

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER- V(OLD) EXAMINATION – SUMMER 2019****Subject Code:151903****Date:31/05/2019****Subject Name:Fluid Power Engineering****Time:02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Derive an expression of power transmission through pipe. Also find condition for maximum power transmission and corresponding efficiency of transmission. **07**
- (b) Derive Darcy- Weisbach formula for head loss due to friction in pipe flow. **07**
- Q.2** (a) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%. **07**
- (b) Write brief note on hydraulic ram. **07**
- OR**
- (b) Prove that the efficiency of propulsion when the inlet orifices face the direction of motion of the ship is given by **07**
- $$\eta = \frac{2u}{V + 2u}$$
- Q.3** (a) What is degree of reaction? Prove that for Francis turbine degree of reaction is 50%. **07**
- (b) The following data relates to a Pelton wheel turbine **07**
- (i) Head of base of nozzle=75m
  - (ii) speed of the wheel = 250 rpm
  - (iii) speed ratio =0.46
  - (iv) Power at the shaft=120 kw
  - (v) Coefficient of velocity = 0.98
  - (vi) Overall efficiency =86%. Design the Pelton wheel to find the wheel diameter, diameter of jet, size of buckets and number of buckets on the wheel.
- OR**
- Q.3** (a) Write short note on: **07**
- (i) Priming in centrifugal pump
  - (ii) Pre-whirl in centrifugal compressor
- (b) Explain the governing of Kaplan turbine with neat sketch. **07**
- Q.4** (a) Define specific speed of pump. Derive an expression for specific speed for centrifugal Pump. **07**
- (b) A single acting reciprocating pump, running at 60 rpm delivers 0.54 m<sup>3</sup> of water per minute. The diameter of the piston is 200mm and stroke length 300mm. the suction and delivery heads are 4m and 12m respectively. Determine: (i) Theoretical discharge, (ii) co-efficient of discharge, (iii) percentage slip of pump, (iv) power required to drive the pump. **07**
- OR**
- Q.4** (a) Derive an expression of work done per cycle for reciprocating compressor by considering clearance volume. **07**
- (b) A centrifugal compressor delivers 16 kg/sec of air with a total head pressure ratio of 4:1, when running at 15000 rpm. Inlet total head temperature is 25 °C, slip factor 0.9, power input factor 1.04 and isentropic efficiency 82%, calculate: (i) Outlet diameter of the impeller, (ii) Power input. Take C<sub>p</sub> = 1.005 kJ/kgK. **07**

- Q.5 (a)** With neat sketch explain construction and working of hydraulic intensifier **07**  
**(b)** Explain following terms: Drafttube, Cavitation and Air vessel **07**
- OR**
- Q.5 (a)** With neat sketch explain construction and working of hydraulic intensifier **07**  
**(b)** Explain the phenomenon of surging and stalling in an axial flow compressor **07**

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