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Seat No.	

S.E. (Mechanical Engineering) (Semester - IV) Examination, May - 2018

APPLIED NUMERICAL METHODS

Sub. Code : 63360

Day and Date : Friday, 04 - 05 - 2018 **Total Marks : 100**

Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Make suitable assumptions/data if required and state clearly.**
3) **Draw neat sketches wherever necessary.**
4) **Figures to the right indicate full marks.**
5) **Use of calculator is allowed.**

Q1) a) Explain the different types of errors in numerical computations. **[4]**

b) Solve any two : **[2×6=12]**

i) Use bisection method to find the root correct to three decimal places of $f(x)=x^3-4x-8.95=0$.

ii) Using Newton's iterative method, find the real root of $x\log_{10}x=1.2$ correct to five decimal places.

iii) Use Muller's method to find a root of the equation $x^3-3x-7=0$, which lies between 2 and 3.

Q2) Solve any two : **[2×8=16]**

a) Solve the following equations by Gauss-Jordon method

$3x+4y+5z=18$

$2x-y+8z=13$

$5x-y+7z=20$

b) Solve the system of equations using LU Decomposition.

$3x+2y+7z=4$

$2x+3y+z=5$

$3x+4y+z=7$

P.T.O.

c) Solve the following equations by Gauss-Jacobi method.

$15x+3y-2z=85$

$2x+10y+z=51$

$x-2y+8z=5$

Q3) a) Fit a polynomial of the second degree for the following data : **[6]**

x:	0	1	2	3	4
y:	1	0	3	10	21

Hence find y at $x=2.5$

b) Derive the equation of the interpolating polynomial by Newton's divided difference table for the following data : **[6]**

x:	0	1	2	3	4	5
y:	3	2	7	24	59	118

c) Calculate the mean and standard deviation for the following data: **[6]**

Size of item:	6	7	8	9	10	11	12
Frequency:	3	6	9	13	8	5	4

Q4) Solve any two : **[2×8=16]**

a) A slider in a machine moves along a fixed straight rod. Its distance $x(m)$ along the rod are given in the table for various values of time (sec). Find the velocity and acceleration of slider at t=0.3 seconds.

t(sec):	0	0.1	0.2	0.3	0.4	0.5	0.6
x(m):	30.13	31.62	32.87	33.64	33.95	33.81	33.24

b) Evaluate $\int_4^{5.2} lnxdx$ using trapezoidal and Simpson's 1/3rd rule n=6.

c) Use Romberg's method to evaluate $\int_0^{\pi} \sin xdx$.

Q5) Solve any two : **[2×8=16]**

a) Compute $y(0.2)$ correct to four decimal places, for $\frac{dy}{dx}+y+xy^2=0$ with $y(0)=1$, take $h=0.1$. Use RungeKutta fourth order method.

b) Given the boundary value problem $\frac{d^2y}{dx^2}=6x+4$ $y(0)=2, y(1)=5$ obtain its solution in the range $0\leq x\leq 1$ with $h=0.25$ using Finite Difference method.

c) Solve the equation $\frac{dy}{dx}=x+y$. Given $y(0)=1$. Obtain the values of $y(0.1), y(0.2)$ using Picard's method.

Q6) a) Classify the following partial differential equations : **[6]**

i) $\frac{\partial^2 y}{\partial t^2}=\alpha^2\frac{\partial^2 y}{\partial x^2}$

ii) $xU_{xx}+yU_{yy}+4y^2U_x=0$

iii) $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}$

b) Solve $U_{xx}+U_{yy}=0$ in the square mesh of side 4 units satisfying the following conditions. **[12]**

i) $u(0,y)=0$ for $0\leq y\leq 4$

ii) $u(4,y)=12+y$ for $0\leq y\leq 4$

iii) $u(x,0)=3x$ for $0\leq x\leq 4$

iv) $u(x,4)=x^2$ for $0\leq x\leq 4$

Perform two iterations

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