

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2160602

Date:20/11/2018

Subject Name:Applied Fluid Mechanics

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**
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|-----|---|-----------|
| (a) | Explain various types of open channels with sketch | 03 |
| (b) | Write the differences between pipe flow and open channel flow? | 04 |
| (c) | Enlist the major and minor losses in pipes. Derive the expression for loss of head due to sudden contraction. | 07 |

- Q.2**
- | | | |
|-----|---|-----------|
| (a) | Explain hydraulically smooth and rough pipes | 03 |
| (b) | Define boundary layer, laminar sub-layer, displacement thickness and momentum thickness | 04 |
| (c) | Derive Darcy Weisbach formula for the loss of head due to friction in pipe line. | 07 |

OR

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|-----|--|-----------|
| (c) | Calculate the head loss due to friction using Darcy Equation and power required to maintain 60 liters per second of liquid flow through a steel pipe 0.08 m radius and 900 m long. Take Sp. Gravity of the liquid = 0.85 and co-efficient of friction $f=0.0025$. | 07 |
|-----|--|-----------|
- Q.3**
- | | | |
|-----|---|-----------|
| (a) | Write the assumptions made in derivation of the Dynamic Equation of the Gradually varied flow | 03 |
| (b) | Explain the Manning's formula in open channel flow | 04 |
| (c) | Explain with diagram the Specific Energy Curve and Discharge Curve and derive the mathematical expression for minimum specific energy and maximum discharge in terms of depth of flow | 07 |

OR

- Q.3**
- | | | |
|-----|--|-----------|
| (a) | Define
(i) Cavitation (ii) Prandtl Mixing length (iii) Water Hammer | 03 |
| (b) | Enlist the important applications of Navier-stoke equations | 04 |
| (c) | A trapezoidal channel is 4.5 m wide at bottom and has a side slope of 0.5H: 1V. The bed slope of the channel is 0.0003. Find the discharge of the most economical section. Assume Manning's coefficient $n = 0.02$ | 07 |
- Q.4**
- | | | |
|-----|--|-----------|
| (a) | What is priming? Why is it necessary in centrifugal pump? | 03 |
| (b) | Discuss the phenomenon of boundary layer separation. | 04 |
| (c) | Define the most economical channel section. Derive the condition for trapezoidal channel of best section | 07 |

OR

- Q.4**
- | | | |
|-----|---|-----------|
| (a) | Derive the expression for displacement thickness. | 03 |
| (b) | Define hydraulic jump? Discuss the types of jump based on Froude number | 04 |
| (c) | A Francis turbine of 0.8 metre runner diameter working under a head of 3.0 metres at a speed of 150 rpm develops 80 kW when the rate of flow of water is $1.6 \text{ m}^3/\text{s}$. If the head on the turbine is | 07 |

increased to 10.5 metres determine the new speed, discharge and power.

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|------------|------------|--|-----------|
| Q.5 | (a) | Discuss the types of the similarities. | 03 |
| | (b) | Compare Impulse turbine and Reaction Turbine. | 04 |
| | (c) | Explain construction and working of a pelton wheel | 07 |

OR

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|------------|------------|---|-----------|
| Q.5 | (a) | Define: Mechanical efficiency and Hydraulic efficiency | 03 |
| | (b) | Discuss the Distorted and Undistorted Models. What are the merits and demerits of Distorted Models? | 04 |
| | (c) | Explain the Buckingham's π - theorem for dimensional analysis | 07 |
