Total nos. of printed pages: 02

PRANVEER SINGH INSTITUTE OF TECHNOLOGY, KANPUR

Odd Semester Session 2022-23 CT - II

B. Tech.III Semester

Engineering mathematics-IV (KAS-302)

CO Number	Course Outcome (Please include all COs of your Course here)
CO1	**Define/State/Find (L1-Remember)** various fundamental concepts of partial differential equations (PDE), probability.
CO2	**Explain/Discuss/Show (L2-Understand) the process involved** various engineering problems to **calculate (L2-Understand)** various value of dependent variables. Partial differential equation are used in heat equation, wave equation, curve fitting, correlation, regression and other statistical techniques.
CO3	**Apply/use (L3-Apply)** the concepts of PDE, probability and statistics to **compute(L3-Apply)** the engineering problems.
CO4	**Solve/Examine (L4-Analyze)** moments, skewness and kurtosis, coefficient of correlation, probability and various dependent variables in PDE. **Test (L4-Analyse)** the significance of chi-square test, F-test, t-test, ANOVA as well as control charts.

Time: 1.5 Hrs. M. M. 15

Section A

Q1. Attempt all questions: **(1X3 = 3 Marks)**

a) Define conditional probability. CO1

b) Find the correlation coefficient from the regressions line are x-y+ 5 = 0 & 16x – 9y = 94. CO1

c) Define radio wave equations. CO1

Section B

Q2. Attempt all questions: **(2X4 = 8 Marks)**

a i) Three groups of children contain respectively 3 girls and 1 boy; 2 girls and 2 boys; 1 girl and 3 boys. One child is selected at random from each group. Show that the chance that the three selected consists of 1 girl and 2 boys is 13/32. CO2

Or

ii) If θ is the acute angle between the two regression lines in the case of two variables x and y, show that $tan\theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x{}^2 + \sigma_y{}^2}$. Explain the significance of the formula when r = 0 and r = ±1. CO2

b i) Calculate the coefficient of correlation for the following table: CO2

x	10	14	18	22	26	30
y	18	12	24	6	30	36

Or

ii) In a partially destroyed laboratory record of an analysis correlation data, the following results only are legible: variance of x = 9, regression equations: 8 x − 10 y + 66 = 0, 40 x − 18 y = 214 Calculate: (i) The mean of x & y (ii) The S. D. of y and (iii) The coefficient of correlation between x and y? CO2

c i) The pressure of the gas corresponding to various volumes V is measured, given by the following data: CO3

V (cm^3)	50	60	70	90	100
P (kg cm^{-2})	64.7	51.3	40.5	25.9	78.0

Apply the concept of method of least square to fit the data to the equation $PV^{\gamma} = C$.

Or

ii) Use the method of rank correlation in following data: CO3

Marks A	15	20	27	13	45	60	20	75
Marks B	50	30	55	30	25	10	30	70

i) Compute the moment generating function of the random variable x having probability distribution CO3

$$f(x) = \begin{cases} x, for\ 0 < x < 1 \\ 2 - x, for\ 1 \le x < 2 \\ 0, elsewhere \end{cases}$$

Also determine v_1, v_2 and μ_2.

Or

) Use the method of least squares to fit the curve $y = \frac{c_0}{x} + c_1\sqrt{x}$ to the following table of values: CO3

x	0.5	0.2	0.4	0.5	1	2
y	21	11	7	6	5	6

Section C

(4X1 = 4 Marks)

i) . Examine the temperature at any point of a rectangular plate with insulated surfaces is 10 cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature along the short edge y = 0 is given by CO4

And $u(x, y) = \begin{cases} 20x, & 0 < x \le 5 \\ 20(10 - x), & 5 < x < 10 \end{cases}$

And the two long edges x= 0 and x = 10 as well as other short edge are kept at 0^0C.

Or

ii) Examine the kurtosis and skewness of the following table represents the height of a batch of 100 students: CO4

Height(in cm)	59	61	63	65	67	69	71	73	75
No. of students	0	2	6	20	40	20	8	2	2