Fourth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Engineering Mathematics – IV

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. Use of statistical table is permitted.

PART – A

1 a. Employ Taylor's series method to find an approximate solution to find y at x = 0.1 given $\frac{dy}{dx} = x - y^2$, y(0) = 1 by considering upto fourth degree term. **(06 Marks)**

   b. Solve the following by Euler's modified method $\frac{dy}{dx} = \log(x + y)$, y(0) = 2 to find y(0.4) by taking h = 0.2. **(07 Marks)**

   c. Given $\frac{dy}{dx} = x^2(Hy)$ and y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979. Evaluate y(1.4) by Adams-Bash forth method. Apply corrector formula twice. **(07 Marks)**

2 a. Solve $\frac{dy}{dx} = 1 + xz$ and $\frac{dz}{dx} = -xy$ for x = 0.3 by applying Runge Kutta method given y(0) = 0 and z(0) = 1. Take h = 0.3. **(06 Marks)**

   b. Use Picard's method to obtain the second approximation to the solution of $\frac{d^2y}{dx^2} - x^3 \frac{dy}{dx} - x^3 y = 0$ given y(0) = 1, y'(0) = 0.5. Also find y(0.1). **(07 Marks)**

   c. Apply Milne's method to compute y(0.4) given y″ + xy′ + y = 0, y(0) = 1, y'(0) = 0, y(0.1) = 0.995, y'(0.1) = -0.0995, y(0.2) = 0.9802, y'(0.2) = -0.196, y(0.3) = 0.956 and y'(0.3) = -0.2863. **(07 Marks)**

3 a. Derive Cauchy-Riemann equation in Cartesian form. **(06 Marks)**

   b. Find an analytic function f(z) whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$ and hence find its imaginary part. **(07 Marks)**

   c. If f(z) is a holomorphic function of z, then show that $\left\{ \frac{\partial}{\partial x}|f(z)| \right\}^2 + \left\{ \frac{\partial}{\partial y}|f(z)| \right\}^2 = |f'(z)|^2$. **(07 Marks)**

4 a. Discuss the transformation $w = z + \frac{1}{z}$. **(06 Marks)**

   b. Find the BLT which maps the points z = 1, i, -1 to w = i, 0, -i. Find image of $|z| < 1$. **(07 Marks)**

   c. Evaluate $\int_C \left\{ \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} \right\} dz$ where 'C' is circle $|z| = 3$. **(07 Marks)**

PART – B

5 a. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ interms of Legendre polynomials. **(06 Marks)**

b. Obtain the solution of $x^2 y'' + xy' + (x^2 - x^2) y = 0$ interms of $J_n(x)$ and $J_{-n}(x)$. **(07 Marks)**

c. Derive Rodrique's formula $P_n(x) = \frac{1}{2^n \underline{|n}} \frac{d}{dx^n}[(x^2 - 1)^x]$. **(07 Marks)**

6 a. State the axioms of probability. For any two events A and B, prove that,
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(06 Marks)**

b. A box 'A' contains 2 white and 4 black balls. Another box 'B' contains 5 white and 7 black balls. A ball is transferred from the box A to the box B. Then a ball is drawn from the box B. Find the probability that it is white. **(07 Marks)**

c. In a certain college 4% of the boys and 1% of girls are taller than 1.8m. Further more 60% of the students are girls. If a student is selected at random and is found to be taller than 1.8m, what is the probability that the student is a girl? **(07 Marks)**

7 a. The probability density of a continuous random variable is given by $p(x) = y_0 e^{-|x|}, -10 < x < \infty$. Find y_0. Also find the mean. **(06 Marks)**

b. Obtain the mean and variance of binomial distribution. **(07 Marks)**

c. In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and SD of 60 hours. Estimate the number of bulbs likely to burn for.
   i) More than 2150 hours.
   ii) Less than 1950 hours.
   iii) More than 1920 hours but less than 2160 hours.
   Given A(1.5) = 0.4332, A(1.83) = 0.4664, A(2) = 0.4772. **(07 Marks)**

8 a. In a city 'A' 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions is significant? Why? **(06 Marks)**

b. A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 of them were faulty. Test his claim at a significance level of 1% and 5%. **(07 Marks)**

c. A set of five similar coins is tossed 320 times and the result is

No. of heads	0	1	2	3	4	5
Frequency	6	27	72	112	71	32

Test the hypothesis that the data follow a binomial distribution $\left[x^2_{0.05} = 11.07 \text{ for 5df}\right]$. **(07 Marks)**

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