Enrolment No.___

GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V • EXAMINATION – SUMMER • 2015

Subject code: 151903 Subject Name: Fluid Power Engineering Time: 02.30pm-05.00pm Instructions:

Date: 11/05/2015

Total Marks: 70

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Explain following terms: Equivalent pipe, Hydraulic gradient line, 07 Syphon, Water hammer
 - (b) The diameter of a horizontal pipe which is 300 mm is suddenly enlarged 07 to 600 mm. The rate of flow of water through this pipe is $0.4 \text{ m}^3/\text{ sec.}$ If the intensity of pressure in the smaller pipe is $125 \text{ kN}/\text{m}^2$, determine
 - 1. Loss of head due to sudden enlargement,
 - 2. Intensity of pressure in large pipe,
 - 3. Power lost due to enlargement.
- Q.2 (a) A jet of water moving with a velocity of 22 m/s impinges on a curved 07 vane at the one end tangentially. The jet leaves the vane at an angle of 120° to the direction of motion of the vane. The velocity of vane is 10 m/s and the angle of the nozzle is 20°. Determine
 - 1. Vane angle at the inlet and outlet
 - 2. Work done per second per unit mass of water.
 - (b) With neat sketch explain construction and working of hydraulic press. 07 OR
 - (b) With neat sketch explain construction and working of hydraulic 07 intensifier.
- Q.3 (a) What are different characteristics curves for turbines? Differentiate 07 between main and operating characteristic curves of hydraulic turbines.
 - (b) Each turbine of a hydro power plant operates under a head of 860 m 07 and produced 6000 k W. The speed of turbine is 600 rpm. Determine
 - 1. The least diameter of the jet
 - 2. The mean diameter of the wheel
 - 3. Jet ratio
 - 4. The number of jets

Assume $C_v=0.98$, Speed ratio of 0.46 and overall efficiency of 0.88

OR

- Q.3 (a) What is specific speed? Derive an expression for specific speed of 07 turbine.
 - (b) A straight conical draft tube with inlet diameter 50 cm and exit diameter 07 90 cm is of 4 m height. The tube is immersed I m in water. The water enters the draft tube with a velocity of 5 m/s. taking friction head loss = 20% of velocity head at the entry, calculate
 - 1. Pressure head at the entry
 - 2. Draft tube efficiency
 - 3. Power lost in friction and at exit.

- **Q.4** (a) Compare the following:
 - 1. Centrifugal compressor and axial flow compressor
 - 2. Screw compressor and Scroll compressor
 - (b) A three stage single acting reciprocating compressor has perfect 07 intercooling. The pressure and temperature at the end of suction stroke in L.P cylinder is 1.013 bar and 15° C resply. If 8.4 m³ of free air is delivered by the compressor at 70 bar per minute and work done is minimum, calculate
 - 1. L.P. and I. P. delivery pressure
 - 2. Ratio of cylinder volume
 - 3. Total indicated power, assume n=1.2

OR

- Q.4 (a) In a two stage air compressor in which intercooling is perfect prove that 07 the work done in compression is minimum when pressure in the intercooler is geometric mean between initial and final pressure.
 - (b) An axial flow compressor, with compression ratio as 5 draws air at 07 20°C and delivers it at 50°C. Assuming 50% degree of reaction, find the velocity of flow if the blade velocity is 100 m/s, also find number of stages. Take work factor= 0.85, α =10°, β =40° and c_p =1 k J/kg K
- Q.5 (a) Explain the following terms: Multistage pumps, cavitation, Air vessel 07
 - (b) A triple cylinder pump raises the water level by 100m and the discharge 07 is 100 lts/ sec. The diameter of the piston is 250 mm and stroke is 600mm. The velocity of water in the delivery pipe is 1.4m/s. The friction losses amount to 2m in the suction pipe and 18 m in the delivery pipe. Taking efficiency of the pump as 90 % and slip 2%. Find the speed and power input of the pump.

OR

- Q.5 (a) Explain how centrifugal pumps are classified?
 - (b) The inlet and outlet diameter of a impeller of a centrifugal pump are 30 07 cm and 50 cm. The velocity of flow at the outlet is 2.5 m /s and vane outlet angle is 45°. Find the minimum speed of the pump required to start the flow. Take manometric efficiency of 75%.

07

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