Total No. of Questions : 5] [Total No. of Printed Pages : 4

Roll No. ....

301(O)

B. E. (Third Semester) EXAMINATION, June, 2010

(Old Scheme)

(Common for AU, CE, CM, CS, EC, EE, EI, EX, FT, IT, ME & BM Engg.)

ENGINEERING MATHEMATICS – III

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Internal choice is given in question. All questions carry equal marks.

1. (a) If $u = x^3 y - x y^3 + 2x^2 - 2y^2$ is the real part of an analytic function $f(z) = u + iv$, find v. Find also $f(z)$ in terms of z.

(b) Evaluate $\int_C (x^2 - i y^2)\, dz$ where C is the path joining (1, 2) to (2, 8) on the parabola $y = 2x^2$.

Or

(a) Using Cauchy's integral formula, evaluate $\int_C \frac{e^{-2z}}{(z+1)^6}\, dz$ where C is $|z| = 2$.

(b) Find the residue of $f(z) = \frac{z^2 - 2z}{(z+1)^2 (z^2+1)}$ at each pole.

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2. (a) Estimate the missing term in the following table :

x	$f(x)$
0	1
1	3
2	9
3	---
4	81

(b) Find the number of men getting wages between Rs. 10 and Rs. 15 from the following data :

Wages in Rs.	Frequency
0 – 10	9
10 – 20	30
20 – 30	35
30 – 40	42

Or

(a) Use Newton's divided difference formula and evaluate $f(6)$, given :

x	$f(x)$
4	48
5	100
7	284
10	900
11	1210
13	2038

(b) Find the value of $\int_1^2 \frac{dx}{x}$ by Simpson's rule. Hence obtain approximate value of $\log_e 2$.

3. (a) Find a root of the equation $x^3 - 3x + 1 = 0$ by Newton-Raphson method.

(b) Solve the following equations by Gauss elimination method :

$$2x + 2y + z = 12$$
$$3x + 2y + 2z = 8$$
$$5x + 10y - 8z = 10$$

Or

(a) Solve the above equations by Jacobi's Iterative method.

(b) Apply Euler's method to solve :

$$\frac{dy}{dx} = x + y, \; y(0) = 0$$

Choosing the step length $h = 0 \cdot 2$.

4. (a) Show that the three vectors (1, 1, − 1), (2, − 3, 5) and (− 2, 1, 4) of R^3 are linearly independent.

(b) Let W be the set of vectors of the form $(x, 2x, -3x, x)$, then prove that W is a surface of $V_4(F)$.

Or

(a) Show that the vectors (1, 0, 0), (1, 1, 0), (1, 1, 1) form a basis for R^3.

(b) Show that $f : V_2(R) \to V_3(R)$ defined as :

$$f(\alpha) = (a, a + b, a - b)$$

where $\alpha = (a, b), \in V_2(R)$ is a linear transformation.

5. (a) Show that the matrix A is diagonalizable :

$$A = \begin{bmatrix} 3 & -2 & 0 \\ -2 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

(b) Write the symmetric matrix of the following quadratic form :

$$q = x_1^2 - 2x_2^2 - 3x_3^2 + 4x_1x_2 + 6x_1x_2 - 8x_2x_3$$

Or

(a) Reduce the quadratic form $x_2x_3 + x_3x_1 + x_1x_2$ into canonical form :

(b) Write the bilinear form corresponding to the matrix :

$$A = \begin{bmatrix} 2 & 3 & 5 \\ 1 & -2 & 0 \\ 3 & 5 & 0 \end{bmatrix}$$