

International Islamic University Chittagong  
Department of Electrical and Electronic Engineering

B.Sc. Engineering in EEE

**Semester End Exam, Autumn 2022**

Course Code: **EEE 4707**

Course Title: **Power Plant Engineering**

Time: 2 hours 30 minutes

Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

<b>Course Outcomes (COs) of the Questions</b>	
<b>CO1</b>	Students will be able to understand the operating principles and economics of different power plants.
<b>CO2</b>	They will learn different possible engineering solutions for power plant in societal and environmental contexts
<b>CO3</b>	They will be able to apply mathematical foundations to solve various power plants and power plant economics related issues.

<b>Bloom's Levels of the Questions</b>						
<b>Letter Symbols</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>C5</b>	<b>C6</b>
<b>Meaning</b>	Remember	Understand	Apply	Analyze	Evaluate	Create

**Part A**

[Answer the questions from the followings]

1. a) Compare between impulse turbine and reaction turbine used in Hydroelectric power plant. **CO1 C4 05**
  1. b) A Hydro-electric power station has a reservoir of area 2-4 square kilometers and capacity  $5 \times 10^6$  m<sup>3</sup>. The effective head of water is 100 meters. The penstock, turbine and generation efficiencies are respectively 95%, 90% and 85%.  
(i) Calculate the total electrical energy that can be generated from the power station.  
(ii) If 0.0947 meters will be the fall in reservoir level in 3 hours supply to load, find the average water discharge. **CO3 C5 05**
  2. a) Explain the basic principle of Nuclear Power Plant. What are the advantages of Nuclear power plant? **CO1 C6 05**
  2. b) Why waste disposal is important for nuclear power plant? How Sodium is advantageous as coolant? **CO2 C4 05**
- OR,**
2. a) What is Nuclear Fission and Chain Reaction? Explain the basic principle of Nuclear Power Plant. **CO1 C6 05**
  2. b) What are the advantages of Nuclear Power plant? Discuss in brief how water is used as coolant in PWR and how energy comes from a Nuclear power plant. **CO2 C4 05**

## Part B

[Answer the questions from the followings]

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|----|----|--|-----|--------|-----|
| 3. | a) | Write briefly about liquid metal M.H.D. generator. Discuss the working principle of a M.H.D. generator.  | CO1 | C1     | 05  |
| 3. | b) | What are the differences between Open and closed cycle MHD?  | CO1 | C6     | 05  |
| 4. | a) | The annual load duration curve of a certain power station can be considered as a straight line from 20 MW to 4 MW. To meet this load, three turbine-generator units, two rated at 10 MW each and one rated at 5 MW are installed. Determine (i) installed capacity (ii) plant factor (iii) units generated per annum and (iv) load factor. | CO3 | C5     | 04  |
| 4. | b) | What is meant by Grid System? Discuss are the advantages of interconnected Grid System?  | CO1 | C2     | 06  |
| 5. | a) | What are the ways for reducing the cost of power generation? Suppose a total load of 4MW is to be supplied by two units A and B. Derive the condition so that they can achieve best economy in load sharing.   | CO1 | C2, C5 | 2+4 |
| 5. | b) | A generating station has a maximum demand of 50,000 kW. Calculate the cost per unit generated from the following data: Capital cost = Tk. $95 \times 10^6$ ; Annual load factor = 40% Annual cost of fuel and oil = Tk. $9 \times 10^6$ ; Taxes, wages and salaries etc. = Tk. $7.5 \times 10^6$ Interest and depreciation = 12%.          | CO3 | C5     | 4   |

OR,

- |    |    |   |     |        |   |
|----|----|---|-----|--------|---|
| 5. | a) | What do you understand by tariff? Discuss the desirable characteristics of a tariff. What is meant by block rate tariff?  | CO1 | C5, C2 | 5 |
| 5. | b) | Calculate the annual bill of a consumer whose maximum demand is 120 kW, p.f. = 0.75 lagging and load factor = 75%. The tariff used is BDT 100 per kVA of maximum demand plus 50 paise per kWh consumed. | CO3 | C5     | 5 |