Total No. of Questions : 8]

SEAT No. :

PE5973

[Total No. of Pages : 2

[6584]-344

B.E. (Robotics & Automation)

ADVANCED COMPUTATIONAL TECHNIQUES

(2019 Pattern) (Semester - VII) (411503(A)) (Elective - III)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Logarithmic Table, slide rule is Electronic pocket calculator is allowed.***

Q1) a) Explain Shooting method for solving for solving boundary value problems with Example. **[8]**

b) An axially loaded wooden column has the following characteristics : $E = 10 \times 10^9$ pa, $I = 1.25 \times 10^{-5}$ m^4, and L = 3m. Employ the polynomial method to determine the eigenvalues for the axially loaded column using (a) one, (b) two, (c) three and (d) four interior nodes. **[10]**

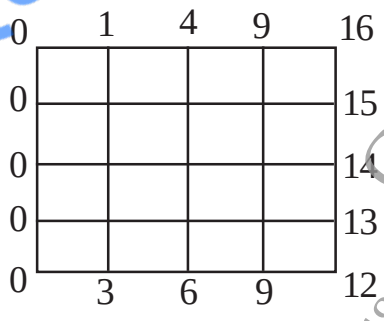
OR

Q2) a) An axially loaded wooden column has the following characteristics : $E = 10 \times 10^9$ pa, $I = 1.25 \times 10^{-5}$ m^4, and L = 3m. Determine the first eight eigen values and the corresponding buckling loads. **[12]**

b) Explain LR & QR methods with example. **[6]**

Q3) a) A steel plate of 750 × 750 mm has its two adjacent sides maintained at 100ºC. While the two other sides are maintained at 0ºC. What will be the steady state temperature at interior assuming a grid size of 250 mm. **[9]**

b) Find by Liebmann's Method the values at the interior lattice points of a square plate of the harmonic function *u* whose boundary values are given in the figure. **[8]**



OR

P.T.O.

Q4) a) Use the simple implicit finite-difference approximation to solve for the temperature distribution of a long, thin rod with a length of 10 cm and the following values : k' = 0.49 cal/(s.cm, ºC), Δx = 2 cm, and Δt = 0.1 s. At t = 0, the temperature of the rod is zero and the boundary conditions are fixed for all times at T(0) = 100ºC and T(10) = 50ºC. Note that the rod is aluminum with C = 0.2174 cal/(g.ºC) and ρ = 2.7 g/cm^3. There fore, k = 0.49/ (2.7. 0.2174) = 0.835 cm^2/s and λ = 0.835(0.1)/(2)2 = 0020875. **[10]**

b) Explain Lax Friedrichs method with example. **[7]**

Q5) a) Write a note on hp-FEM (high performance Finite Element Method). **[6]**

b) Describe the various terminologies used in the semi-implicit Moving Particle technique. Give a relevant example to illustrate. **[12]**

OR

Q6) a) Explain Smoothed-particle hydrodynamics with Example. **[10]**

b) Write a note on Moving particle semi-implicit method. **[8]**

Q7) a) Minimize $f(x) = x_1^3 + 2x_2^2 - 8x_1x_2$ subjected to $h(x)$; $x_2^2 - 1 = 0$ & $g(x)$; $x_1 x_2 - 4 < 0$. **[12]**

b) Write a note on Genetic Algorithm to solve inverse Kinematic problems. **[5]**

OR

Q8) a) Solve the function of maximizing the function $f(x) = x^2$, Where x is permitted to vary between 0 & 31. **[12]**

b) Write a short note on Sequential quadratic programming method. **[5]**