Roll No. ☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

Total No. of Questions : 10

B.Pharma (2011 to 2016)   (Sem.–3)
PHARMACEUTICAL MATHEMATICS
Subject Code : BPHM-301
Paper ID : [D1122]

Time : 3 Hrs.   Max. Marks : 80

INSTRUCTIONS TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of FIFTEEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.
3. SECTION-C contains FOUR questions carrying TEN marks each and students have to attempt ANY THREE questions.

SECTION-A

1. **Solve the following :**

   (a) Construct a 2×2 matrix $A = [a_{ij}]$ whose elements are given by $\dfrac{(i-j)^2}{3}$.

   (b) Compute the product of the matrices A and B, where

   $$A = \begin{bmatrix} 5 & 1 \\ -1 & 2 \\ 3 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} -1 & 3 & 6 \\ -1 & 0 & 1 \end{bmatrix}.$$

   (c) Find the value of $\sin 15°$.

   (d) Prove that $\sin 3x = 3\sin x - 4\sin^3 x$.

   (e) Evaluate $\displaystyle \lim_{x \to 0} \frac{\sin 5x}{\tan 3x}$.

   (f) Find the derivative of $e^{2x} + (7 - 2x)^3$.

   (g) Calculate the median for the following :

Mid – Value	15	20	25	30	35	40	45	50	55
Frequency	2	22	19	14	3	4	6	1	1

(h) Find the mode of the data: 52, 75, 40, 70, 43, 40, 65, 35 and 41.

(i) Find the integrals: $\int \dfrac{x^3 - 1}{x^2}\, dx$.

(j) Find the integrals: $\int x\, e^{2x}\, dx$.

(k) Find the cofactor of each element of the determinant $\begin{vmatrix} 3 & 4 \\ 9 & -7 \end{vmatrix}$.

(l) Find the determinant $\begin{vmatrix} 0 & 3 & 2 \\ 5 & 4 & 7 \\ 4 & 2 & 8 \end{vmatrix}$.

(m) A perfect cubical die is thrown a large number of times in sets of 8. The occurrence of 5 or 6 is called a success. In what proportion of the sets you expect 3 successes.

(n) Find the mode of the following distribution :

Class	$0-7$	$7-14$	$14-21$	$21-28$	$28-35$	$35-42$	$42-49$
Frequency	19	25	36	72	51	43	28

(o) 6 dice are thrown 729 times. How many times do you expect atleast 3 dice to show a 5 or 6?

SECTION-B

2. Consider the following three data sets A, B and C.

   A = {9, 10, 11, 7, 13}, B = {10, 10, 10, 10, 10}, {1, 1, 10, 19, 19}

   (a) Calculate the mean of each data set.

   (b) Calculate the standard deviation of each data set.

3. Find inverse of $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$.

4. Find the derivative of $\dfrac{5x}{\sqrt{1 - x^2}} + \sin^2(2x + 3)$.

5. Evaluate $\int \dfrac{2x-1}{(x-1)(x+2)(x-3)}\,dx$.

6. The following data are the number of seeds germinating out of 10 on damp filter for 80 sets of seeds. Fit a binomial distribution to these data :

x	0	1	2	3	4	5	6	7	8	9	10	Total
f	6	20	28	12	8	6	0	0	0	0	0	80

SECTION-C

7. (a) Solve the equations $2x + 3y = 10$ and $x + 6y = 4$, using Cramer's rule.

   (b) Show that $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$.

8. (a) Write the properties of Normal distribution curve.

   (b) Prove that: $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$.

9. (a) Find the value of other trigonometric functions if $\cos x = -\dfrac{1}{2}$, x lies in third quadrant.

   (b) For what value of k following function is continuous at $x = 0$:

   $$f(x) = \begin{cases} \dfrac{\sin 5x}{3x} & \text{if, } x \neq 0 \\ k & \text{if, } x = 0 \end{cases}.$$

10. (a) Find $\dfrac{dy}{dx}$ when $x = a\dfrac{1-t^2}{1+t^2}$, $y = b\dfrac{2t}{1+t^2}$.

    (b) Evaluate the integral : $\int x \log (1+x)\,dx$.