

CBCS SCHEME

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18EE824

Eighth Semester B.E. Degree Examination, July/August 2022 Power System Planning

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain in detail the planning process. Also enumerate the components of planning. (10 Marks)
b. Explain the need and importance of load forecasting in power system. Mention the different techniques of load forecasting. (10 Marks)

OR

- 2 a. Explain enterprise resource planning with the module diagram. (10 Marks)
b. Write a short on : i) Reactive load forecast ii) Peak load forecast (10 Marks)

Module-2

- 3 a. Explain renovation and modernization of power plants. (10 Marks)
b. Write a short notes on : i) Rural Electrification Investment ii) Credit Risk Assessment. (10 Marks)

OR

- 4 a. Explain the broad options available with respect to power sector finance. (10 Marks)
b. Explain the concept of clean coal technologies. (10 Marks)

Module-3

- 5 a. Enumerate the technical and economic aspects considered for sub-station development. Brief about various substation bus bar schemes. (10 Marks)
b. Illustrate the advantages and disadvantages of HVDC transmission system. Also mention few applications of HVDC transmission system. (10 Marks)

OR

- 6 a. Explain in detail the transmission planning criteria. (10 Marks)
b. Explain the planning criteria for reactive power compensation. (10 Marks)

Module-4

- 7 a. Explain the benefits of deregulation. (10 Marks)
b. Mention the adequacy indices in Distribution System Reliability Evaluation. (10 Marks)

OR

- 8 a. Explain the need for power system studies. (10 Marks)
b. Illustrate the concept of reliability by citing a suitable reliability model. (10 Marks)

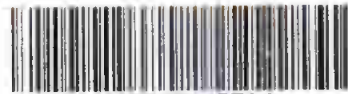
Module-5

- 9 a. Enumerate the demand response programmes. (10 Marks)
b. Enumerate the principles of electricity market. (10 Marks)

OR

- 10 a. With a relevant block diagram explain the importance of energy efficiency programme. (10 Marks)
b. Write a short note on : i) Smart power market ii) Power pool. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.



Scheme & Solutions

[Signature]
Signature of Scrutinizer

Subject Title : Power System Planning

Subject Code : 18EE824

Question Number	Solution	Marks Allocated																								
1. a.	<p>Planning consists of three cyclical components & mentioning of few of the characteristics that make planning process challenging. → 5M.</p> <p><u>Components of planning process</u></p> <table border="1" style="margin-left: 20px;"> <tr><td colspan="3">Creating</td></tr> <tr><td>Vision</td><td>Values</td><td>Mission</td></tr> <tr><td colspan="3">Formulating objectives</td></tr> <tr><td>Long</td><td>Medium</td><td>Short</td></tr> <tr><td colspan="3">Supporting plans.</td></tr> <tr><td>Policies</td><td>Strategies</td><td>Regulatory measures</td></tr> <tr><td></td><td></td><td>Criteria Standards</td></tr> <tr><td></td><td></td><td>Budgets</td></tr> </table>	Creating			Vision	Values	Mission	Formulating objectives			Long	Medium	Short	Supporting plans.			Policies	Strategies	Regulatory measures			Criteria Standards			Budgets	5M.
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1. b.	<p>Need of load forecasting } → 5M. Importance of load forecasting } Techniques of load forecasting.</p> <p>a) Time series b) Moving average c) Trend projections d) Regression Model e) Econometric model → 5M</p>	5M.																								
2 a.	<p align="center"><u>Internet of electricity</u></p> <table border="1" style="margin-left: 20px;"> <tr> <td>Mapping : GIS of facilities</td> <td rowspan="4" style="text-align: center;"> Database & DWG Doc. warehouse Data Network Data facility data consumer data cost data, log data </td> <td>Consumer information, metering & billing</td> </tr> <tr> <td>Planning & Engg. Load forecasting</td> <td>Project management Scheduling, cashflow</td> </tr> <tr> <td>Maintenance planning : Trouble calls</td> <td>Human resources training, productivity</td> </tr> <tr> <td></td> <td>Finance budgeting</td> </tr> <tr> <td></td> <td>Interface with other applications</td> <td>Stores & assets inventory control material procurement</td> </tr> </table>	Mapping : GIS of facilities	Database & DWG Doc. warehouse Data Network Data facility data consumer data cost data, log data	Consumer information, metering & billing	Planning & Engg. Load forecasting	Project management Scheduling, cashflow	Maintenance planning : Trouble calls	Human resources training, productivity		Finance budgeting		Interface with other applications	Stores & assets inventory control material procurement	5M.												
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2.a	Explanation of concept of Enterprise Resource Planning. →	5M.
2.b	Reactive load forecast → Security analysis, voltage / reactive power scheduling Mention any 5 applications of reactive load forecast → Peak load forecast. → Mention any 5 situations which create a necessity for peak load forecast →	5M. 5M.
3.a	Renovation of power plants Residual Life Assessment studies - Life Extension Steam-Turbine Rehabilitation Boiler Renovation → Explain any 5 scenarios Modernisation of Power Plants Mention any 5 situations and need to go for modernisation of power plants →	5M. 5M.
3.b	Rural Electrification Investment Village electrification 2. Pump-set organisation load development 4. System improvement planning 5. Insulated aerial cable system. [Brief about all 5 components]. → Credit Risk Assessment Explanation of the process in the following stages.	5M.
4.a	a) Construction stage b) Operational stage → c) Revenue return Mention any 10 options available for power sector finance a) Bonds issued by central corporations b) Promoters money.	5M.

Question Number	Solution	Marks Allocated
c) d)	Loans from power finance corporation Internal resources generation by utilities →	10M.
4.b.	Mention any 5 points regarding the development process of clean coal technologies →	5M.
	Mention advantages of Circulating fluidised Bed Combustion (CFBC) a) High combustion efficiency b) Low NO _x emission, c) Ability to burn low-grade fuels d) Low SO ₂ emissions e) Fuel flexibility →	5M.
5.a.	Economic & technical aspects considered for substation development. a) load density b) load growth c) Utilization of transformer capacity d) Maximum fault levels e) Flexibility & siting	5M.
	Substation Bus-bar schemes a) Degree of flexibility of operation b) Ism 1) Single Bus System 2) Duplicate Bus System 3) Transfer Bus Arrangement 4) Breaker & a half system. [Brief discussion on all the above]	5M.
5.b.	Advantages of HVDC system. 1) DC cables are cheaper 2) Controlled power flow 3) Control of tie line load factor Disadvantages of HVDC system. 1) Cost effective 2) High cost D.C circuit breakers	2.5M

Question Number	Solution	Marks Allocated
3)	Addition of filters which is again cost effective →	2.5M.
	Applications of HVDC transmission system. (Mention any 5) →	5M.
6.a.	<p>Planning of AC transmission involves</p> <ol style="list-style-type: none"> 1. Power flow requirements 2. System stability 3. Selection of voltage levels 4. Voltage & reactive power flow 5. Selection of conductor <p style="text-align: right;">} Explain any 5 in brief →</p>	10M.
6.b.	<p>Planning criteria for reactive power compensation.</p> <ol style="list-style-type: none"> 1. Not to be transported over long distance 2. Should be produced & consumed locally 3. Sufficient no of reactive power reserves to be maintained. <p>Mention 10 points / Discuss on any 5 points in brief. →</p>	10M.
7.a.	<p>Benefits of deregulation. [Mention any 10 points] →</p> <ol style="list-style-type: none"> 1. Efficient use of system capacity 2. Choices of consumer will be improved 3. Dip in electricity pricing. 4. Optimization of energy supply. 5. Cost of ancillary services is reduced by reserve sharing 	10M.
7.b.	<ol style="list-style-type: none"> 1. System Average Interruption Frequency Index [SAIFI] 2. System Average Interruption Duration Index [SAIDI] 3. Customer Average Interruption Duration Index [CAIDI] 4. Average Service Availability Index [ASAI] 5. Average System Interruption Frequency Index [ASIFI] <p>Mention any 10 / Brief about any 5 →</p>	10M.

Question Number	Solution	Marks Allocated
8.a.	<p>Need for power system studies →</p> <p>Power system studies involves</p> <ol style="list-style-type: none"> 1. Short circuit & Equipment Bracing 2. System Protection & Coordination 3. Arc Flash 4. System Planning & Growth 5. Load flow & load loss 	2M.
8.b.	<p>Reliability is the ability of the power system to satisfy the customer demand.</p> <p>Reliability modeling is the process of predicting or understanding the reliability of a component or system prior to its implementation →</p> <p>Explanation of Reliability modeling →</p>	8M.
9.a.	<p>Demand Response Programmes.</p> <ol style="list-style-type: none"> 1. Advanced Meter Infrastructure (AMI) / Smart Metering Systems. 2. Peak-hour restrictions 3. Interruptible / curtailable (I/C) loads. 4. Off-day restrictions 5. Buyback Programmes. <p>Mention 10 programmes / Brief about any 5 programmes.</p>	10M.
9.b.	<p>Electricity market principles. [Mention any 10]</p> <ol style="list-style-type: none"> 1. Marginal cost varies over the course of the day. 2. Peaking power to be made available by applying time-of-the-day tariffs. 3. Market brings efficiency in usage of transmission capacity by economic dispatch and congestion management. 	10M.

Question Number	Solution	Marks Allocated
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10a

Explanation

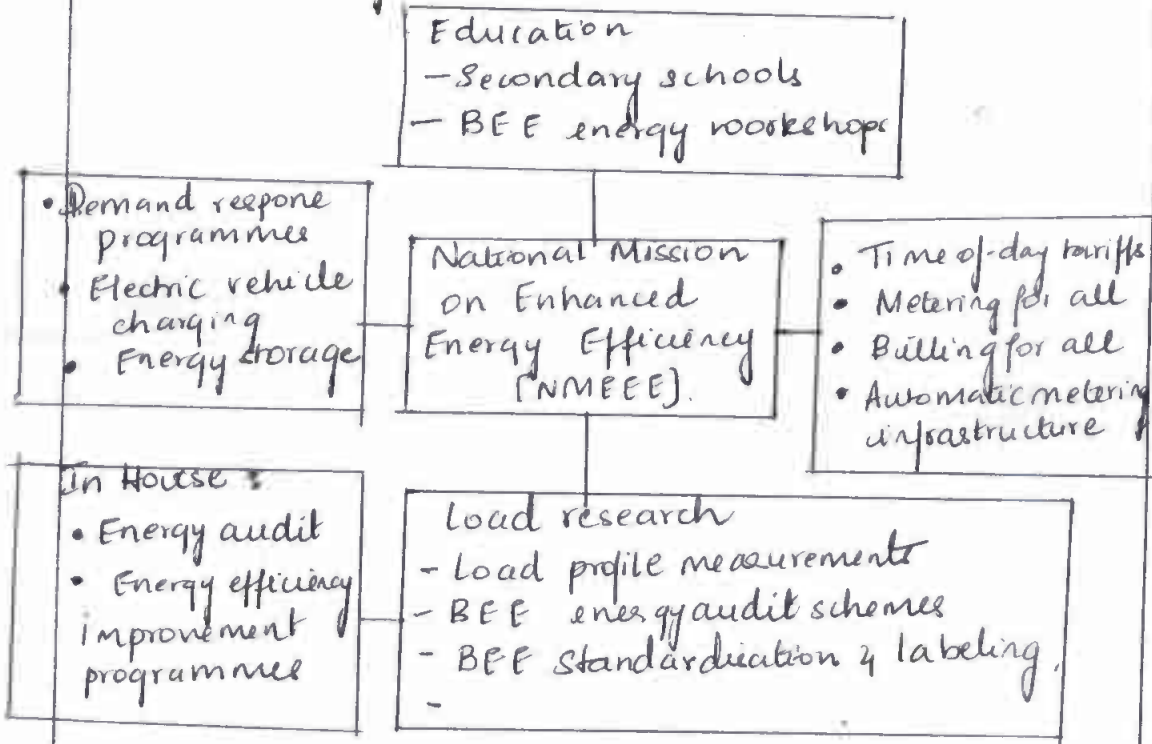
→

5M.

Block diagram

→

5M.



10b.

Smart Power Market

Brief about the role played by smart power market

→

5M.

Power Pool.

Explain the process of work carried out in a power pool / explain the principle / tasks carried out at power pool.

→

5M.