

Master of Power Engineering First Year 1st Semester Examination 2024

Subject: **Energy Planning Management and Modelling**

Time 3 Hour

Full Marks 100

1. CO1

Part A (Answer Any One)

1x10 = 10

1. Draw a Neat Heat and Mass Balance Diagram for a Small Thermal Power Plant (State the Assumptions)
2. Draw a Neat Energy Balance Diagram for a Typical Renewable Based Energy System Consisting of a PV Thermal System, PV Electrical System, Wind Generation System and a Biomass Energy System

PART B (Answer Any Three)

3x 10 = 30

1. By solving the Dual of the L. P. P

$$\text{Minimize } z = x_1 + 2x_2 + 3x_3$$

$$\text{Subject to } x_1 - x_2 + x_3 \geq 4$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_2 - x_3 \geq 2$$

$$x_1, x_2, x_3 \geq 0$$

Show that the minimum value of z is 10 for the optimal solution

$$x_1 = 6, x_2 = 2, x_3 = 0$$

2. By Simplex method, obtain the inverse of the Matrix

$$A = \begin{bmatrix} 3 & 6 \\ -1 & 2 \end{bmatrix}$$

3. In a Pumped Storage Infrastructure, the cost of the Pipe is given by $(100D + 25 D^2)$ where D is the Diameter of the Pipe in cm. The cost of the Reservoir decreases with the increase of the quantity of the Water handled and is given by $(25/Q)$, where Q is the rate at which the Water is handled (cubic metres per second). The pumping cost is given

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by $(100 Q^3 / D^5)$. Find the Optimal size of the Pipe and the amount of Water handled for minimum overall cost.

4. A Company is considering the purchase of one of the following machines for Power Business, whose relevant data are given below:

	Machine A	Machine B
Original Cost	Rs 100000/-	Rs 100000/-
Estimated Life	3 Years	3 Years
Earnings (After Tax)		
Year 1	30000/-	20000/-
Year 2	55000/-	80000/-
Year 3	40000/-	45000/-

The Company follows the Straight-Line Method of Depreciation. The estimated Salvage Value of both the Machines is Zero. Determine the Average Rate of Return of both the Machines

5. A purchase of an Item connected to Power Business requires an initial investment of Rs 20000 and it is expected to generate a cash flow of Rs 1000 for 3 years plus Rs 50000 in the third year. The target rate of return is 10% per annum. Calculate the Net Present Value of the Item. Avoid depreciation.

2. CO2 (Answer Any Five)

5x3 =15

1. What are the Three main parts of Energy Management
2. What are the Different Concepts of Energy System Modelling
3. What are the Components of Energy Management Plan
4. What are the Limitations of Payback Period
5. Why Energy Auditing is required
6. What are the Improved Product Design concepts
7. What are the Improved Techniques for Energy Efficiency Manifestations
7. Why Sensitivity and Risk Analysis is done for Power Project
8. What are the different Energy Auditing Equipment
9. What are the different Classifications of Energy Modelling
10. How energy Conservations with Different Management Techniques can be accomplished

3. CO3 (Answer any Fifteen)

15x3 = 45

1. What is "The Conference of the Parties (COP)"?
2. How Energy Pricing at the Distribution Level is made?
3. What is Frequency Based Mechanism for Energy Pricing?
4. What are SDG7 and SDG13?

5. What is Grid Code Technical Requirement for Reactive Power Supply?
6. How Grid Code Compliance Management is made for Renewable Integrated Grid?
7. What is a Prosumer?
8. What is Grid Code Technical Requirement for 'Ride Through' during Short Interruptions?
9. What is Demand Side Management?
10. What is OTC in Power Trading?
11. What is Cooperative Energy Bidding?
12. What are the Statements of IEA 2006?
13. What is the PAT Scheme in India?
14. How Trading of Renewable Energy Certificate is done?
15. How Green Energy Open Access is made?
16. What is ESCOs?
17. What are the Penalties for Violation of Energy Conservation Act 2001?
18. How Assessment of Specific Power Requirement for a Pump is made?
19. Why Application of Variable Speed Drives are important for energy efficiency?
20. Name two Different Software for Assessment of T and D Losses?
21. How Star Labelling of Energy Efficient Motors are done?
22. What is ECBC?
23. What is Trigeneneration?
24. How Long-term Climate Change and Energy Systems are connected?
25. How Near-term Changes of Radiative Forcing is ascertained?
26. What is Eutrophication?
27. Define Kyoto Protocol?
28. What are the Components of ABT?
29. What is Unscheduled Power Interchange (UI) based Incentive/Penalty?
30. How ABT in Renewable Source based generation is accomplished?
31. What are the Penalties for Grid Indiscipline in ABT Regime?
32. What are the Pre-Audit Phase Activities for Energy Audit?
33. What are the Types of Cogeneration on the basis of Technology?
34. What is Energy Performance Contracting?
35. What are the Steps to Develop a Typical ESCO Contract?
36. What are Energy Exchanges?
37. What is Green Corridor?
38. What is BEE?
40. Name Two Softwares for Power System Design or Operation?