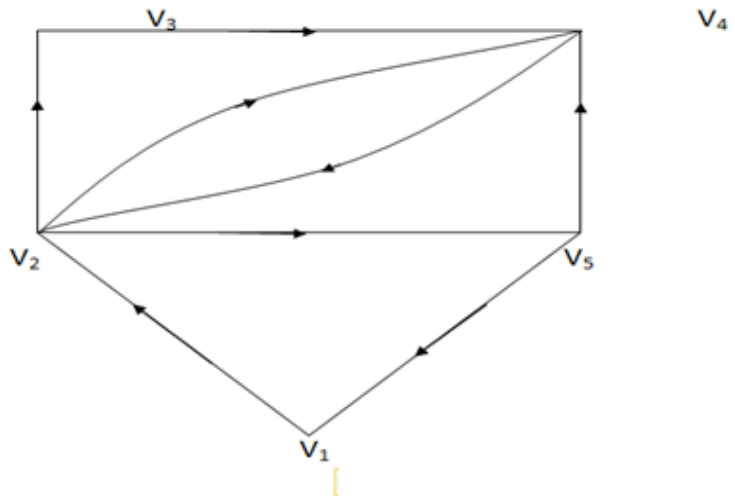
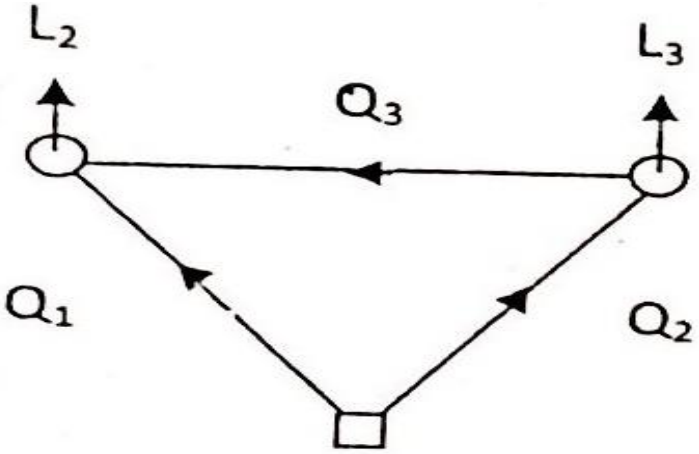
Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Term Examination – December 2019

Program: M.Tech PLE **Semester: III**
Course: Pipeline Network Analysis **Time: 03 hrs.**
Code: CHPL 8004
Max Marks :100

Section A (20)

1	Calculate the gravity of a natural gas mixture consisting of 84% methane, 10% ethane, and 6% propane. From the gas gravity, calculate the pseudo-critical temperature and pseudo-critical pressure for this natural gas mixture	**05**	**CO1**
2	Develop a diagram of facilities at DRS	**05**	**CO5**
3	Derive the equation for equivalent diameter in parallel pipelines	**05**	**CO2**
4	Evaluate line pack system for unsteady state pipeline	**05**	**CO3**
	SECTION B (40)		
5	Explain transient analysis in detail	**10**	**CO2**
6	Formulate equations of Kirchhoff's laws in matrix notations	**10**	**CO3**
7	Find best center position for following network 	**10**	**CO3**
8	A gas pipeline, DN 500 with 12 mm wall thickness, transports natural gas (specific gravity = 0.6) at a flow rate of 7.5 Mm3/day at an inlet temperature of 15°C. Assuming isothermal flow, determine the velocity of gas at the inlet and outlet of the pipe if the inlet pressure is 7 MPa and the outlet pressure is 6 MPa. The base pressure and base	**10**	**CO1**

	temperature are 0.1 MPa and 15°C. Assume compressibility factor Z = 0.95. Determine erosional velocity.		
	SECTION C (40 Marks)		
9	Explain PNG infrastructure in detail	**20**	**CO5**
10	A series piping system, consists of 12 mi of NPS 16, 0.375 in.wall thickness connected to 24 mi of NPS 14, 0.250 in. wall thickness and 8 miles of NPS 12, 0.250 in. wall thickness pipes. Determine the inlet pressure required at the origin A of this pipeline system for a gas flow rate of 100 MMSCFD. Gas is delivered to the terminus B at a delivery pressure of 500 psig. The gas gravity and viscosity are 0.6 and 0.000008 lb/ft-s, respectively. The gas temperature is assumed constant at 60°F. Use a compressibility factor of 0.90 and the General Flow equation with Darcy friction factor = 0.02. The base temperature and base pressure are 60°F and 14.7 psia, respectively. Compare results using the equivalent length method and with the more detailed method of calculating pressure for each pipe segment separately. Comment on your result. $$Q = 1.1494 \times 10^{-3} \left(\frac{T_b}{P_b}\right) \left[\frac{\left(P_1^2 - P_2^2\right)}{GT_f LZf}\right]^{0.5} D^{2.5} \quad \text{(SI units)}$$	**20** **20**	**CO2** **CO2**
	Or  A simple gas network having one source & two loads as shown below. L2 =100 ; L3= 150 ; Pipe 1-2= 400m , 100mm diameter; Pipe 1-3= 300m, 125mm diameter ; Pipe 2-3= 350m , 75mm diameter. Assume low pressure analysis to be valid; $\Delta p = KQ^2$ Where $k = 11.7 * 10^3 * L/D$ Carry out two iterations using Newton Nodal Method.		