

iii) If  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{1}{3}$  and  $P(AB) = \frac{1}{4}$  then  $P(A+B)$  is

- a)  $\frac{1}{24}$
- b)  $\frac{7}{12}$
- c)  $\frac{1}{8}$
- d) none of these.

iv) If the event  $A$  implies event  $B$  then

- a)  $P(A) \geq P(B)$
- b)  $P(A) \leq P(B)$
- c)  $P(A) = 1 - P(B)$
- d) none of these.

v) In coefficient of variation =  $\frac{k}{\text{Mean}} \times 100\%$  where  $k$  is

- a) Mode
- b) Standard Deviation
- c) Variance
- d) Median.

vi) Correlation coefficient lies between

- a) 0 to 1
- b) 1 to 2
- c) - 1 to 0
- d) - 1 to 1.

vii) If  $r = 0.5$ ,  $\text{cov}(x, y) = 10$  and  $\sigma_y = 5$  then the value of  $\sigma_x$  is

- a) 10
- b) 5
- c) 0.10
- d) 0.5

viii) Let  $x$  be a Poisson random variable such that  $2p(x=0) = p(x=2)$ . Then standard deviation of  $x$  is

- a) 4
- b) 2
- c)  $-\sqrt{2}$
- d)  $\sqrt{2}$ .



- ix) Laplace transform of  $(5t - a)$  is
- a)  $\frac{5 - as}{s^2}$                       b)  $\frac{as - 5}{25}$
- c)  $\frac{5 - as}{s}$                               d) none of these.
- x)  $L(te^{2t})$  is equal to
- a)  $\frac{1}{(s - 2)}$                               b)  $\frac{2}{(s - 2)^2}$
- c)  $\frac{1}{(s - 2)^2}$                               d)  $\frac{21}{s^2}$ .
- xi)  $L^{-1}\left\{\frac{1}{s(s + 4)}\right\}$  is equal to
- a)  $\frac{1}{4}(1 - e^{-2t})$                       b)  $\frac{1}{2}(1 - e^{-4t})$
- c)  $(1 - e^{-2t})$                               d) none of these.
- xii) If two forces 100 N and 150 N are acting simultaneously at a point and if the angle between them is  $45^\circ$ , then the resultant of these two forces is
- a) 232 N                                      b) 230 N
- c) 175 N                                      d) 200 N.
- xiii) A particle is thrown vertically upwards with velocity  $u$  then the greatest height attained by the particle is
- a)  $u/g$                                       b)  $u^2/2g$
- c)  $(u/g)^2$                                       d) none of these.



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following

3 × 5 = 15

2. Calculate the mode from the following data :

<b>class :</b>	<b>20-24</b>	<b>25-29</b>	<b>30-34</b>	<b>35-39</b>	<b>40-44</b>	<b>45-49</b>	<b>50-54</b>	<b>55-59</b>
<b>frequency:</b>	<b>3</b>	<b>5</b>	<b>10</b>	<b>20</b>	<b>12</b>	<b>6</b>	<b>3</b>	<b>1</b>

3. A random variable  $x$  has the following probability density

$$\text{function : } f(x) = \begin{cases} 2x & 0 < x < 1 \\ 0 & \text{, otherwise} \end{cases}$$

Find  $P\left(\frac{1}{4} < x < \frac{1}{2}\right)$ .

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

5. Find the centre of gravity of the solid formed by the

revolution about the  $x$ -axis, of the parabola  $y^2 = 4ax$

bounded by the ordinate  $x = h$ .

6. If a bomb, dropped from an aeroplane rising vertically with

uniform velocity, reaches the ground in 5 seconds, find the

height of the aeroplane when the bomb reaches the ground.



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) In a bolt factory the machines  $M_1, M_2, M_3$  manufacture respectively 25%, 30%, 40% of the total product and their output 5%, 4%, 2% are defective respectively. One bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufacture by the machine  $M_3$ ?

- b) Find the coefficient of correlation for the following distribution :

$x$ :	10	14	18	22	26	30	
$y$ :	18	12	24	6	30	36	7 + 8

8. a) Following table gives the frequency distribution of rainfall (in inches) in a certain locality for consecutive 106 days :

Rainfall :	0-5	5-10	10-15	15-20	20-30	30-50	50-70
No. of days :	5	10	25	20	18	20	8

Represent the distribution using a histogram.

- b) Two urns contain respectively 3 white, 2 black balls and 2 white, 6 black balls. One ball is transferred from urn-I to urn-II and then one ball is drawn from the latter. It happens to be white. What is the probability that the transferred ball was black ? 8 + 7



9. a) With the help of Laplace transform, solve

$$\frac{dx}{dt} + 3y = 2x, \quad \frac{dy}{dt} = y - 2x \quad \text{when, } x(0) = 8 \text{ and } y(0) = 3.$$

b) Apply the convolution theorem to find

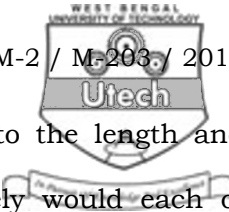
$$L^{-1} \left\{ \frac{s}{(s^2 + 4)(s^2 + 9)} \right\}. \quad 8 + 7$$

10. a) Three forces  $P, Q, R$  act along the sides of the triangle formed by the lines  $x + y = 1, y - x = 1, y = 2$ . Prove that the equation of the line of action of their resultant is  $P(x + y - 1) + Q(y - x - 1) - \sqrt{2}R(y - 2) = 0$ . Also show that the magnitude of the resultant is

$$\left[ P^2 + Q^2 + R^2 - \sqrt{2}R(P + Q) \right]^{\frac{1}{2}}$$

b) A uniform ladder is in equilibrium with one end resting on the ground and the other end against a vertical wall, if the ground and wall be both rough, the coefficient of friction being  $\mu$  and  $\mu'$  respectively and if the ladder be on the point of slipping at both ends, show that the inclination of the ladder to the horizon is given by

$$\tan \theta = \frac{1 - \mu \mu'}{2\mu}. \quad 8 + 7$$



11. a) Two forces  $P$  and  $Q$  acting parallel to the length and base of an inclined plane respectively would each of them singly support weight ' $W$ ' on the plane then prove

that 
$$\frac{1}{P^2} - \frac{1}{Q^2} = \frac{1}{W^2}$$

- b) A stone falling from the top of a vertical tower has descended  $x$  metre when another is let fall from a point  $y$  metre below the top. If they fall from rest and reach the ground together, then show that the height of the tower is  $(x + y)^2 / 4x$  metre. 7 + 8

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