P P SAVANI UNIVERSITY

Sixth Semester of B. Tech. Examination

December 2022

SEME3101 Power Plant Engineering

03.12.2022, Saturday **Time: 1:00 p.m. To 3:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

			CO	BTL
Q - 1	**Answer the Following: (Any five)**	**[05]**		
(i)	The ratio of load factor and capacity factor is the		1	1
	(a) reserve factor (b) demand factor			
	(c) diversity factor (d) plant-use factor			
(ii)	The product of the load-factor and use factor is the		1	3
	(a) demand factor (b) capacity factor			
	(c) reserve factor (d) diversity factor			
(iii)	The cost of power generation (Rs/kwh) is determined by		1	1
	(a) fixed costs (b) operation and maintenance cost			
	(c) fuel costs (d) all of the above			
(iv)	Superheater outlet steam temperature is controlled by		4	1
	(a) desuperheater and attemperator (b) gas recirculation and gas bypassing			
	(c) tilting burners (d) all of the above			
(v)	As the plant use factor approaches unity, it indicates that		1	3
	(a) the plant is not operating efficiently			
	(b) the diversity factor should be increased			
	(c) there is the need for additional capacity of the plant			
	(d) the loads carried are in ascess of the rated capacity			
(vi)	The reciprocal of the thermal efficiency of a power plant is the		1	1
	(a) steam rate (b) heat rate			
	(c) net power output (d) heating value of fuel			
(vii)	Identify conventional energy source		4	1
	(a) tidal energy (b) nuclear energy			
	(c) hydro energy (d) wind energy			
Q - 2 (a)	Sketch layout of modern thermal power plant and explain different circuits.	**[05]**	4	2
Q - 2 (b)	Explain Loffler Boiler with neat sketch.	**[05]**	4	2
	OR			
Q - 2 (a)	Explain La Mont Boiler with neat sketch.	**[05]**	4	2
Q - 2 (b)	Enlist the merits and demerits of stroker firing.	**[05]**	4	2
Q - 3	Explain any one Hydraulic Ash Handling Systems with neat sketch. Also state the advantages and dis advantages of it.	**[05]**	6	2
	OR			
Q - 3	Compare Unit and Central Coal handling systems.	**[05]**	6	2

Q - 4 **Attempt Any One.** **[10]**

(i) A 100 MW thermal power has peak load of 65 MW. The power station supplies load to four town having their maximum demand of 20 MW, 15 MW, 10 MW and 30MW. The annual load factor is 65%. Find: **1 5**

(i) Average load on the plant. (ii) Energy supplied per year.
(iii) Diversity factor. (iv) Demand factor.
(v) Plant capacity factor.

(ii) Power plant supplies load as follows. **1 5**

Time	6 - 8	8 - 9	9 - 12	12 - 2	2 - 6	6 - 8	8 - 9	9 - 11	11 - 5	5 - 6
Load (KW)	1200	2000	3000	1500	2500	1800	2000	1000	500	800

Draw a load curve and calculate
(i) Load Factor (ii) Nos. of Units and Sizes
(iii) Reserve Capacity (iv) Plant Use Factor
(v) Plant Capacity Factor

SECTION - II

Q - 1 **Answer the Following: (Any five)** **[05]**

(i) The function of the moderator in a nuclear reactor is to **3 1**
(a) stop the chain reaction (b) reduce the speed of the neutrons
(c) absorb neutrons (d) reduce temperature

(ii) In CANDU type of nuclear reactors, which is true? **3 2**
(a) Natural uranium is used as fuel and water as moderator
(b) Natural uranium is used as fuel and heavy water as moderator
(c) Enriched uranium is used as fuel and water as moderator
(d) Enriched uranium is used as fuel and heavy water as moderator

(iii) For low heads only, these turbines are used in hydroelectric power plants **2 1**
(a) Francis turbines (b) Kaplan turbines
(c) Pelton wheels (d) Deriaz turbines

(iv) The most efficient ideal regenerative steam power cycle is **2 1**
(a) Rankine cycle (b) Carnot cycle
(c) Brayton cycle (d) Joule cycle

(v) Which one of the following is the fire-tube boiler? **4 1**
(a) Babcock and Wilcox boiler (b) Locomotive boiler
(c) Stirling boiler (d) Benson boiler

(vi) Coal fired power plant boilers manufactured in India generally use: **2 1**
(a) Pulverised fuel combustion (b) Fluidised bed combustion
(c) Circulating fluidised bed combustion (d) Moving stoker firing system

(vii) A gas turbine cycle with heat exchanger and reheating improves **4 3**
(a) Only the thermal efficiency
(b) Only specific power output
(c) Both thermal efficiency and specific power output
(d) Neither thermal efficiency nor specific power output

Q - 2 (a) Explain Construction and Working of Nuclear Reactor with neat sketch. **[05] 3 2**

Q - 2 (b) Explain Pressurized water reactor with proper schematic diagram. **[05] 3 2**

OR

Q - 2 (a) Explain Fast Breeder Reactor with neat sketch. **[05] 3 2**

Q - 2 (b)	Draw and enlist various parts of hydroelectric power plants. Explain them briefly.	**[05]**	4	2
Q - 3 (a)	Derive the condition for maximum discharge through chimney.	**[05]**	5	2
Q - 3 (b)	Explain any one external water treatment system with neat sketch.	**[05]**	6	2
	OR			
Q - 3 (a)	Calculate mass of flue gases flowing through the chimney when the draught produced is equal to 2.1 cm of water. Temperature of flue gases is 290 °C and ambient air temperature is 25 °C. The flue gases formed per kg of fuel burnt are 23 kg. Take diameter of chimney as 1.8 m.	**[05]**	5	5
Q - 3 (b)	Explain Hot Lime soda process with neat sketch.	**[05]**	6	2
Q - 4	**Attempt any one.**	**[05]**		
(i)	Classify the various types of condensers.		4	2
(ii)	Explain Evaporative Condenser with neat sketch.		4	2

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create