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Total No. of Pages : 04

Total No. of Questions : 18

B.Tech. (CSE/IT) (2018 Batch) (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM-204-18

M.Code : 76257

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

**SECTION-A**

**Answer the following :**

- 1) For two events A and B such that  $P(A) = \frac{1}{4}$ ,  $P(B) = \frac{1}{3}$  and  $P(A \cup B) = \frac{1}{2}$ . Find  $P(B/A)$ .
- 2) If A, B and C are three mutually exclusive and exhaustive events associated with random experiments. Find  $P(A)$  given that  $P(B) = \frac{3}{2}P(A)$ ,  $P(C) = \frac{1}{2}P(B)$ .
- 3) If a random variable X assumes the values 0 and 1 with  $P(X = 0) = 3 P(X = 1)$ , then find the variance of X.
- 4) The mean of the binomial distribution is 20 and standard deviation is 4. Calculate the parameter of its distribution.
- 5) State Binomial and Poisson distribution.
- 6) What is Spearman's rank correlation coefficient?
- 7) In Poisson frequency distribution, frequency corresponding to 3 successes is  $\frac{2}{3}$  times frequency corresponding to 4 successes. Find the variance of the distribution.
- 8) Let X be the random variable such that  $P(X = -2) = P(X = -1)$ ,  $P(X = 2) = P(X = 1)$  and  $P(X > 0) = P(X < 0) = P(X = 0)$ . Obtain the probability mass function of x.
- 9) State chi-square and Student's t-distributions.
- 10) A computer program has produced the following output for a hypothesis-testing problem:  
Difference in sample means: 2.35 ; Degree of freedom : 18; Test statistics: 2.01. Find the standard error of the difference in sample means?

**SECTION-B**

- 11) a) Find the Karl Pearson's co-efficient of skewness from the following data :

<b>Size :</b>	1	2	3	4	5	6	7
<b>Frequency :</b>	10	18	30	25	12	3	2

- b) From the following table, calculate the coefficient of correlation by Karl Pearson's method.

<b>X</b>	6	2	10	4	8
<b>Y</b>	9	11	?	8	7

Arithmetic means of X and Y series are 6 and 8 respectively.

- 12) a) Suppose that the time in minutes that a person has to wait at a certain station for a train is found to be a random phenomenon with a probability function specified by the distribution function :

$$F(x) = \begin{cases} 0 & ; \quad x \leq 0 \\ \frac{x}{2} & ; \quad 0 \leq x < 1 \\ \frac{1}{2} & ; \quad 1 \leq x < 2 \\ \frac{x}{4} & ; \quad 2 \leq x < 4 \\ 1 & ; \quad x \geq 4 \end{cases}$$

What is the conditional probability that the person will have to wait for a train

- i) More than 3 minutes, given that it is more than 1 minutes.
  - ii) Less than 3 minutes, given that it is more than 1 minutes.
- b) Two fair dice are thrown independently. Three events A, B and C is defined as follows :

A : Even face with first dice

B : Even face with second dice

C : Sum of the points on the two dice is odd.

Discuss the independence of events A, B and C.

- 13) a) Marks obtained by a number of students are assumed to be normally distributed with mean 50 and variance 36. If four students are taken at random, what is the probability that exactly two of them will have marks over 62? Given that  $\int_0^2 \Phi(z) dz = 0.4772$  where  $Z$  is  $N(0, 1)$ .
- b) If 2 percent of the books bound at a certain bindery have defective bindings. Determine the probability that five of 400 books bound by this bindery will have defective bindings.
- 14) a) Service calls come to a maintenance center, according to a Poisson process and, on the average, 2.7 calls come per minute. Find the probability that (i) no more than 4 calls come in any minute, (ii) fewer than 2 calls came in any minute; (iii) more than 10 calls come in a 5-minute period.
- b) If the two lines of regression are  $4x - 5y + 30 = 0$  &  $20x - 9y - 107 = 0$ . Which of these is the line of regression of  $x$  on  $y$ , and  $y$  on  $x$ . Find correlation coefficients and variance of  $Y$  when variance of  $X$  is 3.

### SECTION-C

- 15) A continuous random variable  $X$  follows the probability law  $f(x) = Ax^2$ ,  $0 \leq x \leq 1$ . Determine  $A$  and find the probability that (i)  $X$  lies between 0.2 and 0.5 (ii)  $X$  is less than 0.3 (iii)  $\frac{1}{4} < X < \frac{1}{2}$  (iv)  $X > \frac{3}{4}$  given that  $X > \frac{1}{2}$ .
- 16) a) The length of time a person speaks over phone follows an exponential distribution with mean 6. What is the probability that the person will talk for (i) more than 8 minutes and (ii) between 4 and 8 minutes?
- b) A continuous random variable  $X$  has a probability density function  $f(x) = k(1+x)$ ,  $2 \leq x \leq 3$ . Find  $P(X \leq 4)$ .
- 17) a) Fit a second degree parabola to the following data :

<b>X :</b>	1	2	3	4	5
<b>Y :</b>	1090	1220	1390	1625	1915

- b) A reading test is given to an elementary school class that consists of 12 Anglo-American children and 10 Mexico-American children. The results of test are :

	<b>Anglo American</b>	<b>Mexico American</b>
<b>Mean</b>	74	70
<b>Std.</b>	8	10

Is the difference between means of the two groups significantly at the 0.05 level of significance? Value of  $t$  at 5% level for 20 degree is freedom is 2.086.

- 18) a) Before an increase in excise duty on tea, 400 people out of a sample of 500 persons were found to be tea drinkers. After an increase in duty, 400 people were tea drinkers in a sample of 600 people. Using standard error of proportion, state whether there is significant decrease in the consumption of tea at 5% level of significance. Take value of  $Z$  at 5% level of significance is 1.645.
- b) The following table gives for a sample of married women, the level of education and marriage adjustment score :

		Marriage adjustment score			
		Very low	Low	High	Very High
Level of Education	College	24	97	62	58
	High School	22	28	30	41
	Middle school	32	10	11	20

Can you conclude from the above, the higher the level of education, the greater is the degree of adjustment in marriage? Use table value of chi-square at 5% level for 6d.f. = 12.59.