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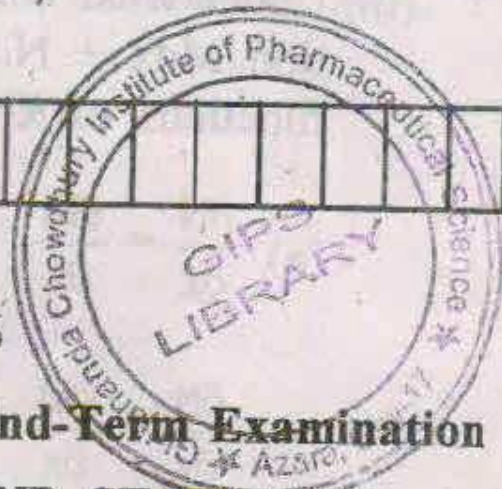
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PY 1322010

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2016



**B. Pharm 2nd Semester End-Term Examination**  
**MATHEMATICS AND STATISTICS**

Full Marks-100 Pass Marks-35 Time-Three hours

The figures in the margin indicate full marks  
for the questions.

1. A. Choose the correct answer :  $2 \times 6 = 12$

(i) The order of the differential equation obtained from the ordinary equation  $a \cos x + b \sin x = 0$  is

- (a) 1 (b) 2  
(c) 3 (d) None of these

(ii) The order and degree of the differential

equation  $\left(\frac{d^2y}{dx^2}\right) - 3\left(\frac{dy}{dx}\right)^4 + 2y = 0$  are

- (a) 3 and 4 (b) 2 and 1  
(c) 2 and 3 (d) None of these

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(iii) Under what condition the differential equation  $Mdx + Ndy = 0$ ,  $M$  and  $N$  being the functions of  $x$  and  $y$ , is exact ?

(a)  $\frac{\partial N}{\partial x} = \frac{\partial M}{\partial y}$

(b)  $\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$

(c)  $\frac{\partial N}{\partial x} + \frac{\partial M}{\partial y} = 0$

(d) None of these

(iv) If  $A$  and  $B$  are two mutually exclusive events then

(a)  $P(A \cap B) = P(A)P(B)$

(b)  $P(A \cap B) = P(A) + P(B)$

(c)  $P(A \cap B) = 0$

(d) None of these

(v) The value of the variable corresponding to maximum frequency is called

(a) Mean

(b) Mode

(c) Variance

(d) None of these

(vi) For the coefficient of correlation  $\rho(X, Y)$

$= \frac{\text{Cov}(X, Y)}{\sigma_x \sigma_y}$  we have

(a)  $-1 < \rho(X, Y) < 1$

(b)  $0 < \rho(X, Y) \leq 1$

(c)  $-1 \leq \rho(X, Y) \leq 1$

(d) None of these

B. Answer any six questions :  $3 \times 6 = 18$

(i) Form a differential equation from the ordinary equation  $y = Ae^x + Be^{-x}$  where  $A$  and  $B$  are arbitrary constants.

(ii) Solve :  $x dy + (x+y)dx = 0$

(iii) Solve :  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 0$

(iv) If  $A$  and  $B$  are two independent events with

$P(A) = \frac{1}{2}$ ,  $P(B) = \frac{1}{3}$ , find  $P(A \cup B)$ .

(v) What do you mean by skewness and kurtosis ?



(vi) Write the characteristics of binomial distribution.

(vii) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than 2 will get a bad reaction.

2. A. Answer any five questions :  $4 \times 5 = 20$

(i) Solve :  $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 2e^{-2x}$

(ii) Find the Laplace transform of  $\cos^2 3t$ .

(iii) Find the inverse Laplace transform of  $\frac{4s-3}{s^2+9}$

(iv) A random variable X has the following probability function :

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k <sup>2</sup>	2k <sup>2</sup>	7k <sup>2</sup> +k.

Find k.

(v) A sample of 100 dry battery cells tested to find the length of life produced the following results :  $\bar{x} = 12$  hours,  $\sigma = 3$  hours.

Assuming the data to be normally distributed, what percentage of battery cells are expected to have life between 10 and 14 hours ?

(vi) A sample of 18 items has a mean 24 units and standard deviation 3 units. Test the hypothesis that it is a random sample from a normal population with mean 27 units.

B. Answer any four questions :  $5 \times 4 = 20$

(i) Solve :  $(x^2 + xy)\frac{dy}{dx} = xy - y^2$

(ii) Solve :  $(D^2 - 4)y = \sin 2x$

(iii) Solve the differential equation using Laplace transform.

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = 0, y(0) = 0, y'(0) = 1$$

(iv) A speaks the truth in 75% of the cases and B speaks the truth in 80% of the cases. In what percentage of the cases are they likely to contradict one another in stating the same fact ?

(v) An urn contains 10 white and 3 black balls while another urn contains 3 white and 5 black balls. One urn is selected at random and then a ball is drawn from it. What is the probability that it is a white ball ?

(vi) In a certain distribution,  $n = 25$ ,

$$\sum x = 125, \sum y = 100, \sum x^2 = 650, \sum y^2 = 436,$$

$$\sum xy = 520$$

Find two regression coefficients.

3. Answer any *three* questions :  $10 \times 3 = 30$

(i) State convolution theorem. Apply it to find

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

(ii) Find the inverse Laplace transform of

$$\frac{2s^2 - 4}{(s+1)(s-2)(s-3)}$$

(iii) Find the mean and median from the following table :

Daily wage (in Rs.)	No. of workers
5 - 15	4
15 - 25	6
25 - 35	10
35 - 45	5
45 - 55	3
55 - 65	2

(iv) Calculate the first three central moments from the following table :

Class interval	Frequency
0 - 10	2
10 - 20	8
20 - 30	10
30 - 40	5
40 - 50	9
50 - 60	6
60 - 70	5