

GANPAT UNIVERSITY
B. TECH SEM- IV MECHANICAL ENGINEERING
CBCS REGULAR EXAMINATION- APRIL-JUNE 2016
2ME403 : Numerical Methods & Computer Programming

TIME: 3 HRS

TOTAL MARKS: 60

- Instructions:** (1) This Question paper has two sections. Attempt each section in separate answer book.
 (2) Figures on right indicate marks.
 (3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 Attempt the following questions.

(10)

(A) Solve following problem using Runge-Kutta method:

The series RLC circuit can be represented mathematically as below:

$$L \frac{di}{dt} + iR = V$$

Where, $L = 50H$, $R = 20\text{ohm}$, $V = 240V$, Current = 1Amp at $t = 10\text{sec}$. Determine current at time $t = 15\text{sec}$. Assume time interval of 1sec.

(B) Write a program to solve following problem using Heun's method.

$$5y' + 2y = 30$$

OR

Q.1 Attempt the following questions.

(10)

(A) Solve following problem using Heun's method:

A mass of 30Kg is free falling from height of 30m. Motion of the mass is described as below:

$$ma = mg + cv$$

Assume drag co-efficient $c = 0.2N\cdot\text{sec}/m$, determine velocity at time $t = 2\text{sec}$ using Heun's method. Take $h = 0.5\text{ sec}$.

(B) Write a program to solve following problem using Euler's method.

$$\frac{dx}{dt} = 10 - 1.2x^2$$

Q.2 Attempt the following questions.

(10)

(A) Evaluate integration of following function using Simpson Three-Eighth rule.

X	0	1	2	3	4	5	6
Y=f(X)	1	0.8	0.2	0.3	0.0588	0.0385	0.027

(B) Write a program to perform following functions.

- i. Read function values from users. Assume suitable step size.
- ii. Integrate these data using Trapezoidal rule
- iii. Display result of integration.

OR

Q.2 Attempt the following questions.

(10)

(A) Determine numerical integration of function using Trapezoidal rule.

X	10	11	12	13	14	15	16
Y=f(X)	30	31.63	33.34	35.47	37.75	40.33	43.25

(B) Write a program to perform numerical integration using Simpson's one-third rule.

Q.3 Attempt ALL.

- (A) Discuss a case when zero error can be guaranteed in case of Euler' method.
(B) Based on Newton-Cotes formula, determine trapezoidal rule.

SECTION: II

Q.4 Attempt the following questions.

- (A) A Curve passes through the points (0,18),(1,10), (3,-18) and (6,90) find the slope of the curve at X=2 using langrage interpolation. (10)
(B) Apply Gauss elimination method to solve the equations:

$$X+2Y+3Z-U=10, \quad 2X+3Y-3Z-U=1, \quad 2X-Y+2Z+3U=7, \quad 3X+2Y-4Z+3U=2$$

OR

Q.4 Attempt the following questions.

- (A) Write down a program to find out roots of $X^3-4X-9=0$ using Bi-section method up to three places decimal. (10)
(B) Find the root of the equation $xe^x = \cos x$ using the secant method correct to four decimal places.

Q.5 Attempt the following questions.

- (A) Write an algorithm for Newton Raphson method to solve the equation $x \log_{10}X=1.2$ correct up to three place decimals. (10)
(B) Find the missing term in the following table using Newton Divided Difference Formula:

x	1	2	4	5	6
y	14	15	5	-----	9

OR

Q.5 Attempt the following questions.

- (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 $P = mW + C$ connecting P and W, Using the following data: (10)

P	12	15	21	25
W	50	70	100	120

Where P and W are taken in kgf. Compute P when W= 150 kgf.

- (B) 1. Explain Interpolation and Curve fitting with small Graph.
2. Give Application of numerical method in Mechanical Engineering.

Q.6 Attempt ALL.

- (A) What are constructor and destructor in C++ language? Write syntax of them and give example of each. (10)
(B) 1. What is object oriented programming? What is difference between C and C++?
2. Write a program to find large number using conditional operator

-----END OF PAPER-----