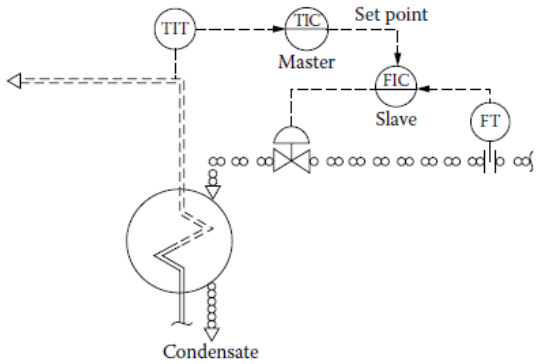
Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Process Design and Flow sheeting — **Semester:** II Sem
Program: M.Tech CE+PDE — **Time** 03 hrs.
Course Code: CHPD 7008 — **Max. Marks:** 100
Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Water is heated at atmospheric pressure from 40°C to 80°C using two different processes. In Process I, the heating is done by a source at 80°C. In Process II, the water is first heated from 40°C to 60°C by a source at 60°C and then from 60°C to 80°C by another source at 80°C. (a) Enthalpy change of water in process I is greater than enthalpy change in process II (b) Enthalpy change of water in process II is greater than enthalpy change in process I (c) Process I is closer to reversibility (d) Process II is close to reversibility	5	CO1
Q 2	In a venturi meter ΔP_1 & ΔP_2 are the pressure drops corresponding to volumetric flow rates Q_1 & Q_2. If $Q_2 / Q_1 = 2$, then calculate $\Delta P_2 / \Delta P_1$	5	CO1
Q 3	Describe the Line numbering philosophy	5	CO2
Q 4	Explain the working of the control loop 	5	CO2

SECTION B

Q 5	Draw the symbols for the followings 1. Horizontal Centrifugal Pump 2. Positive Displacement Pump 3. Centrifugal Compressor 4. Shell & Tube Heat Exchanger 5. Kettle type exchanger 6. Furnace 7. Dome roof tank	15	CO2
Q 6	Draw the symbols for the following instrumentation loops with "shown in P&ID"	15	CO4

	and “detail implied” 1. Flow control (orifice) 2. Shut down valve 3. Temperature control 4. Pressure Instrument 5. Pressure control		
Q 7	Describe working principle of five (5) different types of flow measuring instruments	**15**	**CO3**
Q 8	Describe the main components of a Process Simulator Structure	**10**	**CO5**
SECTION-C			
Q 9	Draw a P&ID diagram of a 3 phase Horizontal Separator Or Draw a P&ID diagram of 3x50% Pumping system (Include suction vessel and discharge vessel, discharge control valve etc.	**25**	**CO2/ CO4**

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SECTION A

S. No.		Marks	CO
Q 1	Describe how pressure drop due to friction varies with diameter of a circular pipe. Deduce the equation	**5**	**CO1**
Q 2	Classify the five differences between PFD and P&ID.	**5**	**CO2**
Q 3	Apply summation equation for calculation of dew point & bubble point for a multi component system	**5**	**CO3**
Q 4	Provide an argument why outlet line size of a PSV needs to be larger than the inlet line size	**5**	**CO4**

SECTION B

Q 5	Draw the symbols for the followings 2. Veritcal Inline Centrifugal Pump 2. Centrifugal Sump Pump 4. Centrifugal Blower 4. Reciprocating Compressor 6. Agitator / Mixer 6. Plate & Frame exchanger 8. Dome roof tank	**15**	**CO2**
Q 6	Fluid: Water Flow rate: 20 m^3/hr Source Equipment Pressure: 10 barg Source Equipment Temperatue: 40 ^oC Length from source equipment to the Pump: 10 m Source equipment is Half Filled. ID of the vessel is 4m. Elevation of source equipment bottom from Pump centerline: 4 m Destination vessel is at pressure 20 barg and same elevation as that of source vessel. 1. Draw the PFD of the system 5 2. Calculate the suction line size to the Pump. 10 Assume: 1. Velocity criteria of 1.4 m/s & pressure drop criteria of 1.5 bar/100 m 2. Consider NPS as ID of the Pipe.	**5 + 10 = 15**	**CO3**

	3. Consider Laminar flow in the line.		
Q 7	Construct a P&ID of centrifugal pump using the followings instrument loops: 2. Flow control 2. Shut down valve 3. Level control 4. Cascading Control (choose appropriate controls for cascading)	**20**	**CO4**
SECTION-C			
Q 8	Describe the different steps followed for conversing a model for1-2 Shell & Tube Heat Exchanger or 3 phase separator in a simulation software (viz. **Aspen Hysys**)	**10**	**CO5**
Q 9	Using data (assume) form Question No 8 Draw a P&ID diagram of 1-2 Shell & Tube Heat Exchanger. Or Draw a P&ID diagram of a 3 phase Horizontal Separator	**20**	**CO5**