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Paper Code : BS-M301 Mathematics III
UPID : 003572

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) If 0.1 is the probability of scoring no goal in a football match, then probability of scoring at least one goal in the match would be .....

   (II) If X has Binomial distribution with parameter n and p, then its variance is.

   (III) In a test of hypothesis corresponding to a particular level of significance, among all critical region "Best critical region" has
   (a) Least type I error   (b) Least type II error   (c) Greatest type I error   (d) Greatest type II error.

   (IV) If the r_{xy} (correlation co efficient) = -(2/3), u=2x+5, v=-3y+3, then find the correlation coefficient of u and v is
   (a) 3/2   (b) 2/3   (c) -(2/3)   (d) 8/3

   (V) Suppose, two students can solve a problem with probability 0.4 and 0.5, respectively, then what is the probability that both the students fail to solve the problem?

   (VI) The mean and variance of a binomial distribution are 4 and 3, respectively. Then the parameters of the distribution are ----- and ------.

   (VII) In a test of hypothesis type I Error is committed when
   (a) Null hypothesis is rejected through it was really false.
   (b) Null hypothesis is rejected through it was really true.
   (c) Null hypothesis is accepted through it was really false.
   (d) Null hypothesis is accepted through it was really true.

   (VIII) The A.M of 20 data is calculated to be 89.4. Later the data 78 is replaced by 87. The A.M of the data after replacement is

   (IX) If probability of hitting a target by A, B and C are respectively 0.3, 0.4, 0.5, then the probability that the target will be hit by A but not by B and C is ....

   (X) When variance of a random variable is 2/3 , then var (3x+7) is
   (a) 8
   (b) 2
   (c) 6
   (d) 11

   (XI) If m be the mean of a population having t-distribution. Then the assumption m=20 is to be tested. Then this hypothesis is _____.

   (XII) Kurtosis reveals the shape of the distribution at the top: i) True ii) False

n	0	1	2	3	4
f(n)	23	24	21	24	20

Group-B (Short Answer Type Question)

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

2. The weight of a student in a school is normally distributed with mean 40 kg and standard deviation 5 kg. Find the percentage of the students that have weight [5]
   (i) less than 40 kg
   (ii) greater than 50 kg
   (iii) between 38 kg and 52 kg

3. How can you draw a random sample of 100 workers form a population of 1000 workers? If in your sample the mean and S.D of weekly wages come out as Rs. 48 and Rs. 11 respectively, how will you get the standard error of the sample mean? [5]

4. Calculate the coefficient of correlation and obtain the lines of regression for the following data: [5]

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

Obtain an estimates of y which should correspond on the average to x=6.2.

5. A fair coin is tossed 10 times. Find the probability of getting at least 7 heads. [5]

6. Let X be a continuous random variable with PDF [5]

$$f(x) = \begin{cases} 4x^3 & 0 < x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

Find $P(X \le \frac{2}{3} | X > \frac{1}{3})$.

Group-C (Long Answer Type Question)

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

7. (a) Find the first four central moments after calculating the first four moments about the origin of the table given below. [8]

Expenditure: 3-6 6-9 9-12 12-15 15-18 18-21 21-24 Total
No of families: 28 292 389 212 59 18 2 1000

(b) Calculate with the use of quartiles the coefficient of skewness of the following distribution: [7]
Under years: 10 20 30 40 50 60
No of person: 15 32 51 78 97 109

8. (a) From 6 positive and 8 negative numbers, 4 numbers are chosen at random without replacement and multiplied. What is the probability that the product is positive? [5]

(b) A committee of 6 is to be formed from 5 senior and 3 junior students. If the members of the committee are chosen at random, what is the probability that there will be a majority of senior students in the committee? [5]

(c) Two cards are drawn without replacement. If the 2nd card is a King what is the probability that the 1st card is also a King? [5]

9. (a) The number of telephone calls arriving on an internal switch board of an office is 90 per hour. Find the probability that at the most 1 to 3 calls in a minute on the board arrive. [5]

(b) Six dice are thrown together at a time, the process is repeated 729 times. How many times do you expect at least three dice to have 4 to 6? [5]

(c) Probability distribution of blood types in India is given in the table   https://www.makaut.com [5]
Types: O   A   B   AB
Probability: 0.3712 0.2288 0.3226 0.0774
A random sample of 10 is considered from Indian population. What is the probability that there will be 4 Os, 3 As, 2 Bs and 1 AB blood types, respectively?

10. You flip a fair coin. If the outcome is head, you roll a fair six-sided die 10 times. If the outcome is tail, you roll the die 15 times. Let X be 1 if the toss gives head and 0 if it is tail. Let Y be the total number of times that you get 6 in the die throws. Find P(X = 1 | Y = 5). [15]

11. (a) If X is a uniformly distributed random variable with mean 1 and variance 4/3, find the value of P(X<0). [5]

(b) A passenger arrives at a bus stop at 9 am knowing that he will have to wait for the bus between 9 am to 9-30 am with uniform probability. [10]
i) Find the probability that he will have to wait longer than 10 minutes.
ii) If the bus does not arrive at 9-15 am, then find the probability that he will have to wait at least 10 additional minutes.

*** END OF PAPER ***