

Seat No.: _____

Enrolment No. _____

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 m³ 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_p = 1.005 kJ/kgK. **07**

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| 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 |
