KU-5234

M. Sc. (Sem. I) Examination - December - 2024

Chemistry

Paper - 1.4
CHEM-514(A)-T

Mathematics for Chemists

Time Allowed : **Three Hours**

Max. Marks : **70**
Min. Marks : **28**

This question paper contains two sections as under:

Section-A ***Max. Marks-20***

*This section will have **10** questions, having **02** questions from each unit with no internal choice. Answer in about **20** words. All questions will have equal marks. **(10×2=20)***

Section-B ***Max. Marks-50***

*This section will have **10** questions, having **02** questions from each unit, one question to be attempted from each unit. Words limit approximately **400-500** words. Questions may have sub divisions. All questions will have equal marks. **(10×5=50)***

https://pyqlelo.com

SECTION - A

1 (i) Write the cancellation law of matrices.

(ii) Write the definition with example of partial differentiation.

(iii) Define order and degree of differential equation.

(iv) Write the model of L.P.P.

(v) Define optimal solution.

(vi) What is inventory control ?

(vii) Define skewness and kurtosis.

(viii) Write the formula of mathematical expectation.

(ix) State the Bay's theorem of probability.

(x) Write the value of mean of Poisson distribution.

SECTION - B

UNIT - I

2 (a) Find the Eigen value and Eigen vector of the matrix A.

$$A=\begin{bmatrix}5 & 4\\ 1 & 2\end{bmatrix}$$

(b) Find the points where the function $x^3 + y^3 - 3axy$ has maximum or minimum value.

OR

(a) If $u = \log\left(y\sin x + x\sin y\right)$, then verify

$$\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}.$$

(b) If $A=\begin{bmatrix}2 & 3 & 4\\ 1 & 2 & 3\\ -1 & 1 & 2\end{bmatrix}$ and $B=\begin{bmatrix}1 & 3 & 0\\ -1 & 2 & 1\\ 0 & 0 & 2\end{bmatrix}$

then prove that $AB \neq BA$.

UNIT - II

3 (a) Solve $(D^2 + 3D + 2)\, y = e^x$

(b) Solve $(D^3+D^2-D-1)y = \cos 2x$

OR

If $\vec{a} = t\,\hat{i} + t^2\,\hat{j} + (1-t)\,\hat{k}$

$\vec{b} = 3t^2\,\hat{i} - \hat{j} + t^3\,\hat{k}$

https://pyqlelo.com

then find the following :

(a) $\frac{d}{dt}\left(\vec{a}\cdot\vec{b}\right)$

(b) $\frac{d}{dt}\left(\vec{a}\times\vec{b}\right)$

UNIT - III

4 A company has 5 jobs to be done, the following matrix shows the return in Rs. of assigning i^{th} (i = 1,2,3,4,5) machines to the j^{th} job (j = 1,2....5). Assign the five jobs to the five machines so as to maximize the total return.

	Jobs →				
Machines ↓	1	2	3	4	5
A	5	11	10	12	4
B	2	4	6	3	5
C	3	12	5	14	6
D	6	14	4	11	7
E	7	9	8	12	5

OR

Solve the following transportation problem :

	D_1	D_2	D_3	D_4	
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
	20	40	30	10	100

UNIT - IV

5 Find the mean and SD for the following frequency distribution.

Age in Years	*No. of Persons*
20-30	3
30-40	61
40-50	132
50-60	153
60-70	140
70-80	51
80-90	2

OR

https://www.uokonline.com

Two unbiased dice are thrown together. Find the expected value of the sum of the number on them.

UNIT - V

6 (a) Four cards are drawn at random from a pack of 52 cards. Find the probability of getting 2 spade cards and 2 heart cards.

(b) What is the probability that a leap year selected at random will contain 53 Sundays?

OR

(a) For a binomial distribution $B\ (x,\ n,\ p)$, prove that

$$b(x+1,\ n,\ p) = \frac{n-x}{x+1} \cdot \frac{p}{q}\, b(x,\ n,\ p)$$

(b) Fit a Poisson distribution to the following data:

x	0	1	2	3	4	5
f	142	156	69	27	5	2

https://pyqlelo.com