

GANPAT UNIVERSITY

B. Tech. Semester: 4th Mechanical Engineering

CBCS Regular Examination April - June 2015

2ME405 Numerical Methods & Computer Programming

Time: 3 Hours

Total Marks: 70

Instruction: 1. All questions are compulsory.

2. Assume suitable data if necessary.

SECTION – I

- Que.1** (a) Compute a root of following equation using Newton Raphson method [06]
 $x^2 - 5x + 6 = 0, x_0 = 5$
- (b) Solve for a positive root of following function by Regula Falsi method. [06]
 $x^3 - 4x + 1 = 0, 0 < x < 1$

OR

- Que.1** (a) Find the root of following equation using bisection method. [06]
 $x^2 - 3x - 20 = 0$
- (b) Use the secant method to estimate the root of equation $x^2 - 4x - 10 = 0$ with the initial estimates of $x_1 = 4$ and $x_2 = 2$. [06]

- Que. 2** (a) Use Simpson's 3/8 rule to evaluate [06]
 1) $\int_1^2 (x^3 + 1) dx$
 2) $\int_0^{\frac{\pi}{2}} \sqrt{\sin(x)} dx$
- (b) Derive formula for Trapezoidal rule. [05]

OR

- Que. 2** (a) Explain error analysis of forward difference quotient. [06]
- (b) Solve the Poisson equation $\nabla^2 f = 2x^2y^2$. Over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h = 1$. [05]

Que.3 _____ [12]

- (a) Explain following terms:
 (1) object and class
 (2) polymorphism
 (3) data abstraction and encapsulation
 (4) dynamic binding
- (b) Explain the scope resolution operator with appropriate Program?
- (c) Write a program to convert decimal number to binary number.

SECTION – II

- Que.4 (a) If P is the pull required to lift a load W by means of a pulley block, Find a linear law of the form $P = m\omega + C$ connecting P and W, Using the following data: [06]

P	12	15	21	25
W	50	70	100	120

Where P and W are taken in Kg-wt. Compute P when $W = 150$ kg.

- (b) Apply Gauss elimination method to solve the equations: $X+2Y+3Z-U=10$, $2X+3Y-3Z-U=1$, $2X-Y+2Z+3U=7$, $3X+2Y-4Z+3U=2$ [06]

OR

- Que.4 (a) Solve by Jacobi's iteration method, the equations $10X+Y-Z = 11.19$; $X + 10Y+Z = 28.08$; $-X + Y+10Z = 35.61$, correct up to two decimal places. [06]

- (b) Find the missing term in the following table using Lagrange's interpolation: [06]

X	0	1	2	3	4
Y	1	3	9	---	81

- Que.5 (a) Using Runge-Kutta method of 4th order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$. [06]

- (b) $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y=1$ at $x=0$; find y for $x=0.1$ by Euler's Method. Take 5 intervals. [05]

OR

- Que.5 (a) Using Newton's Divided differences formula, evaluate $f(8)$ and $f(15)$ given [06]

X	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

- (b) Find by Taylor's method the values of y at $x=0.1$ and $x=0.2$ to five places of decimal from $dy/dx=x^2y-1$, $y(0)=1$. [05]

- Que.6 (a) Apply Gauss-Jourdan method to solve the equations [06]
 $X+Y+Z = 9$; $2X-3Y+4Z=13$; $3X+4Y+5Z = 40$
- (b) Using Modified Euler's method find an approximate value of y when $x=0.3$, given that $dy/dx=x + y$ take initial condition $y=1$ when $x=0$. [06]
- (c) Define : Interpolation, Curve fitting , Numerical Analysis [06]