BE (Mech) Sem - VIII - CBCGS.

53353 - Power Engg.

University of Mumbai
Examinations summer 2022

Time: 2 hour 30 minutes Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Draft tube is used for discharging water from the exit of
Option A:	an impulse turbine
Option B:	a Kaplan turbine
Option C:	a Pelton wheel
Option D:	a reciprocating pump
2.	Turbofan engine is preferred over turbojet due to
Option A:	high propulsive efficiency
Option B:	high thrust
Option C:	reducing noise
Option D:	all of these
3.	The use of recuperator in gas turbine plant is to
Option A:	increases thermal efficiency
Option B:	increase work output
Option C:	increase efficiency and power output
Option D:	decreases thermal efficiency
4.	Difference between impulse and reaction turbine is that
Option A:	in impulse turbine only pressure energy converted into work but in reaction turbine pressure and kinetic energy converted to work
Option B:	in impulse turbine only pressure energy converted into work but in reaction turbine kinetic energy converted to work
Option C:	in impulse turbine only kinetic energy converted into work but in reaction turbine pressure and kinetic energy converted to work
Option D:	in impulse turbine only kinetic energy converted into work but in reaction turbine pressure converted to work
5.	What is the Stoichiometric (Theoretical) A/F ratio for the combustion of Methane CH4 on mass basics?
Option A:	10.58
Option B:	11.58
Option C:	9.58
Option D:	12.58
6.	Cavitation in Centrifugal pump can be reduced by
Option A:	reducing the discharge
Option B:	reducing the suction head
Option C:	increasing the discharge
Option D:	increasing the flow velocity
7.	For given pressure and temperature conditions of reactants maximum adiabatic flame temperature is achieved with
Option A:	weak mixture
Option B:	rich mixture
Option C:	stoichiometric mixture

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Option D:	mixture with 10% excess air
8.	Fusible plug is used
Option A:	to extinguish fire in furnace
Option B:	to control pressure
Option C:	to control water level
Option D:	to control steam generation
9.	Francis turbine is
Option A:	an impulse turbine
Option B:	a radial flow impulse turbine
Option C:	an axial flow turbine
Option D:	a reaction radial flow turbine
10.	If diameter of a centrifugal pump impeller is doubled but discharge is to remain same, then the head needs to be reduced by
Option A:	2 times
Option B:	4 times
Option C:	8 times
Option D:	16 times

Q2. (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	What is the difference between water tube and fire tube boilers?
B	What is cavitation and what are it causes? How will you prevent the cavitation in hydraulic machine?
C	Steam is generated at 11 bar and 250 °C in boiler from feed water at 26 °C. The calorific value of the coal used is 33707 kJ/kg. Calculate the factor of evaporation and equivalent evaporation from and at 100 °C. Also calculate the boiler power if 260 kg/h of coal is burnt.
D	Explain velocity compounded impulse steam turbine showing pressure and velocity variations along the axis of the turbine.
E	Differentiate between jet propulsion and rocket propulsion.
F	Obtain the expression for the force exerted by a jet of water on a fixed curved plates when jet strikes at the center of a symmetrical curved blades.

Q3. (20 Marks)	**Solve any Two Questions out of Three** **10 marks each**
A	In a De-Laval turbine, the mean diameter of the blade is 80 cm and the speed of rotation is 3000 rpm. The steam issues from the nozzles with a velocity of 300 m/s and the nozzle angle is 20°. The blades are equiangular. The friction factor is 0.8. What is the power developed in the blades when the axial thrust on the blades is 140 N?
B	The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2 m^3/s. The angle of deflection of the jet is 165°. Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio 0.45 and velocity coefficient 1.0.

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C	A Francis turbine has a diameter of 140 cm and rotates at 430 rpm. Water enters the runner without shock with a flow velocity of 9.5 m/s and leaves the runner without whirl with an absolute velocity of 7 m/s. The difference between the sum of static and potential heads at entrance to the runner and at the exit from the runner is 62 m. The turbine develops 13000 kW. The flow rate through the turbine is 12 m^3/s for a net head of 115 m. Find the following: i) The absolute velocity of water at entry to the runner and the angle of the inlet guide Vanes ii) The entry angle of the runner blades and iii) The loss of head in the runner

Q4. (20 Marks)	
A	**Solve any Two** **5 marks each**
i.	Explain Ramjet engine with neat diagram. What are its basic characteristics?
ii.	Write short notes on "Enthalpy of Formation".
iii.	Explain the principle of working of Pelton turbine. Draw velocity triangle.
B	**Solve any One** **10 marks each**
i.	In a gas turbine plant, the air enters the compressor at 0.15 Mpa and 20 °C. The maximum pressure and temperature of the cycle are 1.2 Mpa and 1200 °C respectively. Determine the cycle thermal efficiency if the turbine and compressor efficiencies are 85 % each.
ii.	A Single-acting reciprocating pump has stroke length of 15 cm. The suction pipe is 7 meter long and the ratio of the suction diameter to the plunger diameter is ¾. The water level in the sump is 2.5 meters below the axis of the pump cylinder, and the connecting the sump and pump cylinder is 7.5 cm diameter. If the crank is running at 75 rpm, determine the pressure head on the piston: (i) in the beginning of the suction stroke, (ii) in the end of the suction stroke, and (iii) in the middle of the suction stroke. Take coefficient of friction as 0.01.

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1T01428 - B.E (Mechanical Engineering) (SEM-VIII)(Choice Base Credit Grading System) / **53353** - Power Engineering
Correction in QP Code **93500**
Subject - Power Engineering
Question 2 (C)Quantity of Steam= 2340 kg/hr

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23/5/22
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