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Roll No. 39/25257

Total No. of Questions : 10]

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PHM-1.2.2

ADVANCED MATHEMATICS

(B.Pharmacy, 2nd Semester, 2055)

Time : 3 Hours

Maximum Marks : 80

Note :- Section A is compulsory. Attempt any Four questions from Section B and any Three questions from Section C. Statistical tables are available on demand.

Section-A Marks : 2 Each

1. (a) The mean of 5 observations is 7. Later on, it was found that two observations 4 and 8 were wrongly taken instead of 5 and 9. Find the correct mean.
- (b) Calculate the standard deviations of first 7 natural numbers.

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(c) Suppose an ideal die is tossed twice. What is the probability of getting a sum of 10 in two tosses.

(d) A bag contains 30 balls numbered from 1 to 30. One ball is drawn at random. Find the probability that the number of ball is a multiple of 5 or 6.

(e) Is there any fallacy in the statement. The mean of a Binomial distribution is 20 and its variance is 49.

(f) Find the coefficient of correlation for the following data

$$N = 10, \Sigma x = 50, \Sigma y = -30, \Sigma x^2 = 290,$$

$$\Sigma y^2 = 300, \Sigma xy = -115.$$

(g) If $\sigma_x^2 = 9$, $\sigma_y^2 = 1600$, $\gamma_{xy} = .5$, obtain b_{xy} .

(h) If $L\{f(t)\} = \bar{f}(s)$, then prove that:

$$L\{e^{at} f(t)\} = \bar{f}(s-a).$$

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(i) Find the Laplace Transforms of $t \sin t$.

(j) Find :

$$L^{-1} \left\{ \frac{s}{(s+1)^2 + 4} \right\} :$$

(k) Find :

$$L \{ \cos^2 t \}.$$

(l) Form the differential equation for the family of all circles of radius 5 with their centres on the x -axis.

(m) Solve :

$$\frac{dy}{dx} = e^{3x-2y} + x^2 e^{-2y}.$$

(n) Solve :

$$x \frac{dy}{dx} - 2y + x = 0.$$

(o) Solve :

$$\frac{d^4 y}{dx^4} - 8 \frac{d^2 y}{dx^2} + 16y = 0$$

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Section-B

Marks : 5 Each

2. Solve :

$$\left[x \tan\left(\frac{y}{x}\right) - y \sec^2\left(\frac{y}{x}\right) \right] dx \\ + x \sec^2\left(\frac{y}{x}\right) dy = 0.$$

3. Solve :

$$\frac{d^2 y}{dx^2} + y = 1 + x^2.$$

4. Find inverse Laplace transforms of :

$$\frac{3s + 4}{s^2 - 3s - 4}.$$

5. Use Laplace transforms to solve :

$$\frac{d^3 y}{dt^3} + y = 0,$$

$$y(0) = y''(0) = 1.$$

$$y'(0) = -1.$$

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6. Over a long period of time a drug has been effective in 40% of cases in which it has been prepared. If 4 patients are treated by this drug, find the probability that will be effective for :
- (a) at least 3 patients
- (b) none of the patients.

Section-C Marks : 10 Each

7. Uranium disintegrates at a rate proportional to the amount present at any instant. If M_1 and $1/2 M_1$ grams of Uranium are present at times T_1 and T_2 respectively. Show that the half life of uranium is $T_2 - T_1$.

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8. (a) For the data given below find the equation to the best fitting curve of the form $y = ab^x$:

x	y
1	130
2	152.2
3	177.3
4	190.2
5	244.7

- (b) Find out the regression coefficients of y on x and x on y from the following data :

$$\sum x = 50, \bar{x} = 5, \sum y = 60, \bar{y} = 6$$

$$\sum xy = 350, \sigma_x^2 = 4, \sigma_y^2 = 9. \quad 6,4$$

9. A sample of 100 dry battery cells was tested and found the mean life 12 hours and standard deviation 3 hours. Assume that the data to be normally distributed. What percentage of battery cells are expected to have :

- (a) more than 15 hours
- (b) between 10 and 14 hours, and
- (c) less than 6 hours.

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10. Two independent samples of 8 and 7 items gave the following values :

Sample A	Sample B
9	10
11	12
13	10
11	14
15	9
9	8
12	10
14	

Examine whether the difference between the means of two samples is significant at 5% level.

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