

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 3rd Year 2nd Term Examination, 2019

ME 3223

(Power Plant Engineering)

Time: 3 Hours

Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.

ii) Figures in the right margin indicate full marks.

iii) Assume reasonable data if any missing.

SECTION-A

- 1(a) What is meant by power plant? Briefly explain the power system master plan 2016 of Bangladesh. 12
- 1(b) What is load curve? What are the utilities of load curve? 07
- 1(c) What are meant by base load and peak load power plant? What are the effects of variable load on power plant? 08
- 1(d) A diesel station supplies the following loads to various consumers: 08
Industrial consumer = 1600 kW; Commercial establishment = 750 kW; Domestic power = 100 kW; Domestic light = 500 kW.
If the maximum demand of the station is 2500 kW and the number of kWh generated per year is 50×10^5 , determine (i) the diversity factor, and (ii) annual load factor.
- 2(a) What are the factors to be considered while selecting the capacity of a power plant? 05
- 2(b) Explain the fixed and operating cost of power plant. 10
- 2(c) What is meant by tariff? Explain the tariff system in Bangladesh. 08
- 2(d) A power plant of 500 MW installed capacity has the following particulars: 12
Capacity cost = Tk 30,000/kW installed;
Interest and depreciation = 12% ;
Annual load factor = 65%;
Annual capacity factor = 58%;
Annual operating cost = Tk 500×10^6 ;
Energy consumed by power plant auxiliaries = 6%.
Calculate:
(i) The cost of power generation per kWh, and
(ii) The reserve capacity.
- 3(a) Sketch and describe a schematic arrangement of equipments of a steam power plant. 12
- 3(b) What are the steps involved in coal handling in a thermal power plant? Describe the coal transfer methods using belt conveyor and grab bucket elevator. 15
- 3(c) What is fluidized bed combustion system? State the advantages of fluidized bed combustion system. 08
- 4(a) What is meant by pulverized coal? Name the different types of coal pulverized mills. Describe any one of them with neat sketch. 11

- 4(b) Why lubrication is necessary in diesel engine? State the properties of a good lubricant. 10
- 4(c) What are the common steps for starting the engine in diesel power plant? 05
- 4(d) What are the advantages and disadvantages of diesel engine power plant? 09

SECTION-B

- 5(a) Describe the essential features of a hydro-electric power plant with neat sketch. 07
- 5(b) Write short notes on: 06
 (i) Hydrograph, (ii) Run – off, (iii) Draft tube.
- 5(c) Explain the governing of impulse turbine with neat sketch. 08
- 5(d) The following data pertain to a hydro-electric power plant: 14
 Available head = 150 m, catchment area = 2200 sq.km, annual average rainfall = 150 cm, turbine efficiency = 85%, generator efficiency =90%, percolation and evaporation losses =16%. Determine the power developed and suggest the type of turbine to be used if the runner speed is kept below 240 rpm.
- 6(a) What is nuclear power plant? What are the advantages and disadvantages of nuclear power plant? 09
- 6(b) What are the properties of moderator and control rod? 08
- 6(c) Discuss the classification of nuclear reactor. Explain the working principle of pressurized water reactor (PWR) with neat sketch. 10
- 6(d) Compare nuclear power plant with coal power plant. 08
- 7(a) What are the safety measures should be taken in nuclear power plant? 07
- 7(b) Why is power generation by gas turbines attractive these days? 06
- 7(c) What methods are used to improve the efficiency of gas turbine? Explain the effect of regeneration in a gas turbine plant. 10
- 7(d) What is combined cycle power plant? Explain the combined working of gas turbine and steam turbine plant. 12
- 8(a) What is the function of cooling tower in the power plant? Describe the working of a cooling tower. 09
- 8(b) Write down the purpose of chimney. Derive an expression for the height of a chimney. 08
- 8(c) Why feed water treatment is necessary in steam power plant? List out the methods of feed water treatment. Describe the mechanical treatment method with neat sketch. 14
- 8(d) Write short notes on: 04
 (i) Switchgear (ii) Relay