Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Chemical Engineering II (Unit Operations) (CHEG 237) **Semester: IV**
Program: BTech Fires and Safety Engineering
Time: 03 hrs. **Max. Marks: 100**

Instructions: Students are advised to answer questions sequentially and start each answer of a new sheet of paper.

SECTION A
All the questions are compulsory (Max marks 4 x 5 = 20)

S. No.		Marks
Q1	What are the size ranges for i) Powdered activated carbon and ii) Granular activated carbon	**5**
Q2	What are ceramics? List various types of ceramics.	**5**
Q3	Between a cross-current and a co-current heat exchanger which one has higher efficiency in terms of heat exchange?	**5**
Q4	Define i) magma and ii) CSD.	**5**
	SECTION B **All questions are compulsory (Max marks 4 x 10 = 40)**	
Q5	What is the effect of thermodynamic state of the feed on the position of the feed tray? Discuss in detail.	**10**
Q6	With the help of a diagram describe the working of a rapid sand filter in detail. ***Or*** With the help of a diagram describe the working of a slow sand filter in detail.	**10**
Q7	What is the importance of material balance in chemical process design? Write steps involved in material balance calculations.	**10**
Q8	How do ceramics compare with metals? Which is a better choice for process requiring material with high hardness?	**10**
	SECTION-C (2 x 20 = 40) **Answer any two question from this section (Max marks 40)**	
Q9	Filtration operation is used in a number of processes. Explain filtration. Give classification of the types of filters. Describe the particle removal mechanism in filtration with the help of a diagram.	**20**
Q10(a)	Suppose you are to design a sedimentation tank. What is the role of types of sedimentation in the design of a sedimentation tank?	**12**
(b)	What is the effect of size and speed of rotation of impeller on mixing?	**8**
Q11	A continuous fractionating column is to be designed for separating 10,000 kg per hour of a liquid mixture containing 40 mole percent methanol and 60 mole percent water into an	**20**

overhead product containing 97 mole percent methanol and a bottom product having 98 mole percent water. A mole reflux ratio of 3 is used. Calculate (i) moles of overhead product obtained per hour and (ii) number of ideal plates and location of the feed plate if the feed is at its bubble point.

Equilibrium data:

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
y	0.417	0.579	0.669	0.729	0.78	0.825	0.871	0.915	0.959

Where x = mole fraction of methanol in liquid
And y = mole fraction of methanol in vapor

What will be the effect on the overall economy of the process if the thermodynamic state of the feed is changed from bubble to dew point?