

FACULTY OF ENGINEERING

**B. E. (CE/EE/Inst./CSE) (Suppl.) (AICTE) III – Semester Examination,
December 2020**

Subject: Biology for Engineers

Time: 2 hours

Max. Marks: 70

PART – A

Note: Answer any five questions.

(5 x 2 = 10 Marks)

1. What are biomolecules? Name any two biomolecules.
2. Write a note on importance of enzymes.
3. How does nitrogen fixation take place in plants?
4. Give the control measures for microbes.
5. What is central dogma of molecular biology?
6. Describe the theories of evolution.
7. Explain the causes and symptoms of Hepatitis.
8. Difference between epitope and paratope.
9. What are transgenic animals? Write their applications in biology.
10. What is bioremediation? Explain its importance.

PART – B

Note: Answer any four questions.

(4 x 15 = 60 Marks)

11. (a) Give a detailed account on the general classification of carbohydrates.
(b) Differentiate between prokaryotic and eukaryotic cell.
12. (a) What is biodiversity? Explain biodiversity of animal kingdom.
(b) Explain the plant growth and nutrition.
13. (a) Describe the process of mitotic cell division.
(b) Explain briefly Mendel's laws of inheritance.
14. (a) What is immunity? Explain the mechanism of antigen-antibody reaction.
(b) Explain the causes and symptoms of disease Influenza in humans.
15. (a) Define bioreactor? Explain its working and applications in biology.
(b) What are recombinant vaccines? Explain their importance.
16. (a) Give a detailed account on enzyme classification.
(b) Elucidate the microbial diversity with a note on their economic importance.
17. (a) What is biopharming? Give examples.
(b) Write about applications of biosensors in industry.

FACULTY OF ENGINEERING**B.E. (ECE/M/P/AE)(AICTE) III-Semester (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)**

- 1 Obtain a partial differential equation that governs the family of surfaces $z = (x - \alpha)^2 + (y - \beta)^2$.
- 2 Find the general solution of partial differential equation $x^2 p + y^3 q = (z xy^2 - 4 x^3)$.
- 3 Classify the following partial differential equations
 - (a) $\frac{\partial^2 u}{\partial x^2} = 5 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial x}$, (b) $\frac{\partial^2 u}{\partial x^2} + 3 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$
- 4 Classify two dimensional wave and Laplace equations.
- 5 Find the variance of binomial distribution.
- 6 Find the recurrence formula for the moments of Poisson distribution.
- 7 Write the normal equation for $y = a^{bx}$.
- 8 State central limit theorem.
- 9 Two sample of 9 and 7 individuals have variances 4.8 and 9.6 respectively. Is the variance 9.6 significantly greater than the variance 4.6?
- 10 Define Chi-square test.

PART – B**Note: Answer any four questions.****(4 x 15 = 60 Marks)**

- 11 (a) Obtain a second order partial differential equation by elimination the arbitrary functions from $u = f(x + ct) + g(x - ct)$.
(b) Using a transformation, reduce the partial differential equation $y + 2zq = q(4xp + yq)$ to Clairaut's form and hence find its complete integral.
- 12 (a) Find the general solution of partial differential equation $2xzp + 2yzq = z^2 - x^2 - y^2$.
(b) Find the equation of the surface which cuts orthogonally the system of surfaces $2xz + 3yz = a(z+2)$, where a is an arbitrary constant and passes through the circle $z = 0, x^2 + y^2 = 9$.
- 13 (a) A thin rod of length l has initial temperature equal to a constant T . The right end of the rod, $x = l$, is insulated while the left end of the rod is kept at zero temperature. Find the temperature distribution in the bar.
(b) Find the temperature distribution in a thin, infinite bar if the initial temperature is given by

$$u(x, 0) = f(x) = \begin{cases} T_0, & \text{cons } \tan t, |x| < 2 \\ 0, & |x| > 2 \end{cases}$$

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- 14 (a) The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1 , β_2 and comment upon the skewness and kurtosis of the distribution.
- (b) Find the recurrence formula for the moments of binomial distribution.

- 15 (a) A random variable X has the following probability function :

x	0	1	2	3	4	5	6	7
f	0	k	2k	2k	3k	k ²	2k ²	7k ² +k

- (i) Find the value of k (ii) Evaluate $P(X < 6)$, $P(X \geq 6)$ (iii) $P(0 < X < 5)$.
- (b) In a test on 2000 electric bulbs, it was found that the life of particular make, was normally distributed with an average life of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely to burn for
- (i) More than 2150 hours
(ii) less than 1950 hours
(iii) more than 1920 hours and but less than 2160 hours
- 16 (a) Three judges, A, B, C give the following ranks. Find which pair of judges has common approach.

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

- (b) The train resistance R (lbs/ton) is measured for the following values of the velocity V (km/hr).
- 17 (a) Eleven school boys were given a test in drawing. They were given a month's further tuition and a second test of equal difficulty was held at the end of it. Do the marks give evidence that the students have benefitted by extra coaching?

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

- (b) Test run with 6 models of an experimental engine showed that they operated for 24, 28, 21, 23, 32 and 22 minutes with a gallon of fuel. If the probability of a Type I error is at the most 0.01, is this evidence against a hypothesis that on the average this kind of engine will operate for at least 29 minutes per gallon of the same fuel. Assume normality.

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)**

1. Write axioms of probability and theorem of total probability.
2. State Baye's theorem.
3. Find the mean of the Binomial distribution.
4. Define skewness of a distribution.
5. Explain exponential distribution.
6. Find the variance of Uniform distribution.
7. Derive the normal equations for a straight line using the principle of least squares.
8. Find the angle between the two regression lines.
9. Explain level of significance and confidence limits in testing of hypothesis.
10. Define Null hypothesis and alternate hypothesis in test of significance.

PART – B**Note: Answer any four questions.****(4 x 15 = 60 Marks)**

11. 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?

$$f(x) = e^{-x}, x \geq 0$$

$$= 0, x < 0$$

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

12. 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.
 - i) What is the chance that 5 of the lines are busy?
 - ii) What is the most probable number of busy lines and what is the probability of this number.
 - iii) What is the probability that all the lines are busy?
13. 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 $P(|X - 2| < 2)$.
- 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.

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 A , 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B , 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant?
- b) Two random sample 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	66	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 .
