SEAT No. :

[5870]-1020

T.E. (Mechanical/Mechanical (Sandwich))
NUMERICAL AND STATISTICAL METHODS
(2019 Pattern) (Semester - I) (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, Q.7 or Q.8.*
2) *Figures to the right indicate full marks.*
3) *Use of scientific calculator is allowed.*
4) *Assume suitable data if necessary.*

Q1) a) Evaluate formula. $l = \int\limits_{0}^{0.8} \left[\log_e(x+1) + \sin(2x)\right]dx$ by using Gauss-Quadrature two-point. **[9]**

b) Draw Flow Chart for Numerical integraration using Simpsons 3/8 Method. **[8]**

OR

Q2) a) That table below gives the Velocity v of moving particle at time t seconds. **[8]**

t	0	2	4	6	8	10	12
v	4	6	16	34	60	94	136

Find the distance covered by particle in 12 seconds using Simpson's 1/3rd rule.

b) Find double integration of $f(x,y) = 1/(x+y)$

For x = 2 to 3.2 and y = 1 to 2.8 taking no. of steps in both *x* and *y* as $n_x = n_y = 3$. Use Trapezoidal rule. **[9]**

P.T.O.

Q3) a) Draw Flow Chart for power equation $y = ax^b$ **[9]**

b) A set of *x* values and respective *y* values are given below. Using lagrange inverse interpolation method, find the value of *x* at y = 0.42 **[9]**

x	10	20	30	40	50
y	0.1105	0.1985	0.2727	0.4101	0.5123

OR

Q4) a) The values of Nusselt numbers (Nu) and Reynold numbers (Re) found experimentally are given below. If the relation between Nu and Re is of the type Nu = a. Re^b. Find the values of *a* and *b* for the given values of Nu and Re. **[9]**

2000	2400	2800	3200	3600	4000
13.0102	13.5091	14.0789	14.4192	15.1297	16.7535

b) Draw a flowchart for Lagrange's inverse interpolation. **[9]**

Q5) a) Define & Explain with example. **[8]**

i) Mean

ii) Median

iii) Mode

iv) Standard Deviation

b) Calculate the first four moments about the mean of the given distribution. Find β_1 and β_2 and comment on skewness and kurtosis. **[9]**
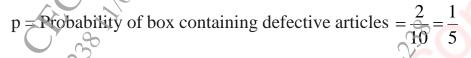
X	5	7	13	24	29	36	40	45	50
f	4	6	17	25	18	12	9	3	2

OR

Q6) **a)** Arithmetic mean and standard deviation of 30 items are 20 and 3 respectively out of these 30 items, item 22 and 15 are dropped. Find new A.M. and S.D. if item 22 is replaced by 8 and 15 is replaced by 17 **[9]**

b) Define and explain the following terms : **[8]**
   i) Kurtosis
   ii) Skewness

Q7) **a)** On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives **[9]**

p = Probability of box containing defective articles $= \dfrac{2}{10} = \dfrac{1}{5}$

q = Probability of non-defective items $= \dfrac{4}{5}$

b) What is probability distribution? **[9]**
Explain following terms with illustrations :
   i) Marginal probability distribution
   ii) Joint probability distribution

OR

Q8) **a)** Describe Binomial poison, normal distribution in details & solve problem. In a certain factory turning out razor blades, there is a small change of 1/500 for any blade to be defective. The blades are supplied in a pocket of 10. Use poisson distribution to calculate the approximate number of packets containing no defective and two defective blades, in a consignment of 10,000 packets. **[9]**

b) Describe joint, conditional and marginal probability in details & solve problem A set of five similar coins is tossed 210 times and the result is **[9]**

No. of Heads	0	1	2	3	4	5
Frequency	2	5	20	60	100	23

Test the hypothesis that the data follow a binomial distribution.

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