Code: 9D12103

M.Tech I Semester Supplementary Examinations August 2016
NUMERICAL METHODS
(Geotechnical Engineering)
(For students admitted in 2012, 2013, 2014 & 2015 only)

Time: 3 hours   Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks
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1 (a) State Lagrange's interpolation formula and use it to find the value of y at x = 8 from data:

x	3	7	9	10
y	168	120	72	63

  (b) Explain Lagrange's method of inverse interpolation.

2 Find the first and second derivatives of the function tabulated below, at the point x = 1.1.

x:	1.0	1.2	1.4	1.6	1.8	2.0
f(x):	0	0.128	0.544	1.296	2.432	4.00

3 If the nonlinear parasitic ordinary differential equation modeled by $\frac{dy}{dt} = 5(y - t^2)$, with initial condition y(0) = 0.08, applying Taylor's series method obtain he solution of y at t =1 and t = 2.

4 (a) Solve the system of equation using Gauss elimination method
   $5x + 3y + 7z = 4$; $3x + 26y + 2z = 9$; $7x + 2y + 10z = 5$.

  (b) Suppose that three jumpers are connected by bungee cords, the parameters mass, spring constant and cord lengths are given in the following table;

Jumper	Mass (kg)	Spring constant (N/m)	Un-stretched cord length (m)
Top (1)	60	50	20
Middle (2)	70	100	20
Bottom (3)	80	50	20

   Determine the displacement of each bungee jumper after they released to jump and find their positions relative to the platform using Gauss-Seidel iterative method starting with (20, 40, 60) up to 5th state.

5 Solve the following equation by using Jacobi's method:
   $3x + 2y + 7z = 4$; $2x + 3y + z=5$; $3x + 4y + z = 7$ with initial values (2, 3, 0)

6 (a) Explain the concept of finite element method. What are its advantages over conventional methods?

  (b) Write the steps to solve a 2D problem by using finite element method.

7 (a) Explain finite element technique using minimization of total potential energy principles.
  (b) Write a short note on variational principles.

8 (a) Write short notes on: Stability analysis of sheet piles, positions of anchorage for sheet piles.
  (b) Failure measurement of sheet piles.