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Paper Code : BSM201 Mathematics - IIA
UPID : 002005

Time Allotted : 3 Hours   Full Marks :70

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer *any ten* of the following :   [1 x 10 = 10]

   (i)   The median of the call received on 7 consecutive days
         11,13,17,13,23,25,19_____ is.

   (ii) Regression equation of
         X on Y is used for estimating value of variable _____ for a given value of _____.

   (iii) A statement made about a population for testing purpose is called _____.

   (iv) Mutually Exclusive events does not contain any _____ sample point.

   (v)   The p.d.f. of exponential distribution is given by _____.

   (vi) The random variables
         X and Y have variances 0.2 and 0.5 respectively and their covariance is zero. Let $Z = 5X - 2Y$. Then variance
         of Z is _____.

   (vii) If X and Y are independent the s.d $(X - Y)$ = _____.

   (viii) If the regression coefficient of
         X on Y and Y on X are -0.5 and -0.5 respectively then the correlation coefficient between X and Y is
         _____.

   (ix) If the Critical region is evenly distributed then the test is referred as _____.

   (x)   The expected value of a discrete random variable 'x_i' with frequency f_i is given by _____.

   (xi) If
         X is a normally-distributed random variable with a mean of 100 and a standard deviation 15 , then
         $P(X<100) =$

   (xii) If the joint pdf of
         X and Y is given by $f(x,y) = e^{-(x+y)}, x>0, y>0$, then $E(XY) =$ _____.

Group-B (Short Answer Type Question)

Answer *any three* of the following :   [5 x 3 = 15]

2. The joint pdf of a bivariate   [5]
   (X,Y)
   is
   $f(x,y) = c(x+y), x>0, y>0, x+y<2$
   . Find
   c
   and
   $P(X<1, Y>0.5)$
   .

3. Find the mean of the following data: [5]

Daily wages (Rs) :	25–29	30–34	35–39	40–44
No. of workers :	16	28	14	12

4. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total output. 5%,   [5]
   4% and 2% are defective bolts. A bolt is drawn at random from the product and found to be defective.
   What are the probabilities that it was manufactured by machines A, B and C?

5. A salesman is expected to give an average sale of Rs. 3500 per day. Observing the sales of a particular   [5]
   salesman for 6 days, it is seen that he gives an average sale of Rs. 3300 per day with s.d. 1016.53. Using

5% level of significance, test whether his work is below standard. Given $t_{0.05}$ = 2.02 for 5 d.o.f.

6. The joint pdf of a bivariate (X,Y) is f(x,y) = 2, x>0, y>0. Find the conditional density of Y given X. Also find [5]
P(Y>1/2 | X = 1/3).

Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. (a) The median and mode of the following frequency distribution are known to be 27 and 26 [8]
respectively. Find the values of α and β.

class interval :	0-10	10-20	20-30	30-40	40-50
frequency :	3	α	20	12	β

(b) Find the s.d. of the following frequency distribution: [7]

Weight (in kg) :	36-40	41-45	46-50	51-55	56-60	61-65	66-70
No of persons :	14	26	40	33	50	37	25

8. (a) Let [8]

$$F(x) = 0, \quad x < 0$$
$$= \frac{1}{5}, \quad 0 \le x < 1$$
$$= \frac{3}{5}, \quad 1 \le x < 3$$
$$= 1, \quad 3 \le x$$

Show that $F(x)$ is a possible distribution function. Find the spectrum and the probability mass of the distribution. Also find the mean and standard deviation of X.

(b) A and B throw alternatively a pair of dice. A wins if he throws 8 before B throws 5, and B wins if he [7]
throws 5 before A throws 8. Find the probability that A wins if he starts the game.

9. (a) Prove that $r_{xy} = 1$ if and only if y is a linear function of x. [10]

(b) If $Var(x) = 9, Var(y) = 4$ and $Var(xy) = Var(x)$, then find the correlation coefficient [5]
between x and y.

10. (a) A car-hire firm has two cars which it hires out day by day. The number of demands for a car on each [5]
day is distributed as a Poisson distribution with average number of demand per day 1.5. Calculate
the proportion of days on which neither car is used and the proportion of days on which some
demands are refused. Given $e^{-1.5} = 0.2231$. https://www.makaut.com

(b) In a certain factory producing razor blades there is a small chance 1/500 for a blade to be [6]
defective. The blades are in packets of 10. Use Poisson distribution to calculate the approximate
number of packets containing (i) no defective (ii) 1 defective (iii) 2 defective blades in one
consignment of 10000 packets. Given $e^{-0.02} = 0.9802$.

(c) If a random variable has a Poisson distribution such that P(1) = P(2), then find (i) mean (ii) s.d. (iii) [4]
P(4).

11. Prove that $-1 \le \rho_{xy} \le 1$.

[15]

*** END OF PAPER ***