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S.E.(Mining) Semester- IV (Revised Course 2007-08)  
EXAMINATION MAY/JUNE 2019  
Fluid Mechanics & Machinery

[Duration : 3 Hours]

[Total Marks : 100]

Please check whether you have got the right question paper.

Instructions :

1. Answer any five questions selecting at least one from each Module.
2. Make suitable assumptions if required and rate them clearly.
3. Supplement your answer with neat sketch wherever required.
4. All symbols and abbreviations have their usual meaning.

MODULE-I

- Q.1 A) Explain 06
- i) Vapour pressure
  - ii) Total pressure and centre of pressure
- B) Explain the various types of fluid with the help of neat graph. 06
- C) Define Kinematic Viscosity and derive its dimensions. 08  
A plate 0.03mm distance from a fixed plate, moves at 80cm/s and requires a force of 3N/m<sup>2</sup> to maintain this speed calculate fluid viscosity between the plates.
- Q.2 A) A simple U- tube manometer containing mercury is connected to a pipe in which oil of specific gravity 0.8 is flowing The pressure the pipe is vacuum. The other end of manometer is open to atmosphere. Find the vacuum pressure in the pipe if the difference in mercury levels in the two limbs is 20cm and the mercury level in left limb is 15cm below the center of the pipe. 10
- B) Explain the following terms: 05
- i) Steady and unsteady flows
  - ii) Uniform and non – uniform flows
- C) Explain rotational and irrotational flow. A fluid flow is given by  $V = 18x^3i - 20x^2yj$ , state whether the flow is rotational or irrotational 05

## MODULE-II

- Q.3 A) Explain the various Hydraulic coefficients considered during flow through orifice. 06
- B) Water is flowing through a taper pipe of length 100m having diameters 600mm at the upper end and 250mm at the lower end at the rate of 80 lit/s. the pipe has a slope of 1 in 50 . Determine the pressure at the lower end if the pressure at higher level is  $90\text{KN/m}^2$ . 08
- C) Derive Euler's equation. 06
- Q.4 A) A horizontal venturimeter with inlet diameter 120mm and throat diameter 60mm is used to measure discharge of water The differential monometer reading is 110mm of mercury . Find discharge through venturimeter if  $C_d = 0.96$  06
- B) Derive the expression for calculating discharge using a Triangular Notch. 08
- C) Find discharge over a rectangular notch of width 20cm when head over the notch is 0.3m Assume  $C_d = 0.6$ . if the same discharge is passing over a triangular notch of angle  $60^\circ$  and  $C_d = 0.63$  Determine the head over this triangular Notch. 06

## MODULE-III

- Q.5 A) Explain : i) Total energy line 06  
ii) Major losses in pipes
- B) A syphon of diameter 200mm connects two reservoirs having a difference in elevation as 20m. The total length of syphon is 800m and the summit is 5m above the water level in the upper reservoir . If separation takes place at 2.8m at water absolute, find the maximum length of the syphon from upper reservoir to the summit. Take  $f=0.004$  and atmospheric pressure = 10.3 of water 09
- C) Explain the water Hammer phenomenon in pipes. 05
- Q.6 A) Two sharp ended pipes of diameters 60mm and 100mm respectively each of length 150m are connected in parallel between two reservoirs having a difference of level of 15m. if the coefficient of friction of each pipe is 0.08 ,calculate the rate of flow for each pipe and also the diameter of a single pipe of length 150m which would give the same discharge if it were substituted for the original two pipes. 08
- B) Derive an expression for loss of head due to sudden contraction of a pipe. 06
- C) Write short note on Dupuits Equation 06

MODULE-IV

- Q.7 A) With a neat labeled diagram, explain the main parts of a centrifugal pump. 10
- B) Write a short note on Multistage centrifugal pumps. 05
- C) Explain the phenomenon of cavitation in centrifugal pump. 05
- Q.8 A) With a neat sketch explain the working of a Reciprocating pump. 10
- B) A single acting reciprocating pump operating at 120 rpm has a piston diameter of 200mm and stroke of 300mm .The suction and delivery heads are 4m and 20m respectively find power required to pump Also calculate discharge in liters/sec. 10