Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: B. Tech. (FSE) **Semester : III**
Course Name : Fluid Mechanics & Fluid Flow Machines **Time : 03 hrs**
Course Code : GNEG 245 **Max. Marks: 100**
Nos. of page(s) :
Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Write the equation of net/resultant force according to: a. Euler's equation of motion b. Navier-Stikes Equation c. Reynold's equation of motion d. Newton's second low of motion	4	CO1
Q 2	Derive the relationship between Bulk modulus and Pressure of a gas for adiabatic process	4	CO2
Q 3	Derive the equation for Minor energy (head) loss in pipe flow due to Sudden obstruction	4	CO2
Q 4	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.	4	CO3
Q 5	Write short note on: a. Vena-contracta b. Temperature-Lapse-Rate	4	CO1

SECTION B

Q 6	A fluid flow field is given by $V = x^2 yi + y^2 zj - (2xyz + y z^2)k$ Prove that it is a case of possible steady incompressible fluid flow. Calculate velocity and acceleration at the point (2, 1, 3) **OR** 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.	10	CO3
Q 7	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.	10	CO4
Q 8	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-	10	CO5

	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.		
Q 9	Derive the equations for most economic hydraulic sections for rectangular channel and trapezoidal channel.	**10**	**CO4**
	SECTION-C		
Q 10	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? **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.	**20**	**CO6**
Q 11	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.	**20**	**CO5**

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