

FACULTY OF ENGINEERING
B.E. IV-Semester (EE/Inst./CSE) (AICTE) (Backlog) Examination, March/April 2021

Subject : Mathematics – III (P & S)

Time: 2 hours

Max. Marks: 70

Note: Missing data, if any may be suitably assumed.

PART – A

Answer any five questions.

(5x2 = 10 Marks)

- 1 From a pack of well shuffled cards, one card is drawn. Find the probability that this card is either a king or an ace.
- 2 Check $f(x) = \begin{cases} xe^{-x^2/2}, & x > 0 \\ 0, & x \leq 0 \end{cases}$ is a probability density function.
- 3 Define skewness and kurtosis.
- 4 Find the variance of Binomial distribution.
- 5 The continuous random variables is uniformly with mean 1 and variance 3. Find $p(x < 0)$.
- 6 Find the variance of normal distribution.
- 7 List the properties of correlation coefficient.
- 8 Write the normal equations for fitting the given data as straight line and parabola.
- 9 Write the test of significance of the difference between the means of two small random samples drawn from the same normal population.
- 10 Write the test for ratio of variances.

PART – B

Answer any four questions.

(4x15 = 60 Marks)

- 11 (a) A problem in a question paper is given to 3 students in a class to be solved. The probabilities of their solving the problem are 0.5, 0.7 and 0.8 respectively. Find the probability that the problem will be solved.
 (b) A bag contains 5 white and 8 red balls. Two drawing of 3 balls are made such that the balls are not replaced before the second trial. Find the probability that the first drawing ball 3 white and the second 3 red balls in each case.
- 12 (a) An irregular six faced dice is thrown 12 times. The expectation that it will give six even numbers is twice the expectation that it will give 5 even numbers. If 1000 sets, each exactly 12 trials are made, how many sets are expected not to give any even number?
 (b) In a certain factory manufacturing razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are placed in packets, each containing 10 blades. Using the Poisson distribution, calculate the approximate number of packets containing not more than 2 defective blades in a consignment of 10,000 packets.
- 13 (a) In a distribution which is exactly normal, 12% of the items are under 30 and 85% are under 60. Find the mean and standard deviation of the distribution.
 (b) Let X_1 and X_2 be two independent uniformly distributed variables in $[0, 1]$. Then find the distribution of $X_1 + X_2$

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- 14 (a) Find the correlation coefficient between x and y from the given data :

x	78	89	97	69	59	79	68	57
y	125	137	156	112	107	138	123	108

- (b) Fit a parabola $y = a + bx + cx^2$ to the following data:

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

- 15 (a) A random sample of 17 value from a normal population has a mean of 105 cm and the sum of squares of deviations from this mean is 1225 sq.cm. Is the assumption of 110 cm for the normal population reasonable? Test under 5% and 1% level of significance.
 (b) Two random samples of sizes 9 and 7 gave the sum of squares of deviations from their respective means as 175 and 95 respectively. Can they be regarded as drawn from normal populations with same variance.

- 16 (a) Find the best possible curve of the form $y = a + bx$ using Method of least squares for the data.

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

- (b) Two random variables have the regression lines with equations $3x + 2y = 26$ and $6x + y = 31$. Find the mean values and the correlation coefficient between x and y .

- 17 (a) Fit a Poisson distribution to the following data and test for its goodness of fit at level of significance 0.05.

No. of defects	0	1	2	3	4
No. of units	214	92	20	3	1

- (b) The number of students in a class is 100. The average marks scored by 64 boys is 66 with standard deviation of 10 while the average marks scored by 36 girls is 70 with standard deviation of 8. Test of 1% level of significance whether the girls performed better than boys.

Subject : Mathematics – III (P & S)

Time : 2 Hours

Max. Marks: 70

Note: (Missing data if, any can be assumed suitable).

PART – A

Answer any five questions.

(5 x 2 = 10 Marks)

- 1 Define conditional probability.
- 2 A continuous random variate X has the probability density function
 $f(x) = a + bx, 0 \leq x \leq 1$
 $= 0$, elsewhere of the distribution is $\frac{1}{3}$, find the values of a and b .
- 3 Define Binomial distribution.
- 4 Define Skewness.
- 5 Find the mean of Exponential distribution.
- 6 Explain Normal distribution.
- 7 Write normal equations of straight line.
- 8 Write the equations of the regression lines.
- 9 Define Null hypothesis.
- 10 Define Population and sample.

PART – B

Answer any four questions.

(4 x 15 = 60 Marks)

- 11 (a) State and prove theorem of total probability.
 (b) If A and B are two mutually exclusive events of a random experiment, then
 $P(A \cup B) = P(A) + P(B)$.
- 12 (a) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2,000 individuals more than 2 will get bad reaction.
 (b) Calculate the quartile coefficient of skewness from the following data.

Weight (lbs)	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
No. of persons	12	18	35	42	50	45	20	8

- 13 (a) A continuous random variable X has probability density function
 $f(x) = \frac{3}{4}(x^2 + 1), 0 \leq x \leq 1$. Find 'a' such that $P(X \leq a) = P(X > a)$.
 (b) A continuous random variable X is uniformly distributed with mean 1 and variance 3. Find $P(X < 0)$.
- 14 (a) A coin was tossed 400 times and head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance.
 (b) Fit a parabola $y = a + bx + cx^2$ for the following data:

x	1	2	3	4	5	6
f(x)	1000	800	500	300	150	90

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- 15 (a) Five dice were thrown 96 times and the no. of times 4, 5 or 6 were thrown were:

No. of dice showing 4, 5, or 6	5	4	3	2	1	0
Frequency	8	18	35	24	10	1

Find the probability of getting this result by chance.

- (b) A normal population has mean 0.1 and a S.D. of 2.1. Find the probability that mean of simple sample of 900 members will be negative?
- 16 (a) The probability density function of variate X is

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

Find $P(X < 4)$, $P(X \geq 5)$, $P(3 < X \leq 6)$

- (b) If X is a Poisson variate such that $P(X = 2) = 3P(X = 4) + 45P(X = 6)$. Find the mean and variance of X .
- 17 (a) Find the moment generating function of uniform distribution.

- (b) Find the correlation coefficient and regression lines for the following data:

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

FACULTY OF ENGINEERING

B.E. (Civil) (AICTE) IV-Semester (Main) Examination, December 2020

Subject : Mathematics – III (PDE, P & S)

Time : 2 Hours

Max. Marks: 70

Note: (Missing data if, any can be assumed suitable).

PART – A

Answer any five questions.

(5 x 2 = 10 Marks)

- Form the partial differential equation by eliminating arbitrary function from $z = f(x^2 - y^2)$.
- Solve $P(1+q) = qz$.
- Using method of separation of variables, solve $\frac{\partial u}{\partial x} + 4 \frac{\partial u}{\partial y}$, given that $u(0, y) = 8e^{-2y}$.
- Define one dimensional and two dimensional heat equations.
- Define uniform distribution and hence find its mean.
- Find the moment generating function of the Poisson distribution.
- The rankings of the ten students in two subjects A and B are as follows:

A	3	5	8	4	7	10	2	1	6	9
B	6	4	9	8	1	2	3	10	5	7

Find the correlation coefficient.

- Prove that correlation coefficient is independent of change of origin and scale.
- A die is thrown 60 times with the following results.

Face	1	2	3	4	5	6
Frequency	8	7	12	8	14	11

Test at 5% level of significance if the die is honest, assuming that $P(\chi^2 > 11.1) = 0.05$ with 5 degrees of freedom.

- A random sample of 10 boys has the following IQ: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean IQ of 100 (at 5% level of significance).

PART – B

Answer any four questions.

(4 x 15 = 60 Marks)

- (a) Solve $(z-y)p + (x-z)q = y-x$.
(b) Solve $p \cdot x \cdot y + pq + qy = yz$.
- (a) Solve the equation with boundary conditions $u(x,0) = 3\sin \pi x$, $u(0,t) = 0$ and $u(1,t) = 0$ where $0 < x < 1$, $t > 0$.
(b) Find the deflection of a vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $f(x) = K(\sin x - \sin 2x)$.
- Find the moments about mean of normal distribution. What can you conclude about odd and even order moments about the mean of $N(\mu, \sigma^2)$.

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- (a) The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5 cm?
(b) Fit the curve $y = ae^{bx}$ to the following data:

x	0	2	4
y	5.1	10	31.1

- (a) Two independent samples of sizes 7 and 6 have the following values:

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

Examine whether the samples have been drawn from normal population having same variances? [F at 5% level for (6, 5) d.f. is for (5, 6) d.f. is 4.39]

- Sample two types of electric light bulbs were tested for length of life and following data were obtained:

	Type 1	Type 2
Sample No.	$n_1 = 8$	$n_2 = 7$
Sample means	$\bar{x}_1 = 1,234$ hrs	$\bar{x}_2 = 1,036$ hrs
Sample S.D.'s	$s_1 = 38$ hrs	$s_2 = 40$ hrs

Is the difference in means sufficient to warrant that type 1 is superior to type 2 regarding length of life?

- (a) Prove that coefficients of regressions are independent of the change of origin but not of scale.
(b) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution?
- Solve the differential equation $\frac{\partial u}{\partial x} = u + \frac{\partial^2 u}{\partial x^2}$ for the condition of heat along a rod without radiation, subject to the following conditions:
(a) u is not infinite for $t \rightarrow \infty$
(b) $\frac{\partial u}{\partial x} = 0$ for $x = 0$ and $x = l$
(c) $u = l - x^2$ for $t = 0$, between $x = 0$ and $x = l$

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 $y = ax^b$ 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 $P(x) = y_0 e^{-|x|}$, $-\infty < x < \infty$. Prove that $y_0 = 1/2$. 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

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It is known that v and t are connected by the relation $V = at^b$. 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

FACULTY OF ENGINEERING
B.E. III - Semester (IT) (AICTE) (Main & Backlog) Examination, July 2021

Subject: Mathematics – III (P & S)

Time: 2 Hours

Max. Marks: 70

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

PART – A

Note: Answer any five questions.

(5x2 = 10 Marks)

- 1 Let A and B two events such that $P(A)=0.5$, $P(B)=0.6$ and $P(A \cup B)=0.8$. Find $P(A/B)$.
- 2 If $f(x) = \begin{cases} \frac{x}{6} + k, & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$ is a probability density function of a random variable, find k.
- 3 Find the moment generating function of binomial distribution.
- 4 A Poisson variant X satisfies $P(X=1) = \frac{1}{2} P(X=2)$. 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 $0 \leq k \leq \frac{1}{4}$.
- 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

Note: Answer any four questions.

(4x15 = 60 Marks)

- 11 (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.
- 12 (a) If the sum of the mean and variance of a binomial distribution of 5 trials is $9/5$, find the binomial distribution.
 (b) Find the mean and variance of Poisson distribution.
- 13 (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 with mean 25 and standard deviation 8. Find the probability that (i) $20 \leq X \leq 40$ and (ii) $|x - 25| \leq 5$.
- 14 (a) Fit a least square curve of the form $y = a + bx$ for the following data:

x_i	61	26	7	26
y_i	350	400	500	600

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

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15 The values in two random samples are given below.

Sample I: 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 equations of 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