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

CLASS: MTECH/PRE-PHD **SEMESTER : I/NA**
BRANCH: EEE **SESSION : MO/19**

SUBJECT: EE533 MODERN POWER SYSTEM PLANNING

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.

Q.1(a) Analyze the factors which affect the short, medium and long term load forecasting for power system planning. [5]

Q.1(b) Formulate the mathematical equation for load forecasting using extrapolation technique, assuming trend curve to be exponential. [5]

Q.2(a) Formulate equivalent load duration curve for power system production simulation and derive EENS involving 2 generating units. [5]

Q.2(b) The daily load curve is as follows. [5]

Hour: 1-6 7-12 13-18 19-24
MW: 40 65 72 58

There are 2 units, one of 40 MW capacity, 400 gm/kWh average coal consumption rate with 0.10 FOR and other is of 20 MW capacity, 450 gm/kWh average coal consumption rate with 0.20 FOR. Carry out Probabilistic Power system production simulation and analyze the system reliability in terms of LOLP and EENS.

Q.3(a) Formulate the mathematical equations to compute effective load carrying capacity and effective load for maintenance scheduling for a power system with using the levelized risk method. [5]

Q.3(b) Evaluate effective load carrying capacity and effective load for power system having a risk characteristic coefficient m=100 MW using the levelized risk method. There are five generating units that should be scheduled for maintenance. The data for the generating unit to be scheduled for maintenance and the load are listed in the tables 1 and 2 below respectively. [5]

Table 1: Data for the generating units

Unit No.	Capacity (MW)	FOR
1	400	0.04
2	300	0.03
3	200	0.02
4	100	0.02
5	100	0.02

Table 2: Load data

Duration (weeks)	Maxm Load (MW)
1	2000
2	1920
3	1800
4	1740
5	1640
6	1500
7	1580
8	1620

Q.4(a) Compare and contrast the advantages and disadvantages of generation planning based on WASP and JASP with mathematical objective functions for each. [5]

Q.4(b) The investment in a hydroelectric power station is ₹500 lakhs. The operational life is 50 years. The annual operation cost is ₹10 lakhs. What is the net present value if the annual overall profit is ₹70 lakhs and the discount rate is 10%? [5]

Q.5(a) For designing a wide area monitoring system (WAMS) smart grid, justify the optimal placement of PMUs for ensuring complete observability for the power system using the functional diagram of a PMU. [5]

Q.5(b) As per the norms of EU research projects for Microgrids, analyze the 3 major functions of Microgrid which are to be taken into account for proper planning. [5]

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