

Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Term Examination – May 2024

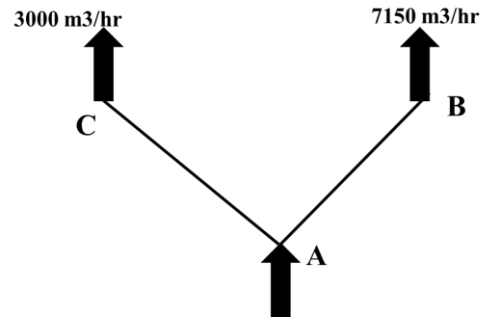
Program: B. Tech APE (Gas)
Course: Design of CGD Network
Code: CHGS 3029
Max Marks :100

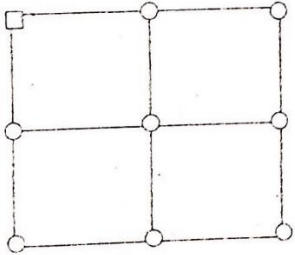
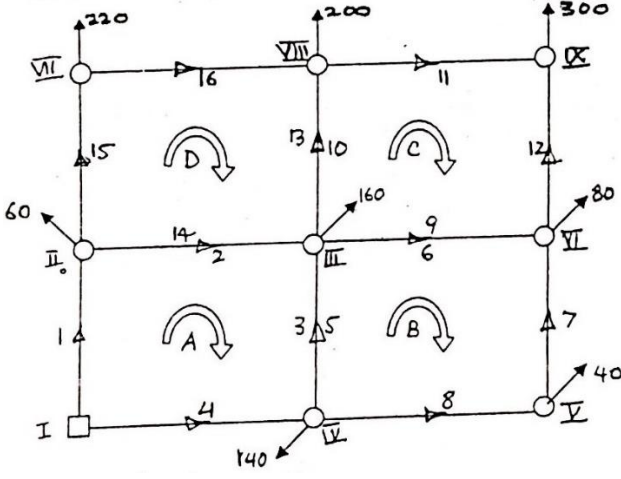
Semester: VI
Time: 03hrs.

SECTION A (4x5=20)

S. No.	Attempt all questions	Marks	CO
1	A natural gas pipeline, DN 500 with 12 mm wall thickness, transports 3.5 Mm ³ /day. The specific gravity of gas is 0.6 and viscosity is 0.00012 Poise. Calculate the value of the Reynolds number. Assume the base temperature and base pressure are 15°C and 101 kPa, respectively.	4	CO1
2	Derive the equation of equivalent diameter parallel pipelines.	4	CO3
3	Explain the principles of line pack system	4	CO2
4	The pseudo-critical temperature and the pseudo-critical pressure of a natural gas mixture were calculated as 370°R and 670 psia, respectively. If the CO ₂ content is 2.5 % and H ₂ S is 4.5%, calculate the adjustment factor <i>e</i> and the adjusted values of the pseudo-critical temperature and pressure.	4	CO4
5	Write a note on Input requirements for network analysis	4	CO2

SECTION B (4x10=40)

6		10	CO2
<p>The existing network is given in above figure. It's proposed to connect section B to C. For the following data calculate the flow rate in each pipe.</p> <p>$L_{AB} = 4500\text{m}$; $D_{AB} = 300\text{mm}$; $L_{BC} = 3500\text{m}$ $D_{BC} = 175\text{mm}$, $L_{AC} = 6500\text{m}$, $D_{AC} = 250\text{mm}$.</p>			

7	Illustrate Kirchoff's first and second law equations for the network in matrix vector notation.	10	CO3
8	 <p>Draw tree structures for the above diagram</p>	10	CO1
9	<p>Natural gas is supplied through a low-pressure distribution pipe of 1200m in length with an initial pressure 50 mbar (gauge) at A and a final pressure of 30mbar at B. It is required to increase the flow rate by 20%, 40 %, 60 %, 80 % and 100% by reinforcing the existing pipe with parallel Pipe of the same diameter as the original pipe.</p> <p>What length of reinforcement pipe must be installed if the pressure drop is to remain unchanged?</p> <p>Plot a graph of capacity vs reinforcement and discuss your results.</p>	10	CO2
SECTION-C (2x20=40)			
10	 <p>It is proposed to analyze the following gas pipeline network using Hardy Cross loop method. All the primary loops assumed flow directions, reference, and load nodes along with loads are shown in the diagram. All loop directions are taken clockwise positive. Assume flow in branches 1,7, 12, 15 as 700, 120, 240, and 440 respectively. Calculate the rest of the flows such that Kirchoff's first law is satisfied.</p>	20	CO5
11	What are the assumptions made for general flow equations? Derive General flow, medium pressure, and low-pressure gas flow equations.	20	CO4