

Code: CE3T1

**II B.Tech - I Semester – Regular/Supplementary Examinations
November - 2019**

**MATHEMATICAL METHODS
(CIVIL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Find the interval in which a root of $3x = \cos x + 1$ lies.

b) Evaluate $\Delta^2(a^x)$ by taking interval of differencing $h = 1$.

c) State Newton's forward interpolation formula.

d) Determine $y(0.2)$ using Euler's method, given that

$$y' = x + y, y(0) = 0.$$

e) State Milne's predictor and corrector formula.

f) If A and B are mutually exclusive events, $p(A) = 0.32$ and $p(B) = 0.21$ then find $p(A \cup B)$.

g) Given the probability density $f(x) = \begin{cases} 2e^{-2x}, & x > 0 \\ 0, & x \leq 0 \end{cases}$. Then

determine $p(1 < x < 3)$.

h) Estimate the finite population correction factor for $n = 10$ and $N = 1000$.

i) A random sample of size 6 has a standard deviation of 0.14. What can you say about the maximum error with 98% confidence?

- j) Explain Type-I and Type-II errors.
- k) What is the test statistic formula for small samples concerning $\mu_1 - \mu_2 = \delta$.

PART – B

Answer any **THREE** questions. All questions carry equal marks.
3 x 16 = 48 M

2. a) Find a real root of the equation $x^4 - x - 10 = 0$ using Newton-Raphson method. 8 M
- b) Apply Lagrange's interpolation formula to find the value of $f(3)$ if $f(0) = 2, f(1) = 3, f(2) = 12, f(5) = 147$. 8 M
3. a) Using Taylor's series method, find y at 0.1 and 0.2, given that $y' = xy + 1, y(0) = 1$. 8 M
- b) Apply R-K 4th order method to find approximate values of $y(0.2)$ and $y(0.4)$, given that $y' = x^2 + y, y(0) = 1$. 8 M
4. a) The probability that a bomb dropped from a plane will strike the target is 0.2. If 6 such bombs are dropped, find the probabilities that (i) exactly two will strike the target (ii) at least two will strike the target. 8 M

b) A random variable having normal distribution with mean 16.2 and variance 1.5625. Then determine the probabilities that it will take on a value (i) between 13.6 and 18.8
(ii) greater than 16.8. 8 M

5. a) If two random samples of size $n_1 = 7$ and $n_2 = 13$ are taken from a normal population. What is the probability that the variance of the first sample will be at least 3 times as large as that of the second sample?. 8 M

b) The mean weight loss of $n = 16$ grinding balls after a certain length of time in mill slurry is 3.42 grams with a standard deviation of 0.68 grams. Construct a 99% confidence interval for the true mean weight loss of such grinding balls under the stated conditions. 8 M

6. a) To test the claim that the resistance of electric wire can be reduced by more than 0.05 ohm by alloying, 32 values obtained for standard wire yielded $\bar{x}_1 = 0.136$ ohm and $s_1 = 0.004$ ohm and 32 values obtained for alloyed wire yielded $\bar{x}_2 = 0.083$ ohm and $s_2 = 0.005$ ohm. At the 0.05 level of significance, does this support the claim?

8 M

b) Transceivers provide wireless communication among electronic components of consumer products. Responding to a need for a fast, low-cost test of Bluetooth-capable transceivers, engineers developed a product test at a wafer level. In one set of trials with 60 devices selected from different wafer lots, 48 devices passed. Test the null hypothesis $p = 0.70$ against $p > 0.70$ at the 0.05 level of significance. 8 M