USN | | | | | | | | | | **10MAT41**

Fourth Semester B.E. Degree Examination, June/July 2013
Engineering Mathematics – IV

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. Use of Statistical tables permitted.

PART – A

1 a. Use modified Euler's method to solve $\dfrac{dy}{dx} = x + y$, $y(0) = 1$ at $x = 0.1$ for three iterations

taking h = 0.1.   **(06 Marks)**

   b. Solve $\dfrac{dy}{dx} = x + y$, $x = 0$, $y = 1$ at $x = 0.2$ using Runge-Kutta method. Take h = 0.2.

                                                                 (07 Marks)

   c. Using Milne's predictor-corrector method find $y(0.3)$ correct to three decimals given,

                                                                 (07 Marks)

x	-0.1	0	0.1	0.2
y	0.908783	1.0000	1.11145	1.25253

2 a. Approximate y and z at $x = 0.2$ using Picard's method for the solution of $\dfrac{dy}{dx} = z$,

$\dfrac{dz}{dx} = x^3(y + z)$ with $y(0) = 1$, $z(0) = 1/2$. Perform two steps (y_1, y_2, z_1, z_2).   **(10 Marks)**

   b. Using Runge-Kutta method solve $y'' = x(y')^2 - y^2$ at $x = 0.2$ with $x_0 = 0$, $y_0 = 1$, $z_0 = 0$ take h = 0.2.   **(10 Marks)**

3 a. If $f(z) = u + iv$ is analytic prove that Cauchy-Reimann equations $u_x = v_y$, $u_y = -v_x$ are true.
                                                                 (06 Marks)

   b. If $w = z^3$ find dw/dz.   **(07 Marks)**

   c. If the potential function is $\phi = \log\sqrt{x^2 + y^2}$. Find the stream function.   **(07 Marks)**

4 a. Find the bilinear transformation which maps the points z = 1, i, -1 onto the points w = j, o, -i.
                                                                 (06 Marks)

   b. Discuss the conformal transformation $w = e^z$. Any horizontal strip of height 2π in z-plane will map what portion of w-plane.   **(07 Marks)**

   c. State and prove Cauchy's integral formula.   **(07 Marks)**

PART – B

5 a. Prove that $J_{1/2}^{(x)} = \sqrt{\dfrac{2}{\pi x}}\, \sin x$.   **(06 Marks)**

   b. State and prove Rodrigues formula for Legendre's polynomials.   **(07 Marks)**

   c. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomial.   **(07 Marks)**

6 a. The probabilities of four persons A, B, C, D hitting targets are respectively 1/2, 1/3, 1/4, 1/5. What is the probability that target is hit by atleast one person if all hit simultaneously?
(06 Marks)

b. i) State addition law of probability for any two events A and B.

ii) Two different digits from 1 to 9 are selected. What is the probability that the sum of the two selected digits is odd if '2' one of the digits selected. **(07 Marks)**

c. Three machine A, B, C produce 50%, 30%, 20% of the items. The percentage of defective items are 3, 4, 5 respectively. If the item selected is defective what is the probability that it is from machine A? Also find the total probability that an item is defective. **(07 Marks)**

7 a. The p.d.f of x is

x	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

Find k. Also find $p(x \geq 5)$, $p(3 < x \leq 6)$. **(06 Marks)**

b. A die is thrown 8 times. Find the probability that '3' falls,
i) Exactly 2 times
ii) At least once
iii) At the most 7 times. **(07 Marks)**

c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more; ii) less than 10minutes; iii) between 10 and 12 minutes. **(07 Marks)**

8 a. What is null hypothesis, alternative hypothesis significance level? **(06 Marks)**

b. The nine items of a sample have the following values: 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5. Apply student's t-distribution at 5% level of significance. ($t_{0.05}$ for 8df = 2.31). **(07 Marks)**

c. In experiments on a pea breading, the following frequencies of seeds were obtained:

Round-yellow	Wrinkled yellow	Round green	Wrinkled green	Total
315	101	108	32	556

Is the experiment is in the agreement of theory which predicts proportion of frequencies 9:3:3:1 $\left(x_{0.05}^2, 3df \equiv 7.815\right)$. **(07 Marks)**

* * * * *