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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)   If kurtosis has a value less than 3 the distribution is called

   (II) If a null hypothesis accepted at 0.5 level of significance then this decision is

   (III) The standard deviation of a sample mean for SRSWR Is____

   (IV) A random variable X has the density function

   f(x)= k -2<x<2

   =0 otherwise

   . Then value of the constant k is____

   (V)   If X has exponential distribution with parameter 1/5 then its standard deviation is

   (VI) If X and Y are uncorrelated then X+Y and X-Y are uncorrelated. True/False

   (VII) The skew ness is positive then mean is ____ mode

   (VIII) In a test of hypothesis probability of Type I error is same as the level of significance of the test. True/False

   (IX) In a test of hypothesis the critical region corresponding to a particular level of significance is unique. True/False

   (X)   If X is normally distributed with zero mean and unit variance,then the expectation of X^2

   (XI) Normal curve of a variate represents _____ function

   (XII) For X and Y random variables E[kf(X,Y)]=____

Group-B (Short Answer Type Question)

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

2. Marks obtained by 10 students in physics and mathematics are given in the following table. Find rank   [5]
   correlation between X and Y.

Marks in physics(X)	48	33	40	9	16	16	65	24	16	57
Marks in mathematics(Y)	13	13	24	6	15	4	20	9	6	19

3. Fit a straight line to the following data by the method of least squares   [5]

x	15	20	25	30	35	40
y	12	14	18	25	31	44

4. The daily yield at a chemical plant,recorded for 50 days possesses a sample mean of 884 tons .The   [5]
   population standard deviation is known to be 42 tons .Do the data provide enough evidence to indicate
   that the average daily yield of the chemical plant is 900 tons per day?Test at 1% level of significance.Carry
   out the test using critical value approach

5. In a normal distribution,31% of the items are under 45 and 8% are above 64.Find the mean and standard   [5]
   deviation.
   [given P(0< Z< 1.405) = 0.42 P(-0.496< Z< 0) = 0.19]

6. Prove that if X and Y are independent then joint pmf   [5]
   is the product of corresponding marginal pmf

Group-C (Long Answer Type Question)

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

7. (a) A bank receives on an average 2.5 customers per hour.Find the probability that in a certain hour the   [5]
   bank receives (i) no customer
   (ii) exactly 4 customers.Assume that the number of customers received in an hour is poissonly
   distributed.[$e^{-2.5}$ = 0.0821]?

(6) The ideal size of a class of a college is 150 students.The college,experienced from past, knows that only 30% of the admitted students will actually attend.The college uses a policy of approving the applications of 450 students.Find the probability that more than150 students attend the class.Area under the standard normal curve enclosed between the ordinates z=0 and z=1.59 is 0.441?   [5]

(g) A fair coin is tossed 400times .Using normal approximation ,find the probability of obtaining (i)exactly 200 heads (ii)less than 210 heads (iii)between 190 and 210 heads,both inclusive .Given that the area under standard normal curve   [5]
between z=0 and z= 0.05 is 0.0199; between z=0 and z= 0.95 is 0.3289
between z=0 and z= 1.05 is 0.3531

8. (a) Calculate mean, median and hence find the approximate value of the mode from the following frequency distribution: [5]

Height(inches)	60-63	64-67	68-71	72-75	76-79	80-83
No. of Students	8	3	18	6	16	8

(b) Calculate the mean deviation from the mode of the following table: [5]

Height(Inch)	60-62	63-65	66-68	69-71	72-74
Frequency	5	18	42	27	8

(c) Measurements of the lengths in feet of 50 iron rods are distributed as follows: [5]

Class boundary	2.35-2.45	2.45-2.55	2.55-2.65	2.65-2.75	2.75-2.85	2.85-2.95	2.95-3.05
frequency	1	4	7	15	11	10	2

Find the value of mean deviation upto two decimal places.

9. (a) a. In order to test whether a coin is perfect the coin is tossed 5 times.The null hypothesis of perfectness is rejected if more than 4 heads are obtained. What is the probability of Type-I error? Find the probability of Type-II error when the corresponding probability of head is 0.2.   [5]

(b) b. A random sample of 25 workers is drawn from a factory to test if their average monthly wage .rs.1400 or not .The population wage distribution is assumed to be normal with a standard deviation of rs.200.The average monthly wagebased on the 25 observations comes out to be rs.1500.Perform a test at 5%level to see if the data support the claim ,using p-value approach   [5]

(g) c. To examine the claim of an expert publisher that m ,the average number of misprints per page of a book is 1, if a particular page of that book contains more than 2 misprints ,then the null hypothesis that m=1 is rejected.Determine power of test against alternative hypothesis m = 2.[e^{-1}=0.368]   [5]

10. (a) A coin is to be tested for unbiasedness. The hypothesis that it is unbiased is rejected if 9 or more tosses of the coin out of 10 tosses result in heads. Can we take 1% as level of significance? Can you suggest an appropriate level of significance for this test rule?   [5]

(b) Two samples of size 900 and 1600 are drawn from two population respectively. The number of defective items in the two samples are 20% and 15% respectively. Test at 1% level of significance whether the proportion of defective items in the first population is more than that of in second population. https://www.makaut.com
[given $\phi(z>=2.33)=0.01$ and $\phi(z>=1.64)=0.05$]   [5]

(c) The daily yield at a chemical plant, recorded for 50 days possesses a sample mean of 884 tons .The population standard deviation is known to be 42 tons .Do the data provide enough evidence to indicate that the average daily yield of the chemical plant is 900 tons per day?Test at 1% level of significance.Carry out the test using p-value approach.   [5]

11. (a) Consider the random experiment of throwing a pair of dice. Let X denote the number of sixes and Y denote the number of fives that turn up. Find the joint pmf of X and Y and marginal pmf of X and Y. Also find P(X+Y≥ 2).   [5]

(b) If f(x+y) = x+y ,0<x<1 ;0<y<1 is the joint pdf of X and Y. Find the distribution of X+Y.   [5]

(c) If X and Y are independent normal variate then what will be the mean and standard deviation of X+Y   [5]

*** END OF PAPER ***