Find the lines of regression and coefficient of correlation from the following table: 7

X	3	4	6	7	10
Y	9	11	14	15	16

5. a) The probability density function $p(x)$ of a random variable is given by $p(x) = y_0 e^{-|x|}$, $-\infty \leq x \leq \infty$. Find the value of y_0. 2

b) If the 10 percent of the bolts produced by a machine are defective, find the probability that out of 5 bolts chosen at random at least two will be defective. 2

c) Write the procedure to test significance and goodness of fit using χ^2 method. 3

d) Prove that the mean deviation from mean of a normal distribution is approximately $\frac{4}{5}$ times of standard deviation. 7

OR

The nine items of a sample have the values:
45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significant from the assumed mean 47.5.
$(t_{0.05} = 2.31 \ for \ \upsilon = 8)$. 7

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B.E. - 401

B.E. IV Semester

Examination, June 2014

Engineering Mathematics - III

(Common for all Branches)

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each question are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Show that the function $\frac{1}{2}\log(x^2 + y^2)$ is harmonic. 2

b) Evaluate the integral $\int_C \frac{z^2 - z + 1}{z - 1} dz$, where C is the circle $|z| = 1$. 2

c) Find Cauchy - Riemann equations in polar form. 3

d) Find the analytic function
$f(z) = u + iv$ if $u - v = (x - y)(x^2 + 4xy + y^2)$ 7

OR

Evaluate the integral $\int_0^\infty \dfrac{\cos ax}{x^2+1}\,dx$. 7

2. a) Determine the Newton - Raphson iterative formula to find the kth root of N. 2

b) Find a real root of the equation $x\log_{10}x = 1.2$ by regula - falsi method correct to one decimal place. 2

c) Find a real root of the equation $3x = \cos x + 1$ by iterative method correct to two decimal places. 3

d) Apply Crout's factorization method to solve the system of equations: 7

$$x - y = 0$$
$$-2x + 4y - 2z = -1$$
$$-y + 2z = 1.5$$

OR

Apply Gauss-Seidel iteration method to solve the system of equations: 7

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 1.5$$

3. a) Prove that: $e^x = \left(\dfrac{\Delta^2}{E}\right)e^x \cdot \dfrac{Ee^x}{\Delta^2 e^x}$ 2

b) Derive Newton's forward interpolation formula. 2

c) Evaluate the integral $\int_0^{0.6} e^{-x^2}\,dx$ by Simpson $\dfrac{1}{3}$ rule. 3

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d) Apply Newton's divided difference formula to find the value of $f(9)$ from the following table: 7

x	5	7	11	13	17
$f(x)$	150	392	1452	2368	5202

OR

Find $\dfrac{dy}{dx}$ at $x = 1.1$ from the following table: 7

x	1.0	1.2	1.4	1.6	1.8	2.0
y	0	0.128	0.544	1.296	2.432	4.000

4. a) Find by Taylor's series method the value y(0.1) correct to three decimal places from the differential equation:

$$\dfrac{dy}{dx} = x^2 y - y, \, y(0) = 1 .$$ 2

b) Write the working rule of Runge-Kutta method of fourth order for the numerical solution of differential equation. 2

c) If θ is the angle between the two regression lines show that: 3

$$\tan\theta = \dfrac{1-r^2}{r}\cdot\dfrac{\sigma_x\sigma_y}{\sigma_x^2 + \sigma_y^2} .$$

d) Using modified Euler's method, find the value of y (0.3) from the equation: 7

$$\dfrac{dy}{dx} = x + y, \, y(0) = 1 .$$

OR

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