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**C Reg. No. :**

**Question Paper Code: 51P05**

M.E. DEGREE EXAMINATION, NOV 2017

First Semester

Structural Engineering

15PMA125 - APPLIED MATHEMATICS FOR STRUCTURAL ENGINEERING

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 1. |  | | | | | | | | CO1- R | | | | |
|  | (a) | | | | | (b) | | | | | | | |
|  | (c) | | | | | (d) | | | | | | |
| 2. | For a two point Gauss Hermite Quadrature then the weight is | | | | | | | | | CO2 -R | | | |
|  | (a) -0.8862 | | (b) | | | | (c) | | | (d) -0.7071 | | | |
| 3. | Suppose ‘*f’* is independent of ‘*y’* then the solution of Euler’s equation is | | | | | | | | | CO3- R | | | |
|  | (a) | | (b) | | | | (c) | | | (d) | | | |
| 4. | To find the dominant eigen value of a matrix then use | | | | | | | | | CO4 -R | | | |
|  | (a) Approximation method | | | | (b) Power method | | | | | | | | |
|  | (c) Rayley-Ritz method | | | | (d) Faddeev-Leverrier method | | | | | | | |
| 5. | The maximum likelihood estimate are | | | | | | | CO5- R | | | | | |
|  | (a) Inconsistent | | | (b) Consistent | | | (c) Not biased | (d) None of the above | | | | | |
|  | PART – B (5 x 3= 15Marks) | | | | | | | | | | | | |
| 6. | Define Laplace transform of unit step function and find its Laplace transform. CO1-U | | | | | | | | | | | | |
| 7. | Define Rayleigh quotient of a Hermitian matrix. CO2-U | | | | | | | | | | | | |
| 8. | If y is independent of y, then give the reduced form of the Euler’s equation. CO3-U | | | | | | | | | | | | |
| 9. | Find the largest eigen value of CO4-U  by Power method. | | | | | | | | | | | | |
| 10. | What are maximum likelihood estimators? CO5-U | | | | | | | | | | | | |
|  | PART – C (5 x 16= 80Marks) | | | | | | | | | | | | |
| 11. | (a) | Using the Laplace transform method, solve the IBVP described as  PDE:  BCs: *u*(0*, t*) *=* 0, *u* is bounded as *x* tends to  ICs: | | | | | | | | | CO1- App | (16) | |
|  |  | Or | | | | | | | | |  |  | |
|  | (b) | A string is stretched and fixed between two fixed points (0,0) and (l,0). Motion is initiated by displacing string inform u= sin  and released from rest at time t=0.  Find the displacement of any point on the string at any time t | | | | | | | | | CO1- App | (16) | |
|  |  |  | | | | | | | | |  |  | |
| 12. | (a) | (i) By relaxation method, solve | | | | | | | | | CO2- Ana | (8) | |
|  |  | (ii) Solve the equation by Choleski method | | | | | | | | | CO2- Ana | (8) | |
|  |  | Or | | | | | | | | |  |  | |
|  | (b) | (i) Using Gaussian three point formula evaluate  and compare with exact solution. | | | | | | | | | CO2- Ana | (8) | |
|  |  | (ii) Evaluate  by Gaussian quadrature formula. | | | | | | | | | CO2- E | (8) | |
|  |  |  | | | | | | | | |  |  | |
| 13. | (a) | State and Prove Brachistochrone problem. | | | | | | | | | CO3-App | (16) | |
|  |  | Or | | | | | | | | |  |  | |
|  | (b) | Show that the curve which extremizes the functional  I =  under the conditions  y(0) = 0 , y’(0) = 1 , y() = y’() = . | | | | | | | | | CO3-App | (16) | |
|  |  |  | | | | | | | | |  |  | |
| 14. | (a) | Use Faddeev-Leverrier method to find the characteristic polynomial and inverse of the matrix  . | | | | | | | | | CO4 -Ana | (16) | |
|  |  | Or | | | | | | | | |  |  | |
|  | (b) | Using Power method find all the Eigen Values of  A = . | | | | | | | | | CO4 -Ana | (16) | |
| 15. | (a) | (i) Fit a parabola *y* = *a* + *bx* + *cx*2 to the following data by the  method of least squares  X : 2 4 6 8 10  Y : 3.07 12.85 31.47 57.38 91.29 | | | | | | | | | CO5 -Ana | (8) | |
|  |  | (ii) Estimate  and  for the distribution defined by    by the method of moments. | | | | | | | | | CO5 -Ana | (8) | |
|  |  | Or | | | | | | | | |  |  | |
|  | (b) | Find the maximum likelihood estimate for the parameter λ of a  Poisson distribution on the basis of a sample of size n. Also find  its variance. Show that the sample mean  is sufficient for  estimating the parameter λ of the Poisson distribution. | | | | | | | | | CO5-Ana | (16) | |
|  |  | | | | | | | | | | | | |