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Roll No. ....

301

B. E. (Third Semester) EXAMINATION, June, 2009

(Old Scheme)

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

ENGINEERING MATHEMATICS – III

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all the *five* questions by selecting parts (a) and (b) or (c) and (d) from each question. All questions carry equal marks.

1. (a) Find the imaginary part of analytic function whose real part is :

$$x^3 - 3xy^2 + 3x^2 - 3y^2$$

(b) Find the image of $|z - 2i| = 2$ under the transformation $w = \frac{1}{z}$.

Or

(c) Evaluate :

$$\int_C \frac{e^z}{(z+1)^2} dz$$

where C is the circle $|z - 1| = 3$.

P. T. O.

(d) Expand $\dfrac{1}{z^2 - 3z + 2}$ in the region :

(i) $|z| < 1$

(ii) $1 < |z| < 2$

2. (a) Prove that :

(i) $e^x = \left(\dfrac{\Delta^2}{E}\right) e^x \cdot \dfrac{E \cdot e^x}{\Delta^2 e^x}$

(ii) $(E^{1/2} + E^{-1/2})(1 + \Delta)^{1/2} = 2 + \Delta$

(b) Use Newton-Raphson method to solve the equation $x^3 - 3x + 1 = 0$ correct to four decimal places.

Or

(c) Find the cubic polynomial which takes the following values :

x	$f(x)$
0	1
1	2
2	1
3	10

Hence or otherwise evaluate $f(4)$.

(d) Evaluate $\int_0^1 \dfrac{dx}{1 + x^2}$ by using :

(i) Simpson's $\dfrac{1}{3}$ rule

(ii) Weddle's rule

3. (a) Solve by Gauss elimination method :

$$2x - y + 3z = 9$$

$$x + y + z = 6$$

$$x - y + z = 2$$

(b) Solve the equation $x \log_{10} x = 1 \cdot 2$ by Regula-Falsi method correct to four decimal places.

Or

(c) Solve by Jacobi's method :

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

(d) Apply Runge-Kutta fourth order method to find an approximate value of y when $x = 0 \cdot 2$, given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$.

4. (a) Define vector space and prove that the set of all matrices of order 2×2 is a vector space with respect to matrix addition and scalar multiplication of matrix by scalar.

(b) Show that the vectors $(1, 0, -1)$ $(1, 2, 1)$, $(0, -3, 2)$ form a basis for $V_3(R)$.

Or

(c) Show that the mapping $f : V_2(R) \to V_3(R)$ defined by $f(a, b) = (a, b, o)$ is a linear transformation

(d) Find the matrix representation of linear transformation T on $V_3(R)$ defines as :

$$T(a, b, c) = (2b + c, a - 4b, 3a)$$

corresponding to the basis :

$$B = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$$

5. (a) Verify Cayley-Hamilton theorem for the matrix :

$$A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$$

and find its inverse.

(b) Find the nature of the following quadratic forms :

(i) $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx$

(ii) $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$

Or

(c) Reduce the quadratic form :

$$3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$$

to the canonical form.

(d) Diagonalize the matrix :

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