Roll No: ----------------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December - 2017

Program Name:	**B. Tech. (Fire and Safety)**	**Semester: III**
Course Name :	**Fluid Mechanics & Fluid Flow Machines**	**Max. Marks: 100**
Course Code :	**GNEG 245**	**Duration: 3 Hrs.**
No. of page/s:		

SECTION: A – **(4 * 5 = 20 Marks)**

1. MCQ

   a. One litre of a certain fluid weighs 8N. What is its specific volume?
      - i. 2.03 * 10– 3 m^3/kg
      - ii. 20.3 * 10– 3 m^3/kg
      - iii. 12.3 * 10– 3 m^3/kg
      - iv. 1.23 * 10– 3 m^3/kg

   b. What is the correct formula for absolute pressure?
      - i. $P_{abs} = P_{atm} – P_{gauge}$
      - ii. $P_{abs} = P_{vacuum} – P_{atm}$
      - iii. $P_{abs} = P_{vacuum} + P_{atm}$
      - iv. $P_{abs} = P_{atm}+ P_{gauge}$

   c. If the dynamic viscosity of a fluid is 0.5 poise and specific gravity is 0.5, then the kinematic viscosity of that fluid is:
      - i. 0.25
      - ii. 0.5
      - iii. 1.0
      - iv. 2.0

   d. Which of the following pressure units represents the least pressure?
      - i. Millibar
      - ii. mm of Mercury
      - iii. N/mm^2
      - iv. kgf/cm^2

   e. What is the correct formula for Euler's equation of motion?
      - i. $(\partial p / \rho) + (\partial g / \rho) + (\partial v / \rho) = 0$
      - ii. $(\partial p / \rho) + (\partial g / \rho) + (v\, dv) = 0$
      - iii. $(\partial p / \rho) + (g\, dz) + (v\, dv) = 0$
      - iv. $(p\, dp) + (g\, dz) + (v\, dv) = 0$

2. A hydraulic press has a ram of 30 cm diameter and a plunger of 4.5 cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500 N.

3. Derive the relationship between Bulk modulus and Pressure of a gas for adiabatic process.

4. Three pipes of lengths 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of the single pipe.

SECTION: B – **(4 * 10 = 40 Marks)**

5. List down Empirical formulae for the value of Chezy's constant.
6. Derive the equation for Minor energy (head) loss in pipe flow due to sudden enlargement.
7. Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.
8. A circular plate 4 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 5 m and 2 m respectively. Determine the total pressure on one face of the plate and position of the Centre of pressure.

SECTION: C – **(2 * 20 = 40 Marks)**

9. A trapezoidal channel has side slope 1 to 1. It is required to discharge 13.75 m^3/s of water with a bed gradient of 1 in 1000. If unlined, the value of Chezy's C is 44. If lined with concrete, its value is 60. The cost per m^3 of excavation is four times the cost per m^3 of lining. The channel is to be the most efficient one. Find whether the lined canal or the unlined canal will be cheaper. What will be the dimensions of that economical canal?
10. Find the convective acceleration at the middle of a pipe which converges uniformly from 0.4 m diameter to 0.2 m over 2 m length.
    a. If the rate of flow is 20 L/s.
    b. If the rate of flow changes uniformly from 20 L/s to 40 L/s in 30 seconds, Find the total acceleration at the middle of the pipe.

OR

A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter id suddenly enlarged to 300 mm. the height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take, coefficient of friction is 0.01 for both section of pipe.

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