Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–6)

STATISTICAL AND NUMERICAL METHOD IN ENGINEERING

Subject Code : BTME-604

Paper ID : [A2364]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

I. Write briefly :

i) Show that standard deviation is independent of change of origin.

ii) Weather records show that the probability of high barometric pressure is 0.82 and the probability of rain and high barometric pressure is 0.20. Find the probability of rain, given high barometric pressure.

iii) Find the standard deviation for the following discrete distribution :

x :	8	12	16	20	24
P(x):	1/8	1/6	3/8	1/4	1/12

iv) A body travels uniformly a distance of (13.8 ± 0.2) meters in a time (4 ± 0.3) seconds. Compute its velocity with error limits and what is percentage error in the velocity.

v) State sufficient condition for the convergence of Iteration method.

vi) Find the numerically largest and smallest eigen values of $\begin{bmatrix} -4 & -5 \\ 1 & 2 \end{bmatrix}$, using Power method.

vii) Find the relation between second order divided difference and second order forward difference.

viii) Discuss Modified Euler's method.

ix) The equation $x^2 + ax + b = 0$ has two real roots α and β then show that the method $x_{k+1} = -1/a\,(x_k^2 + b)$ converges to α if $2|\alpha| < |\alpha + \beta|$.

x) Given log 100 = 2, log 101 = 2.0043, log 103 = 2.0128, log 104 = 2.0170. Find log 102.

SECTION-B

II. The mean and variance of a binomial variable X are 2 and 1, respectively. Find the probability that X takes a value greater than 1.

III. Use Newton-Raphson method solve $x^2 + y = 11$, $y^2 + x = 7$, at least up to two Iterations, near $x_0 = 3.5$ and $y_0 = -1.8$.

IV. Derive Simpson's 3/8th rule and hence evaluate $\int_0^{\pi} \sin x\, dx$.

V. Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$. Find $y(0.1)$ and $y(0.2)$ using Runge-Kutta method of fourth order.

VI. From the following table of values of x and y, obtain dy/dx for $x = 1.6$

X :	1.0	1.2	1.4	1.6	1.8	2.0	2.2
Y :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

SECTION-C

VII. (i) The following table gives the frequency of occupancy of digits 0,1, 2,……,9 in the last place in four logarithms of numbers 10-99. Examine if there is any peculiarity.

Digits :	0	1	2	3	4	5	6	7	8	9
Frequency :	6	16	15	10	12	12	3	2	9	5

(ii) Fit a Poisson distribution to the following data and test for its goodness of fit at 5% level of significance.

x :	0	1	2	3	4
f :	419	352	154	56	19

VIII. (i) Show that the order of convergence of Newton-Raphson method is quadratic.

(ii) Find the value of x for which $f(x)$ is maximum in the range of x given, using the following data. Also find the maximum value of $f(x)$.

x :	9	10	11	12	13	14	15
$f(x)$:	1330	1340	1320	1250	1120	930	725

IX. (i) Using Adam's-Bashforth method to find $y(1.4)$ given $dy/dx = x^2 (1 + y)$, $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$ and $y(1.3) = 1.979$.

(ii) Using finite difference method, solve the equation $y''(x) - x\, y(x) = 0$ for $y(x_i)$, where $x_i = 0, 1/3, 2/3$, given that $y(0) + y'0) = 1$ and $y(1) = 1$.