Roll No. $\square$ Total No. of Pages : 03
Total No. of Questions : 09
B.Tech. (Electronics \& Electrical Engg.) (2012 to 2017)/(EE) (2012 Onwards)/(Electrical \& Electronics Engg.) (2011 Onwards)
(Sem.-5)
NUMERICAL AND STATISTICAL METHODS
Subject Code : BTEE-505
M.Code : 70558

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

1. Do all the questions :
a. The area of cross-section of a rod is desired upto $0.2 \%$ error. How accurately should the diameter be measured?
b. The mean of the binomial distribution is 20 and standard deviation is 4 . Calculate $n$, $p, q$
c. Point out the inconsistency, if any, in the following statement
"The regression equation of $y$ on $x$ is $2 y+3 x=4$ and the correlation coefficient between $x$ and $y$ is $0.8^{\prime \prime}$.
d. Write Newton-cote's quadrature formula.
e. Find the eigen vector corresponding to the eigen value 1 of the matrix $\left[\begin{array}{ll}5 & 4 \\ 1 & 2\end{array}\right]$.
f. If 2 percent of the books bound at a certain bindery have defective bindings. Determine the probability that five of 400 books bound by this bindery will have defective bindings.
g. What is the difference between the Gauss-elimination and Gauss-Seidel methods.
h. Let X be the random variable such that $\mathrm{P}(\mathrm{X}=-2)=\mathrm{P}(\mathrm{X}=-1), \mathrm{P}(\mathrm{X}=2)=\mathrm{P}(\mathrm{X}=1)$ and $\mathrm{P}(\mathrm{X}>0)=\mathrm{P}(\mathrm{X}<0)=\mathrm{P}(\mathrm{X}=0)$. Obtain the probability mass function of X and its distribution functions.
i. Discuss the order of the convergence of the Newton's method for nonlinear equation $f(x)=0$.
j. Write the normal equation for the curve $y=a+b x$, for n points by the method of least squares.

## SECTION-B

2. Perform six iterations of the bisection method to find the root of the equation $\cos x=x e^{x}$ correct to four decimal places.
3. Solve the equations $27 x+6 y-z=85, x+y+54 z=110,6 x+15 y+2 z=72$ by GaussSeidel method.
4. Using Newton's divided difference formula, find the missing value from the table :

| $\mathbf{X}$ | 1 | 2 | 4 | 5 | 6 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{Y}$ | 12 | 15 | 5 | ---- | 9 |

5. The amount of time, in hours, that a computer functions before breaking down is a continuous random variable with probability density function given by :
$f(x)=\left\{\begin{array}{rl}\lambda e^{\frac{-x}{100}} ; & x \geq 0 \\ 0 ; & x<0\end{array}\right.$.
What is the probability that a computer will function between 50 and 150 hours before breaking down?
6. A sample analysis of examination results of 500 students was made. It was found that 220 had failed, 170 had secured a third class, 90 was placed in second class and 20 got a first class. Are these figures commensurate with the general examination result which is in a ratio of $4: 3: 2: 1$ for the various categories respectively? The table value of chi-square for 3 d.f. at the $5 \%$ level of significance is 7.81 .
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## SECTION-C

7. a. Evaluate $\int_{0}^{6} \frac{d x}{1+x^{2}} d x$ by using Trapezoidal rule.
b. Apply Runge-Kutta fourth order method to find the approximate value of $y$ for $x=$ 0.2.

Given that $\frac{d y}{d x}=x+y$, and $y=1$ where $x=0$.
8. a. Find the coefficient of correlation and obtain the lines of regression from the given data

| $\mathbf{X}$ | 62 | 64 | 65 | 69 | 70 | 71 | 72 | 74 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{Y}$ | 126 | 125 | 139 | 145 | 165 | 152 | 180 | 208 |

b. Samples of sales in similar shops in two rooms are taken for a new product with the following results :

| Town | Mean sales | Variance | Size of samples |
| :---: | :---: | :---: | :---: |
| A | 57 | 5.3 | 5 |
| B | 61 | 4.8 | 7 |

Is there any evidence of difference in sales in the two towns? Use $5 \%$ level of significance for testing this difference between the mean of two samples.

Use $t_{10}(0.05)=2.228$
9. The results of a survey on the sales of a product $(\mathrm{Y})$ as a function of time period $(\mathrm{X})$ are summarized as below :

|  | $\mathbf{X}$ | $\mathbf{Y}$ |
| :--- | :--- | :--- |
| Mean | 40 | 125 |
| Standard deviation | 2.5 |  |
| Correlation coefficient (r) |  | 0.85 |
|  |  |  |

a. Fit a regression line of Y on X and estimate the value of Y when X is 45 .
b. Fit a regression line of X on Y and estimate the value of X when Y is 135 .

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

