

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B.TECH
BRANCH: BIOTECHNOLOGY

SEMESTER : III/ADD
SESSION : MO/2025

SUBJECT: BE24245 CHEMICAL PROCESS CALCULATIONS

TIME: 02 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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| Q.1(a) A liquefied mixture has the following composition: n-C ₄ H ₁₀ =50% (MW=58), n-C ₅ H ₁₂ =30% (MW=72), and n-C ₆ H ₁₄ =20% (MW=86). For this mixture, calculate: (a) mole fraction of each component. (b) Average molecular weight of the mixture. (Basis 100 kg) | [5] CO1 | Understanding |
| Q.2(a) In biological system enzymes are used to accelerate the rates of certain biological reactions. Glucoamylase is an enzyme that aids the conversion of starch to glucose (a sugar that cells use for energy). Experiments show that 1 μg mol of glucoamylase in a 4% starch solution results in a production rate of glucose is 0.6 μg mol/ (mL)(min) . Determine the production of glucose for this system in the units lb mol/ (ft ³)(day) | [5] CO1 | Applying |
| Q.3(a) One type of anaerobic respiration converts glucose to ethanol and carbon dioxide. If the molecular weight of glucose is 180 g/mol and the molar mass of ethanol is 46 g/mol, how many grams of carbon dioxide are produced when 1 mol of glucose is digested via respiration? | [5] CO1 | Analyzing |
| Q.4(a) It is required to prepare 1250 kg of a solution composed of 12 wt.% ethanol and 88 wt.% water. Two solutions are available, the first contains 5 wt.% ethanol, and the second contains 25 wt.% ethanol. How much of each solution are mixed to prepare the desired solution? | [5] CO2 | Evaluating |
| Q.5(a) A binary mixture consists of 35% benzene and 65% toluene are continuously fed to the distillation column at rate of 1000 lb mole/hr. The distillate (top product) contains 85 mol. % benzene, whereas the residue (bottom product) contains 95 mol. % toluene. Calculate the quantities of distillate and residue obtained per hour. | [5] CO2 | Evaluating |

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