

Total No. of Questions :8]

SEAT No. :

PE2632

[Total No. of Pages : 3

[6583]-164

T.E. (Mechanical/Mechanical-Sandwich)
NUMERICAL AND STATISTICAL METHODS
(2019 Pattern) (Semester-V) (302041)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of Scientific Calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Find double integral of $f(x, y) = x^3 + y^2 - 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Applying Simpson's 1/3rd rule.

[12]

b) Draw a flow chart for Gauss 2 Point formula to evaluate integration of any function.

[6]

OR

Q2) a) Find integration of $x^3 + y^2 - 5$ in limits 0 to 1 by using 3-point Gauss Legendre formula with 6 strips.

[5]

b) Draw a flow chart for Trapezoidal rule to evaluate integration of any function.

[5]

c) The data listed in table gives measurements of heat flux q at the surface of a solar collector. Estimate the total heat absorbed by a 2×10^5 cm² collector panel during 14 hours period. The panel has an absorption efficiency $\varepsilon = 42\%$. The total heat absorbed is given by, $H = \varepsilon \int qA.t dt$ where A is area, q is heat flux and t is time

[8]

t(hr)	0	1	2	3	4	6	8	11	14
Q(cal/cm ² hr)	0.05	1.72	5.23	6.38	7.86	8.05	8.03	5.82	0.24

P.T.O.

- Q3) a)** Fit a parabola of the form $y = a + bx + cx^2$. Using the least square method to the following data. [9]

x	-2	-1	0	1	2
y	-2	5	8	7	2

- b) The following data gives the values of y corresponding to certain values of x. Find the value of x when $y = 167$ by applying Lagrange's method. [9]

x	1	2	5	7
y	1	12	117	317

OR

- Q4) a)** From the following table of yearly premium for policies maturing at coming ages, estimate the premiums for policies maturing at the age of 46 years. Use suitable method [10]

Age	x:	45	50	55	60	65
Premium	y:	2.871	2.404	2.083	1.862	1.712

- b) Fit a straight line of the form $y = a + bx$ to the following data by the leastsquare method. [8]

x	-2	1	3	6	8	9
y	17	14	12	9	7	6

- Q5) a)** Illustrate the following statistical diagrams with real life example [8]

- i) Coefficient of variation
- ii) Histogram
- iii) Pie chart

- b) Runs scored in 10 matches of current IPL season by two batsmen A and B are tabulated as under [9]

Batsman A	46	34	52	78	65	81	26	46	19	47
Batsman B	59	25	81	47	73	78	42	35	42	10

Decide who better batsman is and who is more consistent.

OR

- Q6) a)** Find the correlation coefficient between age in years (x) and glucose level (y) from the data of 5 people as follows. [7]

x	43	22	25	42	58
y	99	65	79	75	87

- b) Compute Karl Pearson's coefficient of correlation between X and Y for the following data: [10]

X	100	98	78	85	110	93	80
Y	85	90	70	72	95	81	74

- Q7) a)** From the following data of marks obtained by 8 students in Numerical and Statistical methods (NSM) and Heat and mass transfer (HMT) papers, compute rank coefficient of correlation. [9]

NSM	15	20	28	12	40	60	20	80
HMT	40	30	50	30	20	10	30	60

- b) In a distribution of 'NSM' marks exactly normal, 7% of students are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. [$A_1 = 0.43$, $Z_1 = 1.48$, $A_2 = 0.39$, $Z_2 = 1.23$] [8]

OR

- Q8) a)** A bank utilizes four windows to render fast service to the customers on a particular day 800 customers were observed. They were given service at the different windows as follows: [9]

Window Number	Number of Customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows.

[Given $\chi^2 = 7.815$] [Use 5% level of significance]

- b) Let $F: \mathbb{R}^4 \rightarrow \mathbb{R}^3$ be the linear mapping defined by $F(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t)$. Find a basis and the dimension of [8]
- The image of F ,
 - The kernel of F .

