

- (vii) In an impulse turbine, steam expands _____
 (a) wholly in nozzle (b) partly in the nozzle and partly in blades
 (c) wholly in blades (d) none of the mentioned.
- (viii) What is the function of moderators in nuclear reactor?
 (a) Absorb the secondary neutrons (b) Slow down the secondary neutrons
 (c) Control the chain reaction (d) None of the mentioned.
- (ix) What is the difference between the temperature of entering and leaving water in the cooling tower?
 (a) Wet-bulb temperature (b) Dry bulb temperature
 (c) Approach (d) Range.
- (x) In a reaction turbine when the degree of reaction is zero, then there is _____
 (a) no heat drop in moving blades (b) maximum heat drop in fixed blades
 (c) no heat drop in fixed blades (d) maximum heat drop in moving blades.

Fill in the blanks with the correct word

- (xi) Reheat cycle in steam power plant is used to prevent _____ in last stage of turbine.
- (xii) The pressure difference that helps in supplying air and removing flue gases in a boiler is called _____.
- (xiii) When the nozzle is operates with the maximum mass flow, the nozzle is said to be _____.
- (xiv) In a fire tube boiler, the water to be heated is kept in the _____.
- (xv) A single stage impulse turbine is also known as _____.

Group - B

2. In a single –heater regenerative cycle the steam enters the turbine at 30 bar 400°C and the exhaust pressure is 0.1 bar. The feed water heater is a direct contact type which operates at 4.5 bar. Find (i) the efficiency and the steam rate of the cycle and (ii) the increase in mean temperature of heat addition, efficiency and steam rate, as compared to the Rankine cycle (without regeneration). Neglect Pump work. Draw T-s diagram of both the cases.

[[CO1](Evaluate/HOCQ)]

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3. (a) Discuss the desirable characteristics of a working fluid in a vapour power cycle.
- (b) State the essential difference between Carnot and Rankine cycle. What are the difficulties experienced in carrying out the Carnot cycle in steam power plants?

[[CO1](Understand/LOCQ)]

8 + 4 = 12

Group - C

4. (a) What is the significance of dry flue gas loss in boiler performance? What are the main causes of boiler heat losses? *[[CO2](Describe/LOCQ)]*
- (b) How does moisture in fuel adversely affect boiler efficiency? What are radiation losses in a boiler system? *[[CO2](Understand/LOCQ)]*
- (c) How can the heat balance sheet of a boiler be used? What is the significance of flue gas temperature in boiler performance? *[[CO2](Apply/IOCQ)]*
- 4 + 4 + 4 = 12**
5. (a) Mention the principal components of a mechanical ash handling system, and state their functionalities. *[[CO4](Describe/LOCQ)]*
- (b) What is the significance of the air-fuel ratio in coal combustion? *[[CO2](Understand/LOCQ)]*
- (c) What is the role of an economizer in a coal-fired boiler system? *[[CO2](Apply/IOCQ)]*
- 6 + 3 + 3 = 12**

Group - D

6. Combustion gases expand in a propulsion nozzle from 3.8 bar and 450°C to a back pressure of 1 bar at the rate of 16 kg/s. Assuming the inlet velocity is negligible, and taking coefficient of discharge is 0.98 and a nozzle efficiency is 0.93, calculate the required throat and exit areas of the nozzle. Took $C_p = 1.11$ kJ/kg K and specific heat ratio is 1.333. Draw the T-s diagram of the process. *[[CO3](Solve/IOCQ)]*
- 12**
7. (a) A Parsons reaction (50%) turbine running at 400 rpm develops 5 MW using 6 kg/k Wh of steam flow. The exit angle is 20° and the velocity of steam relative to the blades at exit is 1.35 times the mean blade speed. At a particular stage in the expansion the pressure is 1.2 bar and the steam quality is 0.95. Draw the suitable diagram and calculate for this stage (i) a suitable blade height (h_b), assuming the ratio of D_m/h_b as 12 and (ii) the diagram power. Where D_m is rotor diameter. *[[CO3](Solve/IOCQ)]*
- (b) What is the optimum velocity ratio for (i) an impulse stage turbine (ii) a two row Curtis stage (iii) a 50% reaction stage turbine. *[[CO3](Remember/LOCQ)]*
- 8 + 4 = 12**

Group - E

8. (a) A power plant has the following annual factors: load factor = 0.75, capacity factor = 0.62, use factor = 0.65. Maximum demand is 63 MW. Estimate (i) the annual energy production, (ii) the reserve capacity over and above the peak load, and (iii) the hours during which the plant is not in service per year. *[[CO6](Solve/IOCQ)]*
- (b) What is High Temperature Gas Cooled Reactor? Explain its main feature. *[[CO6](Remember/LOCQ)]*
- 6 + 6 = 12**

9. (a) Describe the advantages and disadvantages of hydroelectric power plant. *[[CO6](Understand/LOCQ)]*
- (b) Steam enters the condenser at 35.5°C. The condenser vacuum is 70 cm of mercury when the barometer reads 75.5 cm of Hg. Determine the vacuum efficiency. Estimate the mass of air present in the condenser per kg of steam. *[[CO5](Solve/IOCQ)]*
- 6 + 6 = 12**
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54	48.96	12.5