

Code: CE3T1

## II B.Tech - I Semester–Regular Examinations – December 2015

### MATHEMATICAL METHODS (CIVIL ENGINEERING)

Duration: 3 hours

Max. Marks: 70

#### PART – A

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

11 x 2 = 22 M

- 1 a) Write a short note on bisection method.
- b) Derive Newton iterative formula to find  $\frac{1}{\sqrt{N}}$ .
- c) Evaluate  $\Delta^{10}(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)$
- d) Using Picard's method of successive approximation obtain a solution up to 2<sup>nd</sup> approximation of the equation  

$$\frac{dy}{dx} = x + y \text{ and } y(0)=1.$$
- e) Explain Euler's method for solving  $\frac{dy}{dx} = f(x, y), y(x_0) = y_0.$
- f) Write the axioms of probability for a finite sample space.
- g) If events A and B are independent and  $P(A) = 0.25$  and  $P(B) = 0.4$ , find i)  $P(A \cap B)$  and ii)  $P(A \cup B)$ .
- h) Find the value of finite population correction factor for  $n=10$  and  $N=1000$ .
- i) Write the expressions for maximum error of estimation of mean and sample size determination.
- j) Write the expression for large sample confidence interval for p.
- k) Write the test formula for testing hypothesis concerning difference of two small sample means.

PART – B

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

2 a) Compute a real root of the equation  $x^4 - x - 9 = 0$  by Newton Raphson method. 8 M

b) Compute  $y(17)$  using Newton's backward difference formula, from the following table. 8 M

$x$	8	10	12	14	16	18
$y$	10	19	32.5	54	89.5	15.4

3 a) Solve  $\frac{dy}{dx} = 3e^x + 2y$ ,  $y(0) = 0$  by Taylor series method up to 4 terms and find  $y(0.2)$  8 M

b) Solve  $\frac{dy}{dx} = x^2(1+y)$ ,  $y(1) = 1$  by Runge-Kutta 4<sup>th</sup> order method and find  $y(1.1)$ . 8 M

4 a) State and prove Baye's theorem. 8 M

b) The marks of 1000 students in a University are found to be normally distributed with mean 70 and standard deviation 5. Estimate the number of students whose marks will be  
i) between 60 and 75    ii) more than 75    iii) less than 68  
8 M

- 5 a) The mean and standard deviation of a population are 11,795 and 14,054 respectively. If  $n = 50$ , find 95% confidence interval for the mean. 8 M
- b) A random sample of size 100 is taken from a normal population with mean 76 and standard deviation 16. Find the probability that the mean of the sample will 8 M  
i) exceed 77 ii) fall between 75 and 78
- 6 a) According to the norms established for a mechanical aptitude test, persons who are 18 years old should average 73.2 with a standard deviation of 8.6. If 45 randomly selected persons of that age averaged 76.7; test the null hypothesis  $\mu=73.2$  against the alternative hypothesis  $\mu>73.2$  at the 0.01 level of significance. 8 M
- b) In a study designed to investigate whether certain detonators used with explosives in coal mining meet the requirement that at least 90% will ignite the explosive when charged, it is found that 174 of 200 detonators function properly. Test the null hypothesis  $p=0.90$  against the alternative hypothesis  $p<0.90$  at the 0.05 level of significance. 8 M