/2025**

SUBJECT: EE365 INTRODUCTION TO SUSTAINABLE ENERGY

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)	Discuss the advantages of utilizing more renewable energy sources (RESs) referring to the disadvantages of the conventional energy sources. Mention also the challenges or disadvantages of higher dependency on RESs in the prospective of power system operation.	[5]	1	2
Q.1(b)	Define the following terms associated with PV and wind turbine. (a)Fill factor of solar cell (b) Efficiency of solar cell (c) Tip Speed and tip speed ratio	[5]	2 and 3	2
Q.2(a)	Describe different steps involved with Perturb and observe method for tracking maximum PV power.	[5]	2	2
Q.2(b)	Explain the voltage and current controllers used with proper block diagram to generate switching pulses for controlling boost converter.f	[5]	2	4
Q.3(a)	Discuss the various steps involved in selecting a suitable battery for a specific application.	[5]	4	3
Q.3(b)	For the given load pattern: Load 1: 60 W day and night continuous at 40 V DC. Load 2: water pump: 5 times daily for 1 hr. duration each time, the slots are: two times before sunrise, one at noon and 2 times after sunset. The load has an average running current of 4 A at 40 V DC. A number of 100Ah, 5V lead acid batteries are available in the c-rates of C20, C10, C5, and 2C. Depending upon the load profile, determine the PV array size and suitable c-rate of the battery.	[5]	4	5
Q.4(a)	Design a buck converter based current controlled scheme for battery charger.	[5]	5	4
Q.4(b)	Discuss the operation behind the grid connection in order to transfer power at unity power factor for a given PV module with complete schematic diagram and explanation.	[5]	4	4
Q.5(a)	Derive the maximum efficiency ideally attainable by a wind machine.	[5]	3	4
Q.5(b)	Draw the schematic diagram showing rectifier and inverter connected with PMSG. Explain MPPT control technique to acquire maximum wind power and its achievement through rectifier control.	[5]	5	4

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