Total No. of Questions : 8]

SEAT No. :

PB-3897

[Total No. of Pages : 3

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T.E. (Mechanical/Mechanical Sandwich Engg.)

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 and Q.7 OR Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Scientific Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Evaluate $\int_0^1 \int_0^1 (x^2 y^2) dxdy$ by using suitable method. Take Step size in x & y as 0.25. **[9]**

b) Find the integration of $e^x \cos(x) - 2x$ in limits 0 to 1 by using 3-point Gauss Legendre formula. **[9]**

OR

Q2) a) Gas is expanded according to law $pV^{1.3} = C$ from the pressure of $10N/m^2$. Assuming the initial volume of gas $1m^3$ and final volume $7 m^3$. Calculate work done using Simpson's $\frac{1}{3}$ rule. Divide volume in 6 equal strips. **[8]**

b) Using Gauss-Legendre two point formula to find $\int_3^5 (x^2 - 5x + 2) dx$. **[5]**

c) Draw flowchart of Trapezoidal Method to evaluate Integration of a function. **[5]**

Q3) a) Draw flowchart for the equation $y = ab^x$. **[8]**

b) The population of a town is as follows : **[10]**

Year(x)	1941	1951	1961	1971	1981
Population in Lakhs (y)	20	24	29	36	46

Estimate the populatiqn increase during the period 1941 to 1946.

P.T.O.

OR

Q4) a) The variations of deformation of a metal rod can be modeled as $d = aT^2 + bT + c$, where T is the Operating Temperature. Calculate the values of a, b, and c from the following table : **[10]**

Temperature (K)	300	350	400	450	500
Deformation (mm)	0.913	0.929	0.922	0.918	0.909

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 suitable method. **[8]**

X	1	2	5	6
Y	1	12	117	317

Q5) a) Compute Karl Pearson's coefficient of correlation between X and Y for the following data : **[8]**

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

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]**

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

OR

Q6) 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

Q7) a) A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times and C can hit the target 3 out of 4 times. Find the probability of (i) at least two hit the target (ii) At most two hit the target (iii) No one hitting the target. **[9]**

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) Among 64 offsprings of a certain cross between guinea pigs 34 were red, 10 were black and 20 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? **[9]**

Given $(\chi^2_{2,0.05} = 5.99)$.

b) A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times and C can hit the target 3 out of 4 times. Find the probability of **[8]**

i) At least two hit the target

ii) At most two hit the target

iii) No one hitting the target

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