PHM-1.2.2

ADVANCED MATHEMATICS

(B.Pharm., 2nd Semester, 2054)

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.

Section-A   Marks : 2 Each

1. (a) Define the degree and order of a differential equation

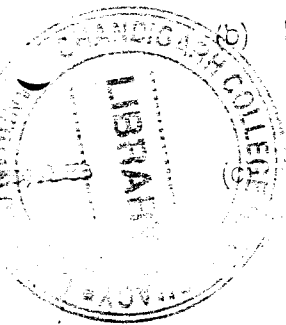   (b) Form a differential equation from

    $$y = ax^2 + 5x^2.$$

    (c) Write down the general linear differential equation of first order and first degree along with its solution.

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(d) What is the particular integral of

$$(D^2 - 2D + 4) y = e^x \cos x ?$$

(e) Solve $y'' - 2y' + 10y = 0$, $y(0) = 4$, $y'(0) = 1$.

(f) Reduce the following differential equation

$$x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$$

into that differential equation in which the coefficients are constants.

(g) Define the term 'Laplace transform'.

(h) Find $L\{(\sin t - \cos t)^2\}$.

(i) Evaluate :

$$L^{-1}\left\{\frac{1}{4s + 3}\right\}.$$

(j) Given :

$$L\{\sin 2t\} = \frac{2}{s^2 + 4}.$$

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

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(k) State briefly, giving reasons, the kind of diagram you consider most appropriate for representing the number of schools in various districts in a state.

(l) What is Kurtosis ? What purpose does it serve ?

(m) Define the term 'Standard deviation'.

(n) To fit a normal distribution, what are the parameters required ?

(o) Find $P(A)$ if A and B are events such that

$$P(A \cup B) = \frac{3}{4}, P(A \cap B) = \frac{1}{4} \text{ and } P(\bar{A}) = \frac{2}{3}.$$

Section-B   Marks : 5 Each

2. Solve :

$$\frac{dy}{dx} + x \sin^2 y = x^3 \cos^2 y.$$

3. Solve :

$$\frac{d^2y}{dx^2} + a^2 y = \sec ax.$$

4. Evaluate :

$$L^{-1} \left\{ \frac{5s - 3}{(s - 1)(s^2 + 2s + 5)} \right\}.$$

5. Find the standard deviation from the following data :

Marks obtained	No. of Candidates
1–10	3
11–20	16
21–30	26
31–40	31
41–50	16
51–60	8

6. A machinist is making engine parts with axle diameter of 0.7 inch. A random sample of 10 parts shows mean diameter 0.742 inch with a

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standard deviation of 0.04 inch. On the basis of this sample, would you say that the work is inferior ?

Section–C   Marks : 10 Each

7. (a) Solve :

$$(x^2 - y^2)\frac{dy}{dx} = 1.$$

(b) Solve :

$$(D^2 - 1)y = x \sin 3x + \cos x.$$

8. (a) Using Laplace transforms, solve :
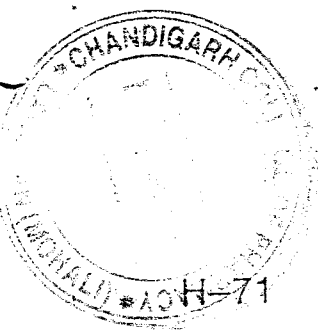
$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t.$$

$$y = \frac{dy}{dt} = 0 \text{ at } t = 0.$$

(b) Fit a binomial distribution to the following frequency distribution :

x	f
0	13
1	25

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2	52
3	58
4	62
5	16
6	4

9. (a) There are three bags : first containing 1 white, 2 red, 3 green balls; second 2 white, 3 red, 1 green balls and third 3 white, 1 red, 2 green balls. Two balls are drawn from a bag at random. These are found to be one white and one red. Find the probability that the balls so drawn come from the second bag.

(b) The following table represents the yield of wheat in bushels per acre for trial plots of land treated with four different levels of

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fertilizer. Each level was applied to 5 plots randomly chosen over a field :

Treatment

Plot No.	1	2	3	4
1	21	24	34	40
2	25	33	26	47
3	31	34	38	39
4	17	39	32	41
5	26	35	35	33

Carry out an analysis of variance and state your conclusion.

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