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**Reg. No. :**

**Question Paper Code: 12061**

M.E. DEGREE EXAMINATION, MAY 2014.

First Semester

Structural Engineering

01PMA125 - APPLIED MATHEMATICS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Prove that.

2. State and prove differentiation property of Fourier Transform.

3. Write Astrogeadsky equation for the functional I(Z( x, y)) = Z xx + Z yy) dx dy.

4. State the translation condition to find the extremum of the functional.

5. Write down the orthogonal property of non symmetric matrices.

6. Write short note on Rayleigh's minimum principle.

7. State any four properties of Gaussian Rule.

8. Derive one point Gaussian Quadrature formula.

9. If a harmonic function vanishes everywhere on the boundary then prove that it is identically zero.

10. Write a note on Exterior Dirichlet problem and Newmann problem.

PART - B (5 x 16 = 80 Marks)

11. (a) Using Laplace Transform method solve , 0 l, t >0 ,

with U(0,t) = 0, U x (l,t) = 0, t>0 and U (x,0) = U t (x,0) =0 , 0 l. (16)

Or

(b) Solve the heat equation given by K U xx = u t , - , t > 0, with

U(x, t) = U x (x,t) =0 and U(x ,0) = f (x) , -. (16)

12. (a) (i) Find the shortest distance between the point (-1,5) and the parabola y2 = x. (8)

(ii) Find the plain curve of fixed perimeter and maximum area. (8)

Or

(b) (i) Solve the boundary value problem y" + y + x = 0 , ( 0≤ x ≤ 1) ,

y(0) = y(1)= 0 by Rayleigh - Ritz method. (8)

(ii) Show that the curve which extremise the functional I = - ) dx

under the conditions y(0)=0, y'(0) =1, y( = , y'( = is y= sin x. (8)

13. (a) For the stress matrix A = the highest principle stress is 4 and the

corresponding direction is . Find the other principle stresses and their directions. (16)

Or

(b) Find the resolvent of the matrix A = by Faddeev - Leverrier method

(16)

14. (a) Apply integration by mapping function to determine the area of the quadrilateral with

vertices at (-4,4), (3,-5),(5,6) and (8,5) marked in anti-clockwise direction. (16)

Or

(b) (i) Integrate f(x) = 10 + 20x - + - + between 8 and 12 using

Gauss - Hermite quadrature. Verify your answer with actual integration. (10)

(ii) Evaluate I = . (6)

15. (a) Solve the following boundary value problem in the half plane y>0 described by

Uxx+Uyy=0 ; - , y > 0, with U(x,0) = f(x), - , u is bounded as y , u and both vanish as by Fourier Transform technique. (16)



Or

(b) Show that in spherical polar coordinates (r, defined by the relation x= r sin cos , y= r sin sin and z= r cos by the equation 2 u=0 takes the form + + = 0. (16)

