Reg. No. : | | | | | | | | | | |

Question Paper Code: 51025

M.E. DEGREE EXAMINATION, DEC 2020

First Semester

Structural Engineering

15PMA125 - APPLIED MATHEMATICS FOR STRUCTURAL ENGINEERING

(Regulation 2015)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. $F\left[\frac{\partial^2 u}{\partial x^2}\right]$ CO1- R

(a) $\alpha\, u(\alpha,t)$ (b) $\alpha^2\, u(\alpha,t)$

(c) $-\alpha\, u(\alpha,t)$ (d) $-\alpha^2\, u(\alpha,t)$

2. $F(e^{-x^2/2}) =$ CO1- R

(a) $e^{s^2/2}$ (b) $e^{-x^2/2}$ (c) $e^{-s^2/2}$ (d) $e^{x^2/2}$

3. For a two point Gauss Hermite Quadrature then the weight is CO2 -R

(a) -0.8862 (b) 0.8862 (c)0.7071 (d) -0.7071

4. For one point Gaussian Quadrature the sampling point is at _____ CO2 -R

(a) $\xi = 0$ (b) $\xi = 2$ (c) $\xi = 3$ (d) $\xi = 1$

5. In solving equation $u_t = \alpha^2\, u_{xx}$ by crank- Nicholson method, to simplify method we take $\frac{(\Delta x)^2}{\alpha^2 k}$ as CO3- R

(a) $\frac{1}{2}$ (b) 2 (a) $\frac{1}{2}$ (b) 2

6. Suppose 'f' is independent of 'y' then the solution of Euler's equation is CO3- R

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(a) $\frac{\partial F}{\partial y'} = c$ (b) $\frac{\partial F}{\partial y} = c$ (c) $\frac{\partial F}{\partial x} = c$ (d) $\frac{\partial F}{\partial x'} = c$

7. To find the smallest eigen values of the matrix then use CO4 -R

(a) Approximation method (b) Power method

(c) Rayley-Ritz method (d) Faddeev-Leverrier method

8. To find the dominant eigen value of a matrix then use CO4 -R

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(a) Approximation method (b) Power method

(c) Rayley-Ritz method (d) Approximation Method

9. The maximum likelihood estimate are CO5- R

(a) Inconsistent (b) Consistent (c) Not biased (d) None of the above

10. Angle between the regression lines are parallel then CO5- R

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(a) $\theta = 0$ (b) $\theta = \frac{\pi}{2}$ (c) $\theta = \frac{\pi}{4}$ (d) $\theta = \pi$

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. Solve the following IBVP using the Laplace transform technique CO1- App (8)

PDE : $u_t = u_{xx}, \quad 0 < x < 1, \quad t > 0$

BCs : $u(0, t) = 1, u(1, t) = 1, t > 0$

ICs : $u(x, 0) = 1 + \sin \pi x, 0 < x < 1.$

12. Solve the equations by successive over relaxation method by assuming $\beta = 1.2$ with Starting vector is (1.5 , 0 , 3.5), $2x_1 - x_2 = 3$, $-x_1 + 2x_2 - x_3 = 0$, $-x_2 + 2x_3 = 7$. CO2- Ana (8)

13. By applying Ritz method, find the extremal of $I[y(x)] = \int_0^1 (y'^2 + y^2)dx$ with $y(0) = 0, y(1) = 1$. CO3-App (8)

14. Find the resolvent of the matrix A = $\begin{pmatrix} -2 & -2 & -4 \\ 2 & 3 & 2 \\ 3 & 2 & 5 \end{pmatrix}$ by Faddeev-Leverrier method. CO4 -Ana (8)

15. Find the regression line of on X for the data CO5 -Ana (8)

X	1	4	2	3	5
Y	3	1	2	5	4