Code No: 07A1BS09 **Set No. 1**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NUMERICAL METHODS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the root of the equation $x^3 + x^2$+x+7=0 correct to three decimal places by.
   (a) Bisection method.
   (b) Method of false position. [8+8]

2. (a) Given sin 45^0=0.7071, sin50^0=0.7660, sin55^0 =0.8192 and sin60^0=0.8660.Find sin52^0 using Newton's interpolation formula. Estimate the error.
   (b) Find the second difference of the polynomial $x^4 - 12x^3 + 42x^2$-30x+9 with interval of differencing h=2. [12+4]

3. (a) Fit a parabola to the data:

x	1	2	3	4	5	6
y	3	4	7	12	21	32

   (b) Find the curve of best fit for the data below:

x	0.5	1	1.5	2	2.5	3
y	1.62	1	0.75	0.62	0.52	0.46

[8+8]

4. (a) Explain Gram-Schmidt orthogonalising process.
   (b) Using the Gram-Schmidt orthogonalisation process, compute the first three orthogonal polynomials $P_0(x), P_1(x), P_2$(x) which are orthogonal on [0,1] with respect to the weight function W(x)=1.Using these polynomials, obtain the least squares approximation of second degree for f(x)=$x^{1/2}$ on [0,1]. [4+12]

5. (a) Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Simpson's one- third rule and hence find the value of .$\log_e 5\,(n = 10)$.
   (b) Compute $\int_0^1 \frac{dx}{1+x^2}$ by using Trapezoidal rule, taking h=0.5 and h=0.25. Compare with exact integration. [8+8]

6. (a) Solve the following equations by Gauss-Jordan method.
   28x + 4y- z = 32
   x + 3y + 10z = 24
   2x + y + 4z = 35.

(b) Solve the following equations by Gauss- elimination method.

$$\begin{aligned} 4x + 2y + z &= 14 \\ x + 5y - z &= 10 \\ x + y + 8z &= 20 \end{aligned}$$

[8+8]

7. (a) Using Euler's method find y (0.2) given dy/dx = log(x + y) and y (0) = 1, h = 0.2.

   (b) Solve by Taylor series method dy/dx = y + x^3 for x = 1.1, 1.2 given y (1) = 1. [8+8]

8. (a) Solve: ∇^2u = 0 for the square mesh. As shown in Figure 8a.

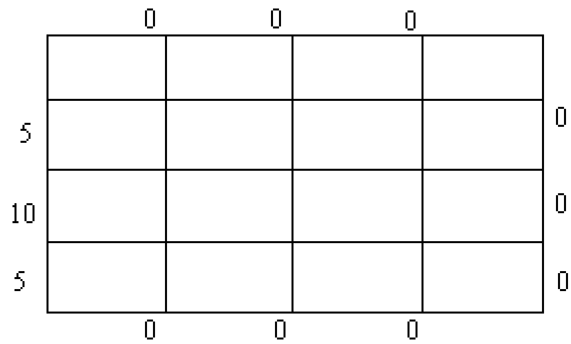

Figure 8a

   (b) Derive standard five point formula to solve Laplace equation, stating the assumptions you make. [8+8]

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Code No: 07A1BS09

Set No. 2

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NUMERICAL METHODS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Find the root of the equation sin$x$=e^x-3x correct to three decimal places using
   (a) Bisection method.
   (b) Method of false position. [8+8]

2. (a) Apply Gauss's forward central difference formula and estimate f(32) from the following table:

x	25	30	35	40
y	0.2707	0.3027	0.3386	0.3794

   (b) Find the forward differences of $\frac{1}{(3x+1)(3x+4)(3x+7)}$. [12+4]

3. (a) Fit a straight line to the following data:

x	0.0	0.2	0.4	0.6	0.8	1.0
y	-1.85	-1.20	-0.55	0.15	0.80	1.35

   (b) Fit the least square approximation of second degree for the discrete data below:

x	-2	-1	0	1	2
f(x)	15	1	1	3	19

[8+8]

4. (a) Show that $\sum_{i=-\infty}^{\infty} B_i^k$ is a constant function.
   (b) Show that the Fourier transform of $e^{-x^2/2}$ is $e^{-s^2/2}$ [8+8]

5. (a) Dividing the range into 10 equal parts, find the approximate value of $\int_0^{\pi} \sin x\, dx$ by
      i. Trapezoidal rule
      ii. Weddle's rule.
   (b) Compute $\int_0^{\pi} \sin x\, dx$ by using Simpson?s rule with 12 subdivisions. [8+8]

6. (a) Show that the system
   2x-3y+z=0
   4x+9y+z=0
   8x-27y+z=0 has no non- trival solution.

(b) Apply Gauss Elimination and solve the system.
2x+3y+4z=9
3x+y+2z=6
x+y+3z=5. [8+8]

7. (a) Using Euler's method find y (0.2) given dy/dx = log(x + y) and y (0) = 1, h = 0.2.

   (b) Solve by Taylor series method dy/dx = y + x^3 for x = 1.1, 1.2 given y (1) = 1. [8+8]

8. (a) Derive the explicit finite difference scheme for solving the one dimensional hyperbolic equation $u_{tt} - a^2\, u_{xx} = 0,\ 0 < x < l,\ t > 0$ subject to u (o,f)=u(l,t)=0, u(x,0)=h(x)and $\frac{\partial u}{\partial t}$ (x,0)=g(x),0 $\leq x \leq l$.

   (b) The function u satisfies Laplace's equation at all points within the square given in the following Figure 8b and has the boundary values indicated. Compute a solution correct to two decimals by Gauss-seidel method. [8+8]

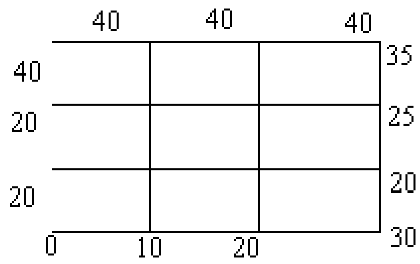

Figure 8b

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Code No: 07A1BS09 **Set No. 3**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NUMERICAL METHODS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the root of the equation sin$x$=1+x^3 between (-2,-1) using
   (a) Regular falsi method.
   (b) Newton's method. [8+8]

2. Find the value of y(21) and y(28) from

x	20	23	26	29	32
y	0.3420	0.3907	0.4384	0.4848	0.4951

. [16]

3. (a) Fit a curve of the form y=ax^b to the data:

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

   (b) Fit a parabola y=a+bx+cx^2 to the following data:

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

[8+8]

4. Show that on $[t_i, t_{i+1}]$ we have $B_i^k(x) = \frac{(x-t_i)^k}{(t_{i+1}-t_i)(t_{i+2}-t_i)...(t_{i+k}-t_i)}$ [16]

5. (a) From the following table of values of x and y, $\frac{dy}{dx}$ at each of the points by fitting the Cubic Spline method.

x	1	2	3	4
y	1	3	4	2

   (b) Using Simpson's 3/8$^{\text{th}}$ rule evaluate $\int_0^6 \frac{dx}{1+x^2}$ by dividing the range into 6 equal parts. [8+8]

6. (a) Solve by Gauss elimination method.
   10x+2y+z=9
   2x+20y-2z=-44
   -2x+3y+10z=22.
   (b) Using Gauss-Jordan method solve.
   2x-3y+4z=7
   5x-2y+2z=7
   6x-3y+10z=23. [8+8]

7. (a) Using Euler's method find y (0.2) given dy/dx = log(x + y) and y (0) = 1, h = 0.2.

   (b) Solve by Taylor series method dy/dx = y + x^3 for x = 1.1, 1.2 given y (1) = 1. [8+8]

8. (a) Solve
   $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, subject to $(a)\ \ u\,(0, y) = 0,\ for\, 0 \le y \le 4$
   $(b)\ \ u\,(4, y) = 12 + y, for\, 0 \le y \le 4 (c)\ \ u\,(x, 0) = 3x, for\, 0 \le x \le 4$
   $(d)\ \ u\,(x, 4) = x^2, for\, 0 \le x \le 4$
   dividing the square into 16 square meshes of side 1.

   (b) Solve $\nabla^2 u = 0$ (the two dimensional heat conduction equation in steady-state) at the interior lattice points, given boundary values as follows solve by Jacobi's method.As shown in Figure 8b. [8+8]

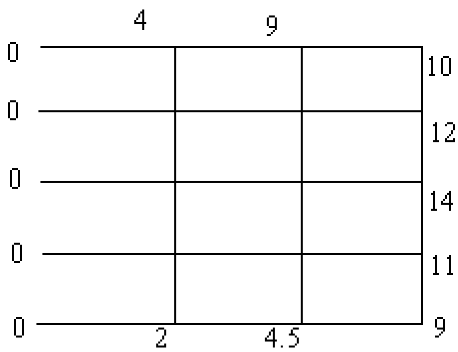

Figure 8b

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Code No: 07A1BS09 **Set No. 4**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NUMERICAL METHODS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the root of the equation x^3-x-11 = 0 correct to four decimals using.
   (a) bisection method
   (b) Method of False position. [8+8]

2. The probability integral $P = \sqrt{\frac{2}{\pi}} \int_0^x \exp(-\frac{1}{2}t^2)dt$has the following values :

x	1.00	1.05	1.10	1.15	1.20	1.25
y	0.682689	0.706282	0.728668	0.749856	0.769861	0.788700

   Calculate P for x=1.025 and x=1.235. [16]

3. (a) Fit a straight line y=a+bx to the data:

x	1	2	3	4	5	6
y	2.4	3.1	3.5	4.2	5.0	6.0

   (b) Derive the condition for linear weighted least squares approximation. [8+8]

4. (a) Prove that the orthogonal polynomials satisfy a three-term recurrence relation.
   (b) Find the Fourier transform of $e^{-a|x|}$ if a >0.Deduce that $\int_0^\infty \frac{1}{(x^2+a^2)^2}dx = \frac{\pi}{4a^3}$ if a>0. [8+8]

5. (a) Dividing the range into 10 equal parts, find the approximate value of $\int_0^\pi \sin x\, dx$ by
      i. Trapezoidal rule
      ii. Weddle's rule.
   (b) Compute $\int_0^\pi \sin x\, dx$ by using Simpson?s rule with 12 subdivisions. [8+8]

6. (a) Show that the system x+2y+3z=6;x+3y+5z=9; 2x+5y+9z=6 has no non-trival solution.
   (b) Using Gauss-Jordan method solve $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ 13 \\ 5 \end{bmatrix}$ [8+8]

7. (a) Using Euler's method find y (0.2) given dy/dx = log(x + y) and y (0) = 1, h = 0.2.

(b) Solve by Taylor series method dy/dx = y + x^3 for x = 1.1, 1.2 given y (1) = 1. [8+8]

8. (a) Solve: ∇^2u = 0 in the square region bounded by x = 0, x = 2, y = U(x,0)= ($x^2/2$)=0, U (x,2)=x^2 by taking h=k=0.5, y = 2 and with boundary conditions u (0, y) = 0, u (2, y) = 8 + 2y.

(b) Solve the equation $u_{xx}+u_{yy}= 0$ in the domain of following Figure 8b by Gauss seidel method. [8+8]

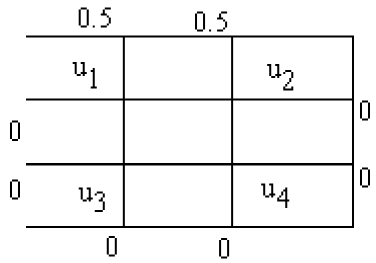

Figure 8b

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