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PRESIDENCY UNIVERSITY BENGALURU

 SCHOOL OF ENGINEERING

 MAKE-UP EXAMINATION – JULY 2024

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| **Semester : V** | **Date : 05-07-2024** |
| **Course Code: PET321** | **Time : 9:30AM TO 12:30PM** |
| **Course Name: Unit Operations** | **Max Marks :100** |
| **Program : B.Tech. in Petroleum Engineering** | **Weightage :50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 2M=10M** |
| 1 | Define Mixing Index. | (CO1) | [Knowledge] |
|  |
| 2 | Define sphericity. | (CO1) | [Knowledge] |
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| 3 | State difference between Apron and Bucket elevator. | (CO2) | [Knowledge] |
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| 4 | Define “Plate and Flame press". | (CO3) | [Knowledge] |
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| 5 | Name any three different motions of a screen. | (CO4) | [Knowledge] |
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| 6 | Define Flocculation. | (CO4) | [Knowledge] |
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| 7 | Define ‘doctor blade’  | (CO3) | [Knowledge] |
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| **PART B** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** |
| 8 | Discuss the different types of analysis that can be used in particle Size distribution. | (CO1) | [Comprehension] |
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| 9 | Describe different types of conveyors for transportation of solid particles. | (CO1) | [Comprehension] |
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| 10 | Suppose three numbers of filter mediums (A, B and C) are present, where A has solid particles just above the medium, the solid particles go inside the flow channels of B and the solid particles does not go inside the C at all. Which filter medium will produce clear water or clean gas and why? Also, name of the filter medium? | (CO2) | [Comprehension] |
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| 11 | A process which involves separation of particles for different densities". identify the name of the process. Please explain it briefly using any method. | (CO4) | [Comprehension] |
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| 12 | A pack of disks lead to a breakthrough during filtration of liquid then how the filtration and solids removal efficiency will vary? What is the process of filtration and also, what is the name of the filter. | (CO2) | [Comprehension] |
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| 13 | Number of plates which are in series containing filter medium, where slurry enters from one end of the plates and leaves the wet cake of solids with clean water. Name the filter and explain the mechanism of it. | (CO3) | [Comprehension] |
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| 14 | The condensate form of the sample is collected in the liquid form, in a measuring cylindrical beaker which gives us the volume distillate collected. Provide the name and describe the procedure of this unit | (CO3) | [Comprehension] |
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| **PART C** |
|  **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** |
| 15 | A sample of crushed silica sand has given below in the Table 8.1 for the particle size analysis. The density of particles is 2650 kg/m³ and the shape factors are a = 0.8 and φₛ = 0.571. For the material between 4-mesh and 28-mesh in particle size, calculate the following: (i)Total surface area in mm²/gm, (ii) Number of particles in each gram, (iii) Volume mean diameter, (iv) Volume surface mean diameter, (v) Mass mean diameter for the particle mesh size between 4 and 10.

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| **Mesh** | **Screen Opening (Dpi in mm)** | **Mass Fraction Retained (Xi)** | **Average Particle Diameter in Increment Davi (mm)** | **Cumulative Fraction Smaller than Dp** |
| 4 | 4.699 | 0.0660 | - | 1.000 |
| 6 | 3.327 | 0.0731 | 4.012 | 0.9749 |
| 8 | 2.362 | 0.1330 | 2.545 | 0.8989 |
| 10 | 1.65 | 0.3207 | 1.407 | 0.7659 |
| 14 | 1.168 | 0.2730 | 1.409 | 0.2723 |
| 20 | 0.833 | 0.1590 | 1.401 | 0.1133 |
| 28 | 0.589 | 0.0653 | 0.711 | 0.0554 |

 | (CO1) | [Application] |
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| 16 | The two different materials which is a part of silica sand particles pass through a screen of 14- mesh and 28-mesh screens. Write the relations for the two different materials with respect to their mass flow rates and calculate the overflow, underflow to feed and an overall effectiveness of the screen for the two-mesh size from Table below. Also, compare the overall effectiveness of the screen for the two given mesh size.

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| --- | --- | --- | --- | --- |
| **Mesh** | **Dp** | **Feed** | **Overflow** | **Underflow** |
| 4 | 4.699 | 0 | 0 | 0 |
| 6 | 3.327 | 0.025 | 0.071 | 0 |
| 8 | 2.362 | 0.15 | 0.43 | 0 |
| 10 | 1.651 | 0.47 | 0.85 | 0.195 |
| 14 | 1.168 | 0.73 | 0.97 | 0.58 |
| 20 | 0.833 | 0.885 | 0.99 | 0.83 |
| 28 | 0.589 | 0.94 | 1.0 | 0.91 |
| 35 | 0.417 | 0.96 | - | 0.94 |
| 65 | 0.208 | 0.98 | - | 0.975 |
| Pan | - | 1.0 | - | 1.0 |

 | (CO3) | [Application] |
|  |
| 17 | A crude oil sample found to be of 31 oAPI. The initial and final boiling point are 90 °C and 180°C. Calculate the K and C.I values to classify the crude oil based on their different composition and different fractions of hydrocarbons. Also, write the different classes of Crude oil sample based on distillate volume collection. | (CO4) | [Application] |
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