PETRODICE ACADEMY

Head office: Hyderabad branch

Topic: Numerical methods

Time Allowed: 45 Min **Maximum Marks:25**

Read the following instructions carefully.

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01. (i) Question Numbers 01 to 05 (05 questions) will carry one mark each.
(ii) Question Numbers 06 to 15 (10 questions) will carry two marks each.

02.**Wrong answers carry 33% negative marks. In Q. 01 to Q.05, 1/3 mark will be deducted for each wrong answer and in Q. 06 to Q.15,2/3 mark will be deducted for each wrong answer. However, there is no negative marking for numerical answer Type questions.**

GROUP – I

Each question carries ONE mark

5 x 1 = 5

1. Only one of the real roots of $f(x) = x^6-x-1$ lies in the interval $1 \leq x \leq 2$ and bisection method is used to find the value. for achieving an accuracy of 0.001,the minimum number of iterations is______.

2. The equation $x^3 – x2 + 4x – 4 = 0$ is to be solved using the Newton-Raphson method.

If x = 2 is taken as the initial approximation of the solution, then the next approximation using this method will be

a) $2/3$

b) $4/3$

c) 1

d) $3/2$

3. The order of error is the Simpson's rule for numerical integration with a step size h is

a) h

b) h^2

c) h^3

d) h^4

4. Match the items in columns I and II.

Column I

P. Gauss seidel method

Q. forward newton Gauss method

R. Ranga-kutta method

S. Trapezodial

Column II

1.Interpolation

2.Non- linear differential equation

3.Numerical method

4.Linear algebraic equation

a) P-1, Q-4, R-3, S-2

b) P-1, Q-4, R-2, S-3

c) P-1, Q-3, R-2, S-4

d) P-4, Q-1, R-2, S-3

5. A calculator has accuracy up to 8 digits after decimal place. The value of

$\int_0^{2\pi} sinx\, dx$

when evaluated using this calculator by trapezoidal method with 8 equal intervals, to 5

significant digits is

a) 0.00000

b) 1.0000

c) 0.00500

d) 0.00025

GROUP – II

Each question carries TWO mark

10x2=20

1. A 2nd degree polynomial, f(x) has values of 1, 4 and 15 at x = 0, 1 and 2, respectively. The integral $\int_0^2 f(x)dx$ is to be estimated by applying the trapezoidal rule to this data. What is

the error (defined as "true value – approximate value") in the estimate?

a) $-4/3$

b) $-2/3$

c) 0

d) $2/3$

2. The table below gives values of a function F(x) obtained for values of x at intervals of 0.25.

X	0	0.25	0.5	0.75	1.0
F(x)	1	0.9412	0.8	0.64	0.50

The value of the integral of the function between the limits 0 to 1 using Simpson's rule is

a) 0.7854

b) 2.3562

c) 3.1416

d) 7.5000

3. The Newton-Raphson iteration

$$x_{n+1} = \frac{1}{2}\left(x_n + \frac{R}{x_n}\right)$$

can be used to compute the

a) square of R

b) Reciprocal of R

c) Square root of R

d) Logarithm of R

4. Simpsons rule for integration gives exact result when f(x) is a polynomial function of degree less than or equal to____.

a) 1 b) 2

c) 3 d) 4

5. The Newton-Raphson method is to be used to find the root of the equation and f'(x) is the derivative of f.the method converges

a) always

b) only if f is a polynomial

c) only if $f(x_0)<0$

d) None of the above

6. The values of a function f(x) are tabulated below

x	F(x)
0	1
1	2
2	1
3	10

Using Newton's forward difference formula, the cubic polynomial that can be fitted to the

above data, is

a) $2x^3+7x^2-6x+2$

b) $2x^3-7x^2+6x-2$

c) x^3-7x^2-6x+1

d) $2x^3-7x^2+6x+1$

7. Given that $\frac{dy}{dx} = x^2 + y$ with initial condition y(0) = 1.The values of y(0.05) using Runge-Kutta second order method with h= 0.05 is _____.(upto 4 decimals)

8. Given that $\frac{dy}{dx} = 1 + y^2$ wher y(0)=0.The value of y(0.2) using runge-kutta fourth order method with h=0.2 is .(upto 4 decimals)

9. Consider the differential equation

$$\frac{dy}{dx} = 1 + y^2$$

. Which one of the following can be a particular solution of this differential equation?

a) y = tan (x + 3)

b) y = tanx + 3

c) x = tan (y + 3)

d) x = tany + 3

10. The Blasius equation,

$$\frac{d^3 f}{d\eta^3} + \frac{f}{2}\frac{d^2 f}{d\eta^2} = 0,$$

is a

a) Second order nonlinear ordinary differential equation

b) Third order nonlinear ordinary differential equation

c) Third order linear ordinary differential equation

d) Mixed order nonlinear ordinary differential equation