

# CBCS SCHEME

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18EE42

## Fourth Semester B.E. Degree Examination, July/August 2022 Power Generation and Economics

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Define the following :  
i) Hydrograph  
ii) Mass curve  
iii) Flow duration curve. (06 Marks)
- b. With neat Schematic diagram, explain the working of hydro electric power plant. (08 Marks)
- c. List out the merits and demerits of Hydro electric power plant. (06 Marks)

OR

- 2 a. How the Hydro electric power plants are classified? Explain in details. (08 Marks)
- b. Mention the factors should be consider for selection of site for hydro power plant. (06 Marks)
- c. With neat sketch, explain the working of Pelton wheel turbine. (06 Marks)

### Module-2

- 3 a. With the sketch, explain block diagram of diesel power plant. (08 Marks)
- b. With neat sketch, explain the working of gas turbine station. (06 Marks)
- c. Mention the factors to be consider for selection of site for steam power plant. (06 Marks)

OR

- 4 a. Explain the working of steam power plant with neat schematic diagram. (08 Marks)
- b. Explain the factors to be considered for selection coal for steam power plant. (06 Marks)
- c. Give the comparison of hydro power plant with steam power plant. (06 Marks)

### Module-3

- 5 a. Explain the nuclear reactor with diagram. (06 Marks)
- b. Mention the factors to be considered for the selection of site for nuclear power plant. (06 Marks)
- c. With the neat layout diagram, explain the working of nuclear power plant. (08 Marks)

OR

- 6 a. List the merits and demerits of nuclear power plant. (06 Marks)
- b. Write briefly about Nuclear waste disposal. (06 Marks)
- c. Describe construction and working of a pressurized water reactor. (08 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.

**Module-4**

- 7 a. Define substation and mention types of substation. (06 Marks)  
 b. Explain the factors are considered for substation side selection. (06 Marks)  
 c. Explain gas insulated substation and mention its advantages. (08 Marks)

**OR**

- 8 a. List out the advantages and disadvantages of outdoor substation over indoor substation. (06 Marks)  
 b. Write short note on :  
 i) Resistance Grounding  
 ii) Reactance Grounding. (08 Marks)  
 c. Explain earthing of transformer with neat diagram. (06 Marks)

**Module-5**

- 9 a. Define the following terms :  
 i) Load factor  
 ii) Diversity factor  
 iii) Plant use factor (06 Marks)  
 b. Explain the factors affecting tariff. (06 Marks)  
 c. Define Tariff? Explain :  
 i) Step rate tariff  
 ii) Black rate tariff  
 iii) Two part tariff (08 Marks)

**OR**

- 10 a. Mention the disadvantages of low power factor. (06 Marks)  
 b. Explain the methods of power factor improvement. (10 Marks)  
 c. Discuss the economics of power factor correction. (04 Marks)

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18EE42

Scheme & Solutions

*[Signature]*  
Signature of Scrutinizer

Subject Title: Power generation and economics Subject Code: 18EE42

Question Number	Solution	Marks Allocated
	<u>MODULE - 1</u>	
1	<p>a. i) <u>Hydrograph</u>: Graphical representation of between water discharge with time. (2m)</p> <p>ii) <u>Mass curve</u>: Indicates total volume of runoff in <math>m^3</math> up to certain time. explanation with graph (2m)</p> <p>iii) <u>Flow duration Curve</u>: IS a convenient form of hydrograph for determining available power in site. It gives the relation b/w flow and length of the time during which they are available. explanation with graph - (2m)</p>	(6)
1. b.	<p>Schematic diagram - (03)</p> <p>Explanation - (5m)</p>	(8)
1. c.	<p>Merits - (3m)</p> <p>Demerits - (3m)</p>	(6)
2 a.	<p>Hydro electric power plants may be classified according to</p> <p>i) The extent of water flow regulation available (3m)</p> <p>ii) availability of water head (3m)</p> <p>iii) Type of load they supply (2m)</p>	(8)
2 b.	<p>i) availability of water, ii) water storage iii) water head  iv) distance from load center v) Accessibility of site  vi) water pollution vii) Sedimentation, viii) long catchment area ix) Availability of land x) <del>Stream</del>  * Stream diversion.</p>	(06)

Question Number	Solution	Marks Allocated
2c.	Diagram - (2m) Explanation of pelton wheel turbine - (4m)	(6)
<u>MODULE - 2</u>		
3a.	Diagram of diesel power plant (3m) Explanation of working of each components (5m)	(8)
3b.	Diagram of gas turbine station - (2m) Explanation of each components of gas turbine station - (4m)	(6)
3c.	Explanation of any 6 factors 6 x 1 = (6m)	(6)
4a.	Diagram of steam power plant (3m) Explanation of: <ul style="list-style-type: none"> <li>i) Fuel gas circuit</li> <li>ii) Air &amp; fuel gas circuit (5m)</li> <li>iii) Feed water and steam circuit</li> <li>iv) Cooling water circuit</li> </ul>	(8)
4b.	<ul style="list-style-type: none"> <li>i) Calorific value</li> <li>ii) weatherability</li> <li>iii) Sulphur</li> <li>iv) Ash</li> <li>v) size requirement</li> <li>vi) grindability index</li> </ul> (6m)	(6)
4c.	6 Composition 6 x 1 = (6m)	(6)



Question Number	Solution	Marks Allocated
<u>MODULE-3</u>		
5 a.	Diagram of Nuclear reactor - (2m) Explanation of moderator, reactor core, control rods, coolant, etc. (4m)	6
5 b.	Explanation of any six factors 6x1 - (6m)	6
5 c.	Layout diagram of Nuclear power plant (3m) Explanation of working - (5m)	8
6 a.	4 Merits - (3m) 4 Demerits - (3m)	6
6 b.	Different forms of Nuclear wastes - (2m) Different methods of Nuclear waste disposal - (4m)	6
6 c.	Diagram - (3m) Explanation of construction and breakdown - (5m)	8
<u>MODULE-4</u>		
7 a.	Definition of Substation - (2m) Classification of Substation based on different modes - (4m)	6

Question Number	Solution	Marks Allocated
7b.	1) Types of Substation 2) Availability of suitable & sufficient land 3) Communication facility 4) Atmospheric pollution 5) Availability of essential amenities to the staff 6) Drainage facility. 6x1 = (6m)	(6)
7c.	Diagram - (2m) Explanation - (4m) advantages (2m)	(8)
8a.	3 advantages - (3m) 3 disadvantages - (3m)	(6)
8b.	i) Resistance grounding: Diagram - (1 1/2 m) Explanation - (2 1/2 m) ii) Reactance grounding Diagram - (1 1/2 m) Explanation - (2 1/2 m)	(8)
8c.	Diagram - (2m) Explanation - (4m)	(6)
<u>MODULE-5</u>		
9a.	i) Load factor = $\frac{\text{Average load}}{\text{maximum demand}}$ - (2m) ii) Diversity factor = $\frac{\text{Sum of individual maximum Load}}{\text{maximum demand on power station}}$ (2m)	

Question Number	Solution	Marks Allocated
	iii) plant use factor = $\frac{\text{Unit generated in a given period}}{\text{Rated capacity of the power plant in kW} \times (\text{Number of hours in the given period})}$ (2m)	6
9b.	6 factors 6x1 — (6m)	6
9c	Definition of tariff — (2m) i) Step rate tariff (2m) ii) Block rate tariff (2m) iii) Two part tariff (2m)	8
10 a.	Any six disadvantages. 6x1 — (6m)	6
10 b.	i) use of static capacitor — (3½m) ii) use of synchronous condenser. — (3½m) iii) phase advancers (3m)	10
10 c.	Definition of economics of power factor (1m) Explanation: 1) In economic power factor when kW demand is constant (3m) 2) kVA demand is constant	4