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

CLASS: MPHARM **SEMESTER: I**
BRANCH: PHARMACY **SESSION: MO/2023**

SUBJECT: MPH103T MODERN PHARMACEUTICS

TIME: 3.00 Hours **FULL MARK: 75**

INSTRUCTIONS:

1. The missing data, if any, may be assumed suitably.
2. Before attempting the question paper, be sure that you have got the correct question paper.
3. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
5. Answer any five questions.

1a. Derive the rate kinetics equation applicable for suspension dosage form and explain it. [7]

1b. Determine elimination rate constant of a drug from the following plasma concentration vs time profile without using graph paper of a tablet containing 400 mg drug administered under fasting condition to human subjects. [8]

Time (Hour)	Plasma Concentration (ng/mL)
0	0
1	265
2	486
3	895
4	1265
5	795
6	612
8	326
12	98

2a. Calculate the mean dissolution time (MDT) of the below-mentioned dissolution profile of a tablet containing 600 mg of drug. [7]

Time (hour)	Cumulative percent drug release
0	0
1	22
2	32
3	45
4	57
5	64
6	71
7	82
8	91
10	100

2b. Write a short note on similarity factor and difference factor to compare the dissolution study of test and reference drug product. [8]

3a. Write a short note on diffusion study and various parameters by which permeation could be demonstrated. [7]

3b. Do the regression analysis by using y=a+bx as model and develop the equation with regression coefficient value. [8]

Concentration (mcg/mL)	Absorbance
1	0.095
2	0.165
3	0.245
4	0.345
5	0.512
6	0.589
7	0.712
8	0.849
10	0.986

PTO

4a. Elucidate the purpose of experimental design and delineate the essential steps involved in its designing. [7]

4b. Justify that the prediction outside of the bounds of the independent variables are unreliable considering theoretical equation: $Y = 5 + 6\ X_1 + 7\ X_1^2 + 3\ X_2$ and multiple regression equation: $Y = -7 + 7.2\ X_1 + 7\ X_1^2 + 11.4\ X_2$ [8]

5a. Illustrate the rationales behind transformation (coding) in optimization through a pertinent example. [7]

5b. Evaluate the components inherent in central composite design (CCD) and elucidate the process of blocking in CCD specifically when dealing with four factors. [8]

6a. Describe the electrical double layer, emphasizing the selective adsorption of cationic charge on particle surfaces. [7]

6b. Examine the key characteristics of DLVO theory with suitable illustration. [8]

7a. The rate constant k1 for the decomposition of 5-hydroxymethylfurfural at 120◦C (393 K) is 1.173 hr^{-1} or 3.258×10^{-4} sec^{-1} and k2 at 140◦C (413 K) is 4.860 hr^{-1}. What is the activation energy, Ea, in kcal/mole and the frequency factor, A, in sec^{-1} for the breakdown of 5-HMF within this temperature range? R= 1.987 calories per mole-kelvin [7]

7b. Explain the significance of self-emulsifying system with a focus on its fate after oral consumption. [8]

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