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Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (CSE/IT) (2018 & Onwards)/(CE)/(ME) (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) Define Probability of an event.
- 2) 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 .
- 3) What is Spearman's rank correlation coefficient?
- 4) State chi-square and Student's t- distributions.
- 5) Define Discrete Variables.
- 6) If arithmetic mean is 56.50, median is 59.50 and standard deviation is 12.40. Find the skewness.
- 7) Differentiate between the discrete and continuous random variables.
- 8) Write the normal equations for the curve fitting $y = a + b x$ by the method of least squares.
- 9) Define Regression Coefficients.
- 10) Define Null and alternative hypothesis.

SECTION-B

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

Size :	1	2	3	4	5	6	7
Frequency :	10	18	30	25	12	3	2

- b) Show that the correlation coefficient r_{xy} between the two variables x and y is given by

$$r_{xy} = \frac{\sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2}{2\sigma_x\sigma_y}$$

where σ_x , σ_y and σ_{x-y} are the standard deviations of x , y and $x - y$ respectively.

- 12) a) 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 .

- b) From a bag containing 4 white and 6 red balls, three balls are drawn at random. If each white ball drawn carries a reward of Rs. 4 and each red ball Rs. 6, find the expected reward of the draw.
- 13) a) With the usual notations, find p for a binomial random variable X if $n = 6$ and $9P(X = 4) = P(X = 2)$.
- b) If the flowers on a truck are classified as A, B, and C according to a size-weight index as: under 75, between 75 and 80, and above 80. Find approximately (assuming a normal distribution) the mean and standard deviation of a lot in which A are 58%, B are 38% and C are 4%. Given that $P(0 < Z < 0.20) = 0.08$ and $P(0 < Z < 1.75) = 0.46$, where Z is standard normal variate.

- 14) From the given data, find :

Marks in Mathematics	25	38	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

- a) The two regression equations,
- b) The coefficient of correlation between the marks in Mathematics & Statistics
- c) The most likely marks in Statistics when the marks in Mathematics are 30.

SECTION-C

- 15) The intelligence quotients (IQ) of 16 students from B.Tech. IInd year showed a mean of 107 and a standard deviation of 10, while the IQs of 14 students from B.Tech. 1st year showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQs of the two groups at significance levels of 0.05? Given that critical value at 28 degree of freedom with 5% level of significance is 2.05.
- 16) a) Suppose that the life length of the two bulbs B1 and B2 have distribution $N(x; 40, 36)$ and $N(x; 45, 9)$ respectively. If the bulb is to be used for 45-hour period, which bulb is to be preferred? If it is to be used for 48-hour period, which bulb is to be preferred? Given that $P(Z < 0.83) = 0.7967$, $P(Z < 1.33) = 0.9082$, $P(Z < 1.00) = 0.8143$.
- b) The time required to repair a machine is exponentially distributed with parameter $\frac{1}{2}$. What is the probability that a repair time exceeds 2 hours? What is the conditional probability that a repair time takes at least 10 hours given that its duration exceeds 9 hours?
- 17) The prices of a commodity during 2011-2016 are given below. Fit a parabola $Y = a + bX + cX^2$ to these data.

Year (X)	2011	2012	2013	2014	2015	2016
Price (Rs.) (Y)	100	107	128	140	181	192

- 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 peoples were tea drinker in a sample of 600 people. Using standard error of proportion, state whether there is a significant decrease in the consumption of tea. Take level of significance at 5%.
- b) The number of scooter accidents per month in a certain town were as follows :

12	8	20	2	14	10	15	6	9	4
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Are these frequencies in agreement with the belief that accident conditions were the same during this 10 month period? (The table value of χ^2 for 9 d.f. at 5% level of significance is 16.919).

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.