Code: CE3T1

II B.Tech - I Semester–Regular/Supplementary Examinations – November 2017

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) State Intermediate Value theorem.
   b) Write the sufficient condition for the convergence of Newton-Raphson method.
   c) Using Newton Raphson method to find the reciprocal of a number.
   d) Prove that $\Delta\, Tan^{-1}\left(\frac{n-1}{n}\right) = Tan^{-1}\frac{1}{2n^2}$, if h=1.
   e) Show that $\sum_{k=0}^{n-1}\Delta^2 f_k = \Delta f_n - \Delta f_0$
   f) Write the advantages & disadvantages of Taylor series method.
   g) A die is tossed. If the number is odd. What is the probability that it is prime?
   h) A random variable X has the following probability function

X	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

   Determine K

i) If the population is finite with N=10, sample size n=2. Find population correction factor.

j) Samples of size 2 are taken from a population 1, 2, 3, 4, 5, 6 with replacement. Find the mean of the population. Write all possible samples of size 2.

k) Write test static to test the null hypothesis $\mu_1 = \mu_2$ when population standard deviations are σ_1, σ_2.

PART – B

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

2. a) Using iteration method find a real root of
$f(x) = x^2 - 3x + 1$ correct upto three decimal places starting with $x = 1$.   8 M

   b) Estimate the population in 1895 and 1925 from the following statistics   8 M

Year	1891	1901	1911	1921	1931
Population	46	66	81	93	101

3. a) Find y(0.1) by Taylor's series expansion when
$y' = x - y^2, y(0) = 1$.   8 M

   b) Apply R-K method to solve $y' = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$, $h = 0.2$ and find $y(0.2)$.   8 M

4. a) Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atleast one boy? Assume equal probabilities for boys and girls. 8 M

b) Assume that the reduction of a person's oxygen consumption during a period of Transcendental Meditation is a continuous random variable X normally distributed with mean 37.6cc/mt and standard deviation 4.6 cc/mt. Determine the probability that during a period of Transcendental Meditation a person's oxygen consumption will be reduced by
(i) at least 44.5 cc/mt   (ii) at most 35 cc/mt.   8 M

5. a) A population consists of six numbers 4, 8, 12, 16, 20, 24. Consider all samples of size two which can be drawn without replacement from this population. Find   8 M
   i) The population mean
   ii) The population standard deviation
   iii) The mean of sampling distribution of means
   iv) The standard deviation of sampling distribution of means.

b) A random sample of size 100 is taken from a population with $\sigma = 1.5$. Given that the sample mean is $\bar{x} = 21.6$ Construct a 95% confidence interval for the population mean μ. 8 M

6. a) In a big city 325 men out of 600 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?

8 M

b) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with standard deviation of 423 hours. A second sample of 17 bulbs choose from a different batch showed a meanlife of 1280 hours with standard deviation of 398 hours. Is there a significant difference between the means of two batches?

8 M