Registration No: | | | | | | | | | | |

Total Number of Pages: 03 **MCA**

MCA104

1st Semester Regular Examination 2016-17
COMPUTER ORIENTED NUMERICAL METHODS
BRANCH: MCA
Time: 3 Hours
Max Marks: 100
Q.CODE: Y681

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions.** **(2 x 10)**

a) Binary equivalent of the decimal number 37 is _____

b) Newton-Raphson's method is convergent if _____ = _____

c) In Gauss elimination method all the elements below the principal diagonal are _____

d) The system of linear equations can be savable by Gauss-Seidel/Jacobi method if at least one of the equations is _____.

e) Gauss two point formula is _____

f) Richardson's integration formula is _____.

g) Milne-Simpson's predictor-corrector formulae are _____ and _____.

h) The error in R-K method is of order _____.

i) The 2nd derivate of a function using central difference formula is _____.

j) Heun's self starting predictor-corrector formulae are _____ and _____.

Q2 Answer the following questions: **(2 x 10)**

a) Round-off the numbers to two decimal places: 48.21416, 52.275, 81.2555 and 2.3876

b) Find the value of $\sqrt{7}$ using Newton-Raphson's method.

c) Explain the criteria for the stability of numerical methods.

d) Define spline function

e) State the conditions required for quadratic spline function having (n+1) data points.

f) Explain Gauss elimination method.

g) Explain multistep methods for solving an ordinary differential equation

h) Define a boundary value problem

i) Write the general 2^{nd} order linear partial differential equation.

j) State the nature of each of the following PDE:

$$u_{xx} + u_{yy} = 0$$

$$u_{tt} = 4u_{xx}$$

Part – B (Answer any four questions)

Q3 **a)** Solve the following system of equations by LU decomposing method. **(10)**

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

b) Using Bisection method, find a real root of the equation $xe^x = 1$,correct to three decimal places. **(5)**

Q4 **a)** Using Gauss-Seidel method, solve the following system of linear equations correct to four decimal places. **(10)**

$$x + 5y - z = 10$$

$$4x + 2y + z = 14$$

$$x + y + 8z = 20$$

b) Using Secant method, find a real root of the equation $x^3 - 2x - 5 = 0$ correct to five decimal places. **(5)**

Q5 **a)** Solve the following system of equations by SOR method assuming suitable over relaxation parameter. **(10)**

$$2x - y = 3$$

$$-x + 2y - z = 0$$

$$-y + 2z = 7$$

b) Write a flow chart to solve the following: **(5)**

$\frac{dy}{dx} = f(x, y)$ with initial condition $y(x_0) = y_0$

by Euler's method.

Q6 **a)** Apply natural cubic spline interpolation method, to develop piecewise cubic polynomials using the data y(0)=2, y(2)=4, y(3)=3, y(5)=0.5 **(10)**

b) Write the Newton-Raphson's algorithm. **(5)**

Q7 **a)** Compute $\frac{dy}{dx}$ at x=0 for the function $y = f(x) = e^{3x}$ using Richardson's extrapolation technique. **(10)**

b) Evaluate $\int_{0.2}^{1.5} e^{-x^2} dx$ using Gauss three point formula. **(5)**

Q8 **a)** Use the Runge-Kutta method to solve : **(10)**

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 - x^2} \text{ with } y(0) = 1 \text{ at } x = 0.2$$

b) By Picard's method approximate $y(0.1)$,given $y' = x + y$, with initial condition $y(0) = 1$. **(5)**

Q9 **a)** Using Adam's –Bashforth method find $y(4.4)$,given **(10)**

$5xy' + y^2 = 2$,

$$y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143$$

b) Solve the following boundary-value problem : **(5)**

$$\frac{d^2y}{dx^2} - y = 0 \text{ with } y(0) = 0, y(2) = 3.62686$$