

Total No. of Questions : 8]

SEAT No. :

P7656

[6180]-178

[Total No. of Pages : 3

T.E. (Mechanical Engg) (Mechanical s/w)
NUMERICAL AND STATISTICAL METHODS
(2019 Pattern) (Semester - I) (302041)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No. 2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.7 or Q.No.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figures to the right indicates full marks.
- 5) Assume suitable data, if necessary.

Q1) a) Find integration of $e^x \cos(x) - 2x$ in limits 0 to 1 by using 3-point Gauss Legendre formula. [6]

b) Evaluate [6]

$$\int_0^6 \frac{1}{(1+x^2)} dx$$

by using the Trapezoidal rule. Take six intervals.

c) Draw a flow chart for Simpson's 1/3rd rule to evaluate integration of any function. [6]

OR

Q2) a) Find integration of $\int_0^1 xe^x dx$ by using 2-point Gauss Legendre formula. [5]

b) Draw a flow chart for Trapezoidal rule to evaluate integration of any function. [5]

c) The velocity 'v' (km/hr) of a vehicle which starts from rest, is given at fixed intervals of time 't' (min) as follows: [8]

t (min)	2	4	6	8	10	12	14	16	18	20
V(km/hr)	10	18	25	29	32	20	11	05	02	00

Estimate approximately the distance covered in 20 minutes. Select appropriate method.

P.T.O.

- Q3) a)** Find the least square polynomial approximation of quadratic curve to the data. [9]

x	0	1	2	3	4
y	-4	-1	4	11	20

- b) The following data gives the values of y corresponding to certain values of x, Find the value of x when $y=167.59789$ by applying Lagrange's method. [9]

x	1	2	5	7
y	1	12	117	317

OR

- Q4) a)** Following is the table of square roots. Calculate the values of $\sqrt{151}$ by Newton's interpolation formula. [9]

X	150	152	154	156
$Y=\sqrt{X}$	12.247	12.329	12.410	12.490

- b) Fit a straight line to given data regarding x as the independent variable. [9]

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

- Q5) 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) Discuss the following terms. [8]

- i) Coefficient of variation
- ii) Central moments
- iii) Standard deviation
- iv) Grouped and Ungrouped Data.

OR

- Q6) a)** Illustrate the following statistical diagrams with real life example [9]
- Scattered diagram
 - Histogram
 - Pie chart

- b) The competitors in a beauty contest are ranked by three judges in the following order. Use rank correlation coefficient to discuss which pair of judges has nearest approach to beauty. [9]

1 st judge	1	5	4	8	9	6	10	7	3	2
2 nd judge	4	8	7	6	5	9	10	3	2	1
3 rd judge	6	7	8	1	5	10	9	2	3	4

- Q7) a)** The number of breakdowns of a computer in a week is a Poisson variable with $\lambda = np = 0.3$. What is the probability that the computer will operate: [8]

- With no breakdown
- At the most four breakdown.
- At least five breakdowns.
- More than 5 breakdown.
- Less than 4 breakdowns in a week.

- b) In 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. [8]

$$[A_1 = 0.43, Z_1 = 1.48, A_2 = 0.39, Z_2 = 1.23]$$

OR

- Q8) a)** Let $F: R^4 \rightarrow R^3$ be the linear mapping defined by [9]

$F(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t)$. Find a basis and the dimension of (a) the image of F, (b) the kernel of F.

- b) Among 64 offsprings of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to a genetic model, these numbers should be in the ratio 9:3:4. Are the data consistent with the model at 5% level? [8]

Given $(\chi^2, 0.05 = 5.99)$

