

PART - A

2018

- ① Let A and B two events such that $P(A) = 0.5$, $P(B) = 0.6$ and $P(A \cup B) = 0$ Find $P(A \cap B)$.
- ② If $f(x) = \begin{cases} \frac{x^2}{6} + K & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$ is a probability density function of a random variable.
- ③ Find the moment generating function of binomial distribution.
- ④ A poisson variate (X) satisfies $P(X=1) = 1/2 P(X=2)$ find the variance of X.
- ⑤ Find the mean of uniform distribution.
- ⑥ Write any two properties of normal Curve.
- ⑦ If $X = 4Y + 5$ and $Y = KX + 4$ are two regression lines show that.
- ⑧ Define level of significance.
- ⑨ Write the test statistic t to test of significance for difference of means of two small samples.
- ⑩ Write any two uses of f-test.

PART-B

16) A
a

1 (a) State and prove Baye's theorem.

b) A bag A contains 2 white and 3 red balls and a bag B contains 4 white and 5 red balls. One ball is drawn from one of the bags and is found to be red. Find the probability that it was drawn from bag B.

2 (a) If the sum of the mean and variance of a binomial distribution of 5 trials is ~~one~~ $9/5$. Find the binomial distribution.

b) Find the mean and variance of poisson distribution.

3 (a) If a random variable X is uniformly distributed over $(-a, a)$, find a such that $P(X > 1) = 1/3$.

b) A continuous random variable X is normally distributed and with mean 25 and standard deviation 8. Find the probability that (i) $20 \leq X \leq 40$ and (ii) $|X - 25| \leq 5$.

4 (a) Fit a least square curve of the form $y =$ for the following data.

X	61	26	7	25
Y	360	400	500	600

(b) A random sample of 900 members has a mean 3.4 cms. Can be reasonably regarded as a sample from a large population of a mean 3.2 cms and standard deviation 2.3 cms? Test at 5% level of significance.

(15) The values in two random samples are given below.

Sample 1: 15 25 16 20 22 24 21 17 19 23
 Sample II: 35 31 25 38 26 29 32 34 33 27
 29 31

Can we conclude that the two samples are drawn from the same population? Test at 5% level of significance

(16) A random variable X has the following probability distribution.

x	1	2	3	4	5
$P(x)$	c	c	$3c$	$c^2 + c$	$6c^2$

Find (i) the value of c (ii) $E(4x+1)$ (iii) $\text{Var}(4x+1)$
 (iv) $P(x < 3)$ and (v) $P(1 < x < 4)$

17) Find the correlation coefficient and the regression lines from the following data.

X	1	2	3	4	5	6	7	8	9	10
Y	10	12	16	28	25	36	41	49	40	50

FACULTY OF ENGINEERING

B.E. III Semester (AICTE) (I.T) (Main) Examination, December 2019

Subject: MATHEMATICS- III

Time: 3 Hours

Max. Marks: 70

Note: Answer all questions from Part-A & any five questions from Part-B

PART - A (20 Marks)

1. Define Random Experiment, Sample Space, and Event.

2. A Variant X has the Following Distribution.

x	-3	6	9
$P(X=x)$	$1/6$	$1/2$	$1/3$

Find $E(2X+1)^2$

3. Find the Variance of Poisson distribution.

4. Define Kurtosis of a distribution.

5. Explain Uniform distribution.

6. Find the Mean of Exponential distribution.

7. Derive the normal equations for the curve $y = ax^2$ using the method of least squares.

8. Show that correlation coefficient is the geometric mean between the two regression coefficients.

9. Define Central Limit Theorem.

10. Define Type I Error and Type II Error.

PART - B (5 x 10 = 50 Marks)

11. a) The content of three urns are: 1 white, 2 red, 3 green balls; 2 white, 1 red, 1 green balls and 4 white, 5 red, 3 green balls. Two balls are drawn from an urn chosen at random. These are found to be one white and one green. Find the probability that the balls so drawn came from the third urn.

b) The probability density function $P(x)$ of a continuous random variable is

$P(x) = \frac{1}{2}e^{-|x|}, -\infty < x < \infty$. Prove that $\mu_2 = 1$. Find the mean and variance of the distribution.

12. a) Fit a Binomial frequency distribution for the following data.

x	0	1	2	3	4	5
f	2	14	20	34	22	8

b) In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10, use Poisson distribution to calculate the approximation number of packets containing no defectives, one defective and two defective blades respectively in a consignment of 10,000 packets.

13. a) Find the variance and moment generating function of uniform distribution. Also find mean, variance the uniform distribution $f(x) = 1, 0 \leq x \leq 1$.

b) In a Normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

14. a) An experiment gave the following values

v (ft/min)	350	400	500	600
t (min)	61	26	7	2.6

It is known that v and t are connected by the relation $t = av^b$. Find the best possible values of a and b .

- b) Find the correlation coefficient between x and y for the following data

x	1	2	3	4	5
y	2	5	3	8	7

15. a) The mean of simple samples of size 1000 and 2000 are 67.5cm and 68cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5cm?

- b) The theory predicts the proportion of beans in the four groups G1, G2, G3, G4 should be in the ratio 9:3:3:1. In an experiment with 1600 beans the numbers in the four groups were 882, 313, 287 and 118. Does the experiment result support the theory?

16. a) Find the rank correlation coefficient for the following data

x	3	8	9	2	7	10	4	6	1	5
y	5	9	10	1	8	7	3	4	2	6

- b) Two independent sample of sizes 7 and 6 had the following values

Sample A	28	30	32	33	31	29	34
Sample B	29	30	30	24	27	28	

Examine whether the samples have been drawn from normal populations having the same variance.

17. a) Two random variables have the regression lines with equations $3x + 2y = 26$ and $5x + y = 31$. Find the mean values and correlation coefficient between x and y .

- b) Fit the curve $y = ax^b$ to the following data.

x	77	100	185	239	285
y	2.4	3.4	7	11.1	19.6

FACULTY OF ENGINEERING

B.E. III Semester (AICTE) (I.T) (Suppl.) Examination, December 2020

Subject: MATHEMATICS- III

Time: 2 Hours

Max. Marks:70

PART - A

Note: Answer any five questions.

(5 x 2 = 10 Marks)

Write axioms of probability and theorem of total probability.

State Baye's theorem.

Find the mean of the Binomial distribution.

Define skewness of a distribution.

Explain exponential distribution.

Find the variance of Uniform distribution.

Derive the normal equations for a straight line using the principle of least squares.

Find the angle between the two regression lines.

Explain level of significance and confidence limits in testing of hypothesis.

Define Null hypothesis and alternate hypothesis in test of significance.

PART - B

Note: Answer any four questions.

(4 x 15 = 60 Marks)

- a) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4 and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B?
- b) Is the function defined as follows a density function?

$$f(x) = \begin{cases} kx^2 & 0 \leq x \leq 2 \\ 0 & \text{elsewhere} \end{cases}$$

$$k = \frac{1}{2}$$

If so, determine the probability that variant having this density will fall in the interval (1, 2). Also find the cumulative probability function F(2).

- a) Fit Poisson distribution to the set of observation

x	0	1	2	3	4
f	122	60	15	2	1

- b) If the chance that one of the telephone lines is busy at an instant is 0.2.
- What is the chance that 5 of the lines are busy?
 - What is the most probable number of busy lines and what is the probability of this number.
 - What is the probability that all the lines are busy?
- a) A random variable X has Uniform distribution over (-3, 3). find k for which $P(X > k) = 1/3$. Also evaluate $P(X < 2)$ and $P(|1 - 2| < 2)$.
- b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. What are the mean and S.D of the distribution.

-2-

14. a) If P is the pull required to lift a load W by means of pulley block, find a linear law of the form $P = mW + c$ connecting P and W , using the following data.

P	12	15	21	25
W	50	70	100	120

- b) Find the correlation between x and y for the data

x	2	4	6	8	10
y	5	7	9	8	11

15. a) The nine items of a sample have the following values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5?

- b) The following table gives the number of accidents that took place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	MON	TUE	WED	THU	FRI	SAT
No. of accidents	14	18	12	11	15	14

16. a) In a city x , 20% of a random sample of 900 school boys had a certain slight physical defect. In another city y , 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant?

- b) Two random samples from two normal populations are given below:

Sample 1	16	26	27	23	24	22
Sample 2	33	42	35	32	28	31

Do the estimates of population variances differ significantly?

17. a) Find the rank correlation coefficient of the data

x	68	66	68	65	69	66	68	65	71	67	68	70
y	65	63	67	64	68	62	70	68	68	67	69	71

- b) In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $20x - 5y - 33 = 0$ and $20x - 9y = 107$ respectively. Calculate $\bar{x}$, $\bar{y}$ and coefficient of correlation between x and y .

FACULTY OF ENGINEERING

B.E. IV - Semester (EE/InaVCSE) (AICTE) (Main&Backlog) Examination,

October 2021

Subject: Mathematics - III (Probability and Statistics)

Max. Marks: 70

Time: 2 Hours

(Missing data, if any, may be suitably assumed)

PART - A

(5x2 = 10 Marks)

Note: Answer any five questions:

1. State Bayes' theorem.
2. A random variable X has the following probability distribution:

X	1	2	3	4
$P(X)$	$1/10$	$1/5$	$3/10$	$2/5$

3. Find the mean of the distribution.
4. Average number of accidents on any day on a national highway is 1.8. Find the probability that the number of accidents is at least one.
5. Define Skewness of a distribution.
6. Write any two properties of the normal probability curve.
7. Find the variance of the uniform distribution.
8. Two lines of regression are $7x - 16y + 9 = 0$, $5x - 4y - 3 = 0$. Find $\bar{x}$ and $\bar{y}$.
9. Define type I and type II errors.
10. Write the assumptions for conducting t-test.
11. Explain briefly F-test.

PART - B

Note: Answer any four questions

(4x15 = 60 Marks)

- 11 (a) State and prove theorem of total probability.

(b) A continuous random variable X has the pdf $f(x) = \begin{cases} ax^3, & 0 \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases}$

Find (i) a (ii) $P\left(X < \frac{1}{4}\right)$ and (iii) $P\left(X > \frac{1}{2}\right)$.

- 12 (a) Fit a binomial distribution to the following data:

x	0	1	2	3	4	5
f	2	14	20	34	22	8

- (b) Calculate the first four moments about the mean for the following data:

x	1	2	3	4	5	6	7	8	9
f	1	6	13	25	30	22	9	5	2

- 13 (a) The marks obtained in Mathematics by the students in a class are approximately normally distributed with mean 62 and variance 36. If 3 students are selected at random, find the probability that at least one of them would score more than 80 marks.
- (b) Find the mean and moment generating function of exponential distribution.

14 (a) Find the least square line $y = a + bx$ for the following data.

x:	5	-1	0	1	2
f:	1	2	3	3	4

(b) Intelligence test of two groups of boys and girls gave the following results.

Girls: $\bar{x} = 84$, S.D. = 10, $n_1 = 121$

Boys: $\bar{x} = 80$, S.D. = 14, $n_2 = 81$

Is the difference between the standard deviations significant? Test at 5% level of significance.

15 The values of two random samples are given below.

Sample A 15 25 16 20 22 24 21 17 19 23

Sample B 35 31 25 38 26 29 32 34 33 27 29 31

Can we conclude that the two samples are drawn from the same population? Test at 5% level of significance.

16 (a) A dice is thrown twice and the sum of the numbers appearing is noted to be 8. Find the probability that the number 5 has appeared at least once.

(b) Find the variance of the normal distribution.

17 From the following data, calculate coefficient of correlation between X and Y and the two lines of regression equations.

X:	1	2	3	4	5	6	7	8	9
Y:	12	11	13	15	14	17	16	19	10