UG Even Semester (CBCS) Exam., May—2017

PHARMACEUTICAL SCIENCES

(2nd Semester)

Course No. : BPH–210 (C)

(Mathematics—II)

Full Marks : 75

Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Solve the following systems of equations by using Gauss elimination method : 5+5=10

(i)
$$2x \quad y \quad 3z \quad 9$$
$$x \quad y \quad z \quad 6$$
$$x \quad y \quad z \quad 2$$

(ii)
$$x \quad y \quad z \quad 9$$
$$2x \quad 5y \quad 7z \quad 52$$
$$2x \quad y \quad z \quad 0$$

(b) The sum of three numbers is 6. If we multiply the third number by 2 and add the first number to the result, we get 7. By adding second and third numbers to three times the first number, we get 12. Using Gauss elimination method of matrix, find the numbers. 5

2. *(a)* An amount of ₹ 65,000 is invested in three investments at the rate of 6%, 8% and 9% per annum respectively. The total annual income is ₹ 4,800. The income from the third investment is ₹ 600 more than the income from the second investment. Using matrix algebra, determine the amount of each investment. 7½

(b) The price (in ₹) of three commodities *X*, *Y* and *Z* are *x*, *y* and *z* per unit respectively. *A* purchases 4 units of *Z* and sells 3 units of *X* and 5 units of *Y*. *B* purchases 3 units of *Y* and sells 2 units of *X* and 1 unit of *Z*. *C* purchases 1 unit of *X* and sells 4 units of *Y* and 6 units of *Z*. In the process, *A*, *B* and *C* earn ₹ 6000, ₹ 5000 and ₹ 13,000 respectively. Using matrices, find the prices per unit of the three commodities. 7½

UNIT—II

3. Calculate mean deviation, standard deviation and quartile deviation from the following data : 5+5+5=15

Class	0–10	10–20	20–30	30–40	40–50
Frequency	2	5	9	3	2

4. *(a)* The frequency distribution below gives the following information :

Class Interval	10–20	20–30	30–40	40–50
Frequency	6	9	11	14

Class Interval	50–60	60–70	70–80
Frequency	20	15	10

Calculate arithmetic mean, geometric mean and harmonic mean. 4+4+4=12

(b) The following table gives the regions of petroleum (in %) for different regions :

America	*Europe*	*Africa*	*Middle East*	*Others*
13	12	9	61	5

Represent the data by a pie diagram. 3

UNIT—III

5. *(a)* Two dice are thrown. Find the probability that the sum of the points in the two dice is equal to 7 or 8. 3

(b) A problem of statistics is given to three students Amar, Akbar and Anthony, whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that *(i)* the problem will not be solved and *(ii)* the problem will be solved? 3+3=6

(c) The probability that a man will survive for 25 years is $\frac{3}{5}$ and the probability that his wife survive for 25 years is $\frac{2}{3}$. Find the probability that—

(i) both will survive;

(ii) only the man will survive;

(iii) only the wife will survive. 2+2+2=6

6. *(a)* Let X be a random variable with probability distribution given below :

X	0	1	2	3
$P(X \quad x)$	$\frac{1}{3}$	$\frac{1}{2}$	0	$\frac{1}{6}$

Find the expectations of X, X^2 and $(X \quad 1)^2$. Also find the variance of X.

3+3+3+3=12

(b) A discrete random variable X is defined as follows :

X	0	1	2	3	4
$P(X \quad x)$	k	$3k$	0·2	k	$2k$+0·1

Find the following : 3

(i) The value of k

(ii) Probability distribution

(iii) $E(X)$

UNIT—IV

7. *(a)* State and prove Newton's forward interpolation formula. 7

(b) Using the following data, evaluate $f(3{\cdot}5)$ and $f(5{\cdot}5)$: 4+4=8

x	3	4	5	6
$f(x)$	4	13	25	43

8. Solve the following by using Newton-Raphson method : 5+5+5=15

(a) $x^3 \quad 3x \quad 1 \quad 0$, correct up to 4 decimal places

(b) $x^4 \quad x \quad 10 \quad 0$, correct up to 4 decimal places

(c) $3x \quad \cos x \quad 1 \quad 0$, correct up to 4 decimal places

UNIT—V

9. Derive general quadrature formula, trapezoidal rule, Simpson's $\frac{1}{3}$rd rule and Simpson's $\frac{3}{8}$th rule. 3+4+4+4=15

10. *(a)* From the following tabular values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$, for $x = 1{\cdot}2$: 6

x	1·0	1·2	1·4	1·6	1·8	2·0
y	2·7	3·32	4·0	4·9	6·0	7·3

(b) The velocities of a car running on a straight road at intervals of 2 minutes are given below :

Time (in min)	0	2	4	6	8	10	12
Velocity (km/hr)	0	22	30	27	18	7	0

Apply Simpson's $\frac{3}{8}$th rule to find the distance covered by the car in 12 minutes. 5

(c) Evaluate

$$^{1}_{0}\frac{dx}{1 \quad x}$$

using Simpson's $\frac{1}{3}$rd rule taking $h = \frac{1}{6}$. 4

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