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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(EE) PT (Sem.-6)
NUMERICAL AND STATISTICAL METHODS
Subject Code : BTEE-505
M.Code : 72790

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. Write briefly :

- a) Find the absolute and absolute errors in $\sqrt{6} + \sqrt{7} + \sqrt{8}$ correct to 4 significant digits.
- b) Write the Newton-Raphson formula for a function $f(x) = 0$
- c) Find the eigen values of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.
- d) Write Newton-cote's quadrature formula.
- e) What is the difference between Euler's and Runge-Kutta methods for solving the differential equations?
- f) Given that $f(x) = k(1/2)^x$, is a probability distribution for a random variable which can take on its values $x = 0, 1, 2, 3, 4, 5, 6$. Find k .
- g) A shipment of 7 television sets contains 2 defective sets. A hotel makes random purchase of 3 of the sets. If x is the number of defective sets purchased by the hotel, find the probability distribution of X .
- h) The probability of bomb hitting a target is $1/5$. Two bombs are enough to destroy a bridge. If six bombs are aimed at the bridge, find the probability that the bridge is destroyed.

- i) In Poisson frequency distribution, frequency corresponding to 3 successes is $\frac{2}{3}$ times frequency corresponding to 4 successes. Find the standard deviation of the distribution.
- j) A computer program has produced the following output for a hypothesis-testing problem :

Difference in sample means : 2.35

Degree of freedom : 18

Test statistics : 2.01

Find the standard error of the difference in sample means.

SECTION-B

2. Find a real root of $2x - \log_{10} x = 7$ correct to four decimal places using iteration method.
3. Find the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using Rayleigh's power method. Take $[1, 0, 0]^T$ as initial eigen vector.
4. Using Newton's divided difference formula, evaluate $f(8)$ given :

x	4	5	7	10	11	13
$y = f(x)$	48	100	294	900	1210	2028

5. Suppose that the life length of the two bulbs B1 and B2 have distribution $N(x; 40, 36)$ and $N(x; 45, 9)$ respectively. If the bulb is to be used for 45-hours period, which bulb is to be preferred? If it is to be used for 48-hours period, which bulb is to be preferred? Given that $P(Z < 0.83) = 0.7967$, $P(Z < 1.33) = 0.9082$, $P(Z < 1.00) = 0.8143$.
6. The intelligence quotients (IQ) of 16 students from B.Tech. IInd year showed a mean of 107 and a standard deviation of 10, while the IQs of 14 students from B.Tech. Ist year showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQs of the two groups at significance level of 0.05? Given that critical value at 28 degree of freedom with 5% level of significance is 2.05.

SECTION-C

7. From the given data, find : (i) the two regression equations, (ii) the coefficient of correlation between the marks in Mathematics & Statistics, and (iii) the most likely marks in Statistics when the marks in Mathematics are 30.

Marks in Mathematics	25	38	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

8. Apply Runge-Kutta method to find the approximate value of y for $x = 0.2$ in steps of 0.1, if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ where $x = 0$.
9. (a) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's 1/3rd rule. Compare the error with the exact value.
- (b) In a multiple choice examination, there are 20 questions. Each question has four alternative answers following it and the student must select the one correct answer. Four marks are given for the correct answer and one marks in deducted for every wrong answer. A student must secure at least 50% of maximum possible marks to pass the examination. Suppose that a student has not studied at all so that he decides to select the answers to the questions on a random basis. What is the probability that he will pass in the examination.

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC against the Student.