14MAU11

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2018
(Fourth Semester)

Branch – **MATHEMATICS**

NUMERICAL METHODS

Time : Three Hours | Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 2 = 20)

1 Justify why Newton Raphson method is consider superior to Regula falsi method.

2 Give the geometrical interpretation of bisection method.

3 Explain partial and complete pivoting in Gauss Elimination method.

4 Write the condition for convergence of Gauss-Seidel method of iteration.

5 Prove : $E\nabla = \nabla E = \Delta$.

6 What is inverse interpolation? Explain.

7 Give trapezoidal rule for finding numerical integration.

8 State Simpson's one third rule.

9 Write the demerit of Taylor's method of solution.

10 State Euler's formula to find numerical solution to first order differential equation.

SECTION - B (25 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a Show that the iterative formula for finding the reciprocal of N is $x_{n+1} = x_n (2 - N x_n)$ and hence find the value of $1/31$.

OR

b Find a real root of the equation cos x = 3x -1 correct to 3 decimal places by using iteration method.

12 a Solve by Gauss Elimination method: $2x + y + 4z = 12$; $8x - 3y + 2z = 20$; $4x + 11y - z = 33$.

OR

b Solve by Gauss Seidal iteration method : $27x + 6y - z = 85$; $6x + 15y + 2z = 72$; $x + y + 54z = 110$.

13 a Construct forward difference table & find y at x = 0.5;

x :	0	1	2	3	4	5	6
f(x) :	1	2	33	244	1025	3126	7777

OR

b Derive Gregory Newton forward difference formula using symbolic operator method.

Cont ...

14 a For the following data, find $\frac{dy}{dx}$ at x = 1.05

x :	1.00	1.05	1.10	1.15	1.20	1.25	1.30
y :	1.00000	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

OR

b Find approximate value of $\int_0^{\pi} \sin x \, dx$ by Simpson's rule. (Divide range to 10 equal parts).

15 a Use Taylor series method to find the value of y(1.1) given that $y^1 = xy^{1/3}$, y(1) = 1. (Taking first three terms of Taylor's series expansion).

OR

b Prove that the solution for the equation $\frac{dy}{dx} = y, y(0) = 1$ yields $y_m = (1+h+\frac{1}{2}h^2)^m$, using second order Runge - Kutta method.

SECTION - C (30 Marks)

Answer any **THREE** Questions

ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Compute the real root of $x \log_{10} x - 1.2 = 0$ correct to five decimal places.

17 Solve the following equations by the method of triangularisation :
2x + y + 4z = 12; 8x – 3y + 2z = 0; 4x + 11y – z = 33.

18 i) Given the value

x :	14	17	31	35
f(x) :	68.7	64.0	44.0	39.1

Find the value of f(x) corresponding to x = 27.

ii) Find the value of ϕ, if $F(\phi) = 0.3887$

ϕ :	21°	23°	25°
$F(\phi)$:	0.3706	0.4068	0.4433

19 Use Romberg's method to compute $\int_0^1 \frac{1}{1+x^2} dx$ correct to 4 decimal places. Hence deduce an approximate value to π.

20 Apply the fourth order Runge Kutta method, to find an approximate value of y when x = 0.2 given that $y^1 = x + y$, y(0) = 1.

Z-Z-Z END