

University of Mumbai
Examination Summer 2022
Program: **Mechanical Engineering**
Curriculum Scheme: CBCGS (REV-2016)
Examination: BE Semester- VIII

Course Code: MEDLO8041
Time: 2.30 Hrs

Course Name: Power Plant Engineering
Max. Marks: 80

1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Pumped storage plant in connection with thermal power plant is used to take....
Option A:	No load
Option B:	Base load
Option C:	peak load
Option D:	Equal load
2.	What is the principle of operation of steam power plant?
Option A:	Carnot cycle
Option B:	Rankine cycle
Option C:	Brayton cycle
Option D:	Stirling cycle
3.	In combined GT-ST plant no mechanical draught supply needed because....
Option A:	furnace gas pressure is LOW
Option B:	furnace gas pressure is high
Option C:	induced or forced draught is not possible
Option D:	it will increase the cost
4.	Sum of maximum demands on transformers to the maximum demands is called as
Option A:	Demand factor
Option B:	Diversity factor
Option C:	Use factor
Option D:	Capacity factor
5.	Boron or cadmium, used to control the chain reaction by absorbing required neutron in nuclear reactor are called as
Option A:	moderator
Option B:	shielding
Option C:	Control rods
Option D:	reflectors
6.	Direct runoff constitutes of
Option A:	Surface runoff and infiltration
Option B:	Rainfall and evaporation
Option C:	Surface runoff and prompt inter flow and channel precipitation
Option D:	Overland flow
7.	What is the name of leading hydroelectric power stations installed in India?
Option A:	Kundamkulam
Option B:	Kalapakkam
Option C:	Narora
Option D:	Bhakra Nangal

8.	Method which is commonly applied for unloading the coal for small power plant is
Option A:	coal accelerators
Option B:	lift trucks
Option C:	tower cranes
Option D:	belt conveyor
9.	In thermal power plant, turbine is placed
Option A:	before boiler
Option B:	in between boiler and generator
Option C:	after generator
Option D:	at any place
10.	What is the unit of Heat rate?
Option A:	kJ/KW
Option B:	KW/kJ
Option C:	KW
Option D:	kJ

Q2	
A	Solve any Two 5 marks each
i.	Explain pumped storage power plant with neat sketch.
ii.	What do you understand by tariff? What is the Blockmeter rate tariff plan?
iii.	Prove that for economical load sharing in a power plant, the incremental rate (dI/dL) of all power generating units must be equal.
B	Solve any One 10 marks each
i.	The yearly duration curve of a certain plant can be considered as straight line from 300 MW to 80 MW. Power is supplied with one generating unit of 200 MW capacity and two units of 100 MW capacity each determine: i) installed capacity ii) load factor iii) plant factor iv) maximum demand v) utilization factor.
ii.	Explain working of CANDU reactor with neat sketch.
Q3	
A	Solve any Two 5 marks each
i.	Write short note on surge tank with neat sketch.
ii.	Write short note on base load and peak load plants.
iii.	Write merits and demerits of combined cycle power generation.
B	Solve any One 10 marks each
i.	Following data relates to combined gas and steam cycle. Gas turbine: Pressure ratio for compressor and turbine = 10. Inlet temperature of air = 27°C Inlet temperature to turbine = 827°C Isentropic efficiency of compressor = 0.85 Isentropic efficiency of turbine = 0.90 Mass flow rate of air = 100 kg/sec C.V of fuel = 44500 kJ/kg Steam turbine :- Inlet conditions to turbine = 20 bar, 250°C Condense pressure = 0.1 bar Temperature of gas leaving to the chimney from HRSG = 200°C Find the following 1. Power output and gas turbine cycle efficiency. 2. Mass flow rate of fuel and A:F ratio 3. Amount of steam generated in kg/hr

	4. Rankine cycle power output and efficiency. 5. Overall power output and efficiency of combined plant. Assume $C_{pg} = C_{pa} = 1.05 \text{ kJ/kg}$, $\gamma = 1.4$ both for air and gas.																												
ii.	Explain with neat sketches the stages of coal handling systems in details.																												
Q4																													
A	Solve any Two 5 marks each																												
i.	What is radioactivity and radioactive decay?																												
ii.	Discuss Rankine cycle with the help of schematic (T-S) and (h-s) Diagram																												
iii.	i) Explain Fluidised bed combustion																												
B	Solve any One 10 marks each																												
i.	The data of monthly flow for hydel plant at a site for 12 months is given below. Find the size of reservoir and possible rate of available flow. <table border="1" style="margin: 10px auto;"><tr><th>Month</th><th>Flow (m³/sec)</th><th>Month</th><th>Flow (m³/sec)</th></tr><tr><td>1</td><td>6</td><td>7</td><td>1.2</td></tr><tr><td>2</td><td>4</td><td>8</td><td>4.5</td></tr><tr><td>3</td><td>5.4</td><td>9</td><td>8</td></tr><tr><td>4</td><td>2</td><td>10</td><td>4</td></tr><tr><td>5</td><td>1.5</td><td>11</td><td>3</td></tr><tr><td>6</td><td>1</td><td>12</td><td>2</td></tr></table>	Month	Flow (m ³ /sec)	Month	Flow (m ³ /sec)	1	6	7	1.2	2	4	8	4.5	3	5.4	9	8	4	2	10	4	5	1.5	11	3	6	1	12	2
Month	Flow (m ³ /sec)	Month	Flow (m ³ /sec)																										
1	6	7	1.2																										
2	4	8	4.5																										
3	5.4	9	8																										
4	2	10	4																										
5	1.5	11	3																										
6	1	12	2																										
ii.	The following proposals are under consideration for an industry which has maximum demand of 45 MW and a load factor of 0.45 i) A steam power plant having an initial cost of Rs.1200/kW and maintenance cost of Rs. 2.4 paise/kWh. The coal of CV of 2550 kJ/N is used The overall efficiency of plant is 24%. ii) An hydro plant having a capital cost of Rs. 3600 /kW and a running cost of 0.6 paise/kWh. Assuming interest and depreciation rate of 10% for steam power plant and 8% for hydro plant, determine the price of coal above which steam station is uneconomical.																												