

Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No.

301(N)

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

(New Scheme)

(Common for all Branches)

ENGINEERING MATHEMATICS – III

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : The question paper is divided into five Units. Each Unit carries an internal choice. Attempt *one* question from each Unit. All questions carry equal marks.

Unit – I

1. (a) Show that the function $u = e^{-xy} \sin(x^2 - y^2)$ is harmonic. Find the conjugate function v and express $u + iv$ as an analytic function of z .
- (b) Find the bilinear transformation which maps the points $z = 0, -1, i$ onto $w = i, 0, \infty$.

Or

2. (a) Use Cauchy integral formula to evaluate

$$\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$$

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

- (b) Use residue calculus to evaluate the integral

$$\int_0^{2\pi} \frac{1}{5 - 4 \sin \theta} d\theta$$

P. T. O.

Unit - II

3. (a) (i) Prove with the usual notations that

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

- (ii) Express $y = 3x^3 + x^2 + x + 1$ in factorial functions and hence show that $\Delta^3 y = 18$.

- (b) Using Newton's divided difference formula, find $f'(10)$ from the following data :

x	$f(x)$
3	-13
5	23
11	899
27	17315
34	35606

Or

4. (a) Apply Lagrange's formula to find $f(15)$, if :

x	$f(x)$
10	2420
12	1942
14	1497
16	1109
18	790
20	540

- (b) Find the real root of the equation $x^4 - x - 10 = 0$ correct to three places of decimal by using Newton-Raphson's method.

Unit - III

5. (a) Find the cube root of 15 correct to four significant figures by iterative method.

- (b) Solve the following equations by the application of Crout's triangularization (LU) method :

$$2x - 3y + 10z = 3$$

$$-x + 4y + 2z = 20$$

$$5x + 2y + z = -12$$

Or

6. (a) Apply Runge-Kutta method (Fourth order) to find an approximate value of y when $x = 0.2$, given that $\frac{dy}{dx} = x + y^2$ and $y = 1$ when $x = 0$.

- (b) Show the Poisson's equation :

$$\nabla^2 u = -10(x^2 + y^2 + 10)$$

over the square with sides $x = 0 = y$, $x = 3 = y$ with $u(x, y) = 0$ on the boundary and mesh length = 1.

Unit-IV

7. (a) Using Simplex method solve the L.P.P.

Maximize : $z = 3x_1 + 2x_2$

Subject to : $x_1 + x_2 \leq 4$ (1)

$x_1 - x_2 \leq 2$ (2)

and $x_1, x_2 \geq 0$.

- (b) Solve the following minimal assignment problem :

		Men			
		A	B	C	D
Job	I	12	30	21	15
	II	18	33	9	31
	III	44	25	24	21
	IV	23	30	28	14

Or

8. (a) Solve the following L. P. P. graphically

Maximize :

$$z = 3x - z$$

P. T. O.

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Subject to the constraints :

$$x + y \leq 1$$

$$3x + 3y \geq 9$$

and $x, y \geq 0$.

- (b) Find the optimal solution of the following transportation problem :

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	23	27	16	18	30
S ₂	12	17	20	51	40
S ₃	22	28	12	32	53
Demand by	22	35	25	41	

Unit-V

9. (a) Obtain the steady state equations for the queuing model $(M|M|1):(\infty|FCFS)$.
- (b) The mean life time of sample of 100 fluorescent light bulbs produced by a company is computed to be 1570 hours with a standard deviation of 120 hours. The company claims that the average life of the bulbs produced by it is 1600 hours. Using the level of significance of 0.05, is the claim acceptable ?

Or

10. (a) We have three samples A, B, C from normal populations with equal variances. Analyse the population means are equal at 5% level :

	A	12	14	12	9	13
Samples	B	9	9	5	7	10
	C	7	8	10	11	14

- (b) Write short notes on the following :
- (i) Factorial design (ii) Taguchi loss function

