BH/K/TY

Reg. No:

VIT®
Vellore Institute of Technology

Final Assessment Test – November 2025

Course: **BMEE326L - Power Plant Engineering**

Class NBR(s): **2356**

Slot: **E2+TE2**

Time: **Three Hours**

Max. Marks: **100**

- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

General Instructions: Steam table with mollier chart is permitted

COs	CO Statements
CO1	Demonstrate the various components and layouts of steam power plant.
CO2	Analyze the different types of steam generators and their subsystems.
CO3	Analyze the gas turbine, nuclear and diesel power plants.
CO4	Assess the selection and layout of different renewable power plants.
CO5	Evaluate the economic aspects of power plant installation and operation.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Answer ALL Questions

(10 X 10 = 100 Marks)

1.	Explain the principle of Carbon Capture and Storage and discuss its importance in mitigating climate change.	CO1	BL4
2.	Explain in detail about mechanical dust collector and Electrostatic precipitator. Why both are used over a single unit in modern power plants.	CO2	BL4
3.	Steam at a pressure of 15 bar abs. and 250°C is expanded through a turbine at first to a pressure of 4 bar abs. It is then reheated at constant pressure to the initial temperature of 250°C and is finally expanded to 0.1 bar abs. Using Mollier chart, estimate the work done per kg of steam flowing through turbine and amount of heat supplied during the process of reheat. Compare the work output when expansion is direct from 15 bar abs. to 0.1 bar abs. without any reheat. Assume all expansion processes are isentropic.	CO2	BL5
4.	Explain the construction and working principle of super critical Boilers with suitable sketch.	CO2	BL3
5.	Explain different methods for nuclear waste disposal with necessary sketch.	CO3	BL3
6.	In a gas turbine the compressor takes in air at a temperature of 15°C and compresses it to four times the initial pressure with an isentropic efficiency of 82%. The air is then passed through a heat exchanger heated by the turbine exhaust before reaching the combustion chamber. In the heat exchanger 78% of the available heat is given to the air. The maximum temperature after constant pressure combustion is 600°C, and the efficiency of the turbine is 70%. Neglecting all losses except those mentioned, and assuming the working fluid throughout the cycle to have the characteristic of air find the efficiency of the cycle. Assume R = 0.287 kJ/kg K and γ =1.4 for air and constant specific heats throughout.	CO3	BL5

7. Draw a schematic and explain the layout of a Diesel based power plant, Also discuss the function of various components of a Diesel based power plant. **CO3 BL3**

8. A power station has to supply load as follows: **CO5 BL5**

Time (hours)	0-6	6-12	12-14	14-18	18-24
Load (MW)	45	135	90	150	75

(i) Draw the load curve
(ii) Draw load duration curve
(iii) Choose suitable generating units to supply the load
(iv) Calculate the load factor
(v) Calculate the plant capacity factor

9.a) With neat schematic explain the following: **CO4 BL3**

(i) Low head hydro plant
(ii) Pumped storage power plant.

OR

9.b) With neat schematic explain the following: **CO4 BL3**

(i) Wind energy conversion
(ii) Tidal power plant.

10.a) Examine the relationship between fixed cost, variable cost, and total generation cost in determining the unit cost of electricity. **CO5 BL4**

OR

10.b) Evaluate how payback period analysis helps in deciding between renewable and non-renewable power generation investments. **CO5 BL4**

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