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TMA–202

B. TECH. (CS) (SECOND SEMESTER) END SEMESTER EXAMINATION, 2019

PROBABILITY AND DIFFERENTIAL EQUATION

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Each part carries **ten** marks. Total marks assigned to each question are **twenty.**

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) A company produces lightbulbs at three factories A, B, C. Factory A produces 40 percent of the total number of bulbs, of which 2 percent are defective. Factory B

produces 35 percent of the total number of bulbs, of which 4 percent are defective. Factory C produces 25 percent of the total number of bulbs, of which 3 percent are defective. A defective bulb is found among the total output. Find the probability that it came from :

(i) Factory A

(ii) Factory B

(iii) Factory C

(b) (i) Suppose 20 percent of the items produced by a factory are defective. Suppose 4 items are chosen at random. Find the probability that :

(I) 2 are defective

(II) 3 are defective

(III) None is defective

(ii) Suppose 220 misprints are distributed randomly throughout a book of 200 pages. Find the probability that a given page contains :

(I) no misprints

(II) 1 misprint

(III) 2 misprints

(IV) 2 or more misprints

(c) The probability that a bomb dropped from a plane will strike the target is 1/5. If six bombs are dropped, find the probability that :

(I) Exactly two will strike that target

(II) At least two will strike the target

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Answer the following :

(i) What is the Chebyshev's Inequality ?

(ii) What is the difference between discrete and continuous random variable ?

(iii) What is the binomial distribution ? Define with an example.

(iv) What is the independent random variable ?

(b) Define the Skewness and find the skewness of following data :

Marks obtained	No. of Students
0—10	5
10—20	13
20—30	4
30—40	7
40—50	6
50—60	5

(c) Calculate the coefficient of correlation between the marks obtained by 8 students in Probability and Differential Equation :

Students	Probability	Differential Equation
A	25	8
B	30	10
C	32	15
D	35	17
E	37	20
F	40	23
G	42	24
H	45	25

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Ten B. Tech. students are taking participation in a company placement. Competitors are ranked by three interviewers in the following order :

Interviewer I	Interviewer II	Interviewer III
5	1	6
3	6	4
10	5	9
7	10	8
2	3	1
1	2	2
4	4	3
10	9	10
4	7	5
6	8	7

Using the correlation coefficient determine which pair of interviewer has the nearest approach to common tastes in beauty.

(b) Show that :

$$\int_0^{\infty} \frac{\lambda^{\alpha} x^{\alpha-1} e^{-\lambda x}}{\sqrt{\alpha}} dx = 1$$

(c) A die is rolled twice. Let X_1 and X_2 be the outcomes, and let $S_2 = X_1 + X_2$ be the sum

of these outcomes. Then X_1 and X_2 have the common distribution function.

$$m = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} \end{pmatrix}$$

Find the probability of getting sum of 4 by using sums of random variables.

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Solve :

$$\left(D^2 + 4\right) y = 3x \sin x + x^3 e^{2x}$$

(b) Solve the differential equations :

$$\left(y^2 e^{xy^2} + 4x^3\right) dx + \left(2xye^{xy^2} - 3y^2\right) dy = 0$$

(c) Solve :

$$x^3 \frac{d^3y}{dx^3} + x^2 \frac{d^2y}{dx^2} - 2y = x - \frac{1}{x^3}$$

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find Laplace transformation of the function $f(t) = t + t^2 + t^3$.

(b) Find the inverse Laplace transform of $\frac{s^2}{\left(s^2 + a^2\right)\left(s^2 + b^2\right)}$.

(c) Solve the differential equation by using Laplace transformation :

$$\frac{d^2y}{dx^2} + 25 \frac{dy}{dx} = 10 \cos 5t,$$

$$y(0) = 2; y'(0) = 0.$$