

**FACULTY OF ENGINEERING**

**B.E. (EEE/EIE/AI&DS)/(AI&ML/IoT/IT) III– Semester (AICTE) (New)(Main & Backlog)  
Examinations, February / March-2023**

**Subject: Mathematics-III / Mathematics-III (P & S)**

**Time: 3 Hours**

**Max. Marks: 70**

- Note:** (i) First question is compulsory and answer any four questions from the remaining six questions. Each questions carries 14 Marks.  
(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.  
(iii) Missing data, if any, may be suitably assumed.

1. (a) What is the probability that a number selected from 1,2,...,20 is an even number, when each of the given numbers is equally likely to be selected?  
(b) Find the mean of the Poisson distribution.  
(c) Explain exponential distribution.  
(d) Write the normal equations for the curve  $y = ax^b$ .  
(e) Define Type I error and Type II error.  
(f) Define skewness and kurtosis.  
(g) Explain the test of significance of the difference between the means of two small drawn from the same normal population.
2. (a) Four boxes A,B,C,D contain fuses. The boxes contain 5000,3000, 2000 and 1000 fuses Respectively. The percentage of fuses in the boxes which are defective are 3%,2%,1% and 0.5% respectively. One fuse selected at random arbitrarily from one of the boxes. It is found to be a defective fuse. Find the probability that it has come from box D.  
(b) A continuous random variable X has probability density function  
$$F(x) = \frac{3}{4}(x^2 + 1), \quad 0 \leq x \leq 1.$$
 Find  $a$  such that  $P(X \leq a) = P(X > a)$ .
3. (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 of exactly 12 trials are made, how many sets are expected not to give any even number?  
(b) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more that 2 will get a bad reaction.
4. (a) In a test of 2000 electric bulbs, It was found that life of a electric bulbs was normally distributed with an average life of 2040 hours and S.D of 60 hours. Estimate the number of bulbs likely to burn. (i) more than 2150 hours (ii) less than 1950 hours.  
(b) Define uniform distribution. The continuous random variable X is uniformly distributed with mean 1 and variance 3. Find  $P(X < 0)$ .

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5. (a) Using method of least square, fit parabola  $y = a + bx + cx^2$  to data

x	0	1	2	3	4
y	1	0	3	10	21

- (b) In a partially destroyed laboratory record, only the lines of regression of  $y$  on  $x$  and  $x$  on  $y$  are available as  $4x - 5y + 33 = 0$  and  $20x - 9y = 107$  respectively. Calculate  $\bar{x}$ ,  $\bar{y}$  and the coefficient of correlation between  $x$  and  $y$ .

6. (a) The heights of 8 males participating in an athletic championship are found to be 175cm, 168cm, 165cm, 170cm, 167cm, 160cm, 173cm and 168cm. can we conclude that the average height is greater than 165cm? test at 5% level of significance.
- (b) Fit a Poisson distribution for the following data and test the goodness of fit at 5% level of significance.  $\chi^2_{(0.05)} = 7.815$

x	0	1	2	3	4	5
f(x)	110	170	130	60	23	7

7. (a) A random variable  $X$  has the following probability function.

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> + K

(i) Find K value

(ii)  $E\left(\frac{6x+3}{5}\right), \text{Var}(2X - 3)$

(iii) Find the minimum value of  $X$  so that  $P(X \leq x) > 1/2$ .

- (b) The ranks of ten students in two subjects A and B as follows

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

Then find the rank correlation coefficient.

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