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FINALTERM EXAMINATION
Spring 2010
MTH603- Numerical Analysis (Session - 2)

Question No: 1 (Marks: 1) - Please choose one

Symbol used for forward differences is

- ∇
- Δ
- δ
- μ

Question No: 2 (Marks: 1) - Please choose one

The relationship between central difference operator and the shift operator is given by

- $\delta = E - E^{-1}$
- $\delta = E + E^{-1}$
- $\delta = E^{\frac{1}{2}} + E^{-\frac{1}{2}}$
- $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$

Question No: 3 (Marks: 1) - Please choose one

Muller's method requires --------starting points

- 1
- 2
- 3
- 4

Question No: 4 (Marks: 1) - Please choose one

If S is an identity matrix, then

- $S^{-1} = S$
- $S^t = S$
- $All\ are\ true$
- $S^{-1} = S^t$

Question No: 5 (Marks: 1) - Please choose one

If we retain r+1 terms in Newton's forward difference formula, we obtain a polynomial of degree ---- agreeing with y_x at $x_{0,}x_1,...,x_r$

- r+2
- r+1
- r
- r-1

Question No: 6 (Marks: 1) - Please choose one

P in Newton's forward difference formula is defined as

- $p = (\frac{x - x_0}{h})$
- $p = (\frac{x + x_0}{h})$
- $p = (\frac{x + x_n}{h})$
- $p = (\frac{x - x_n}{h})$

Question No: 7 (Marks: 1) - Please choose one

Octal number system has the base ----------

- 2
- 8
- 10
- 16

Question No: 8 (Marks: 1) - Please choose one

Newton's divided difference interpolation formula is used when the values of the independent variable are

- ► Equally spaced
- ► Not equally spaced
- ► Constant
- ► None of the above

Question No: 9 (Marks: 1) - Please choose one

Given the following data

x	0	1	2	4
$f(x)$	1	1	2	5

Value of $f(2,4)$ is

- ► 1.5
- ► 3
- ► 2
- ► 1

Question No: 10 (Marks: 1) - Please choose one

If $y(x)$ is approximated by a polynomial $p_n(x)$ of degree n then the error is given by

- ► $\varepsilon(x) = y(x) + P_n(x)$
- ► $\varepsilon(x) = y(x) - P_n(x)$
- ► $\varepsilon(x) = P_n(x) - y(x)$
- ► $\varepsilon(x) = y(x) \times P_n(x)$

Question No: 11 (Marks: 1) - Please choose one

Let I denotes the closed interval spanned by $x_0, x_1, x_2, x_3, x_4, x_5, x_6, x_7, \bar{x}$. Then $F(x)$ vanishes ------times in the interval I.

- n-1
- n+2
- n
- n+1

Question No: 12 (Marks: 1) - Please choose one

Differential operator in terms of forward difference operator is given by

- $D = \frac{1}{h}(\Delta + \frac{\Delta^2}{2!} + \frac{\Delta^3}{3!} + \frac{\Delta^4}{4!} + \frac{\Delta^5}{5!} + ...)$
- $D = \frac{1}{h}(\Delta + \frac{\Delta^2}{2} + \frac{\Delta^3}{3} + \frac{\Delta^4}{4} + \frac{\Delta^5}{5} + ...)$
- $D = \frac{1}{h}(\Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \frac{\Delta^4}{4} + \frac{\Delta^5}{5} - ...)$
- $D = \frac{1}{h}(\Delta - \frac{\Delta^2}{2!} + \frac{\Delta^3}{3!} - \frac{\Delta^4}{4!} + \frac{\Delta^5}{5!} - ...)$

Question No: 13 (Marks: 1) - Please choose one

Finding the first derivative of $f(x)$ at x =0.4 from the following table:

x	0.1	0.2	0.3	0.4
$f(x)$	1.10517	1.22140	1.34986	1.49182

Differential operator in terms of ----------will be used.

- Forward difference operator
- Backward difference operator
- Central difference operator
- None of the given choices

Question No: 14 (Marks: 1) - Please choose one

For the given table of values

x	0.1	0.2	0.3	0.4	0.5	0.6
$f(x)$	0.425	0.475	0.400	0.452	0.525	0.575

$f'(0.1)$, using two-point equation will be calculated as.....

- ► -0.5
- ► 0.5
- ► 0.75
- ► -0.75

Question No: 15 (Marks: 1) - Please choose one

In Simpson's 1/3 rule, $f(x)$ is of the form

- ► $ax+b$
- ► ax^2+bx+c
- ► ax^3+bx^2+cx+d
- ► $ax^4+bx^3+cx^2+dx+e$

Question No: 16 (Marks: 1) - Please choose one

$$I=\int_a^b f(x)dx$$

While integrating , h, width of the interval, is found by the formula-----.

- ► $\frac{b-a}{n}$
- ► $\frac{b+a}{n}$
- ► $\frac{a-b}{n}$
- ► None of the given choices

Question No: 17 (Marks: 1) - Please choose one

To apply Simpson's 1/3 rule, valid number of intervals are.....

- ► 7
- ► 8
- ► 5
- ► 3

Question No: 18 (Marks: 1) - Please choose one

For the given table of values

x	02	0.3	0.4	0.5	0.6	0.7
$f(x)$	0.425	0.475	0.400	0.452	0.525	0.575

$f''(0.2)$, using three-point equation will be calculated as ……

- ► 17.5
- ► 12.5
- ► 7.5
- ► -12.5

Question No: 19 (Marks: 1) - Please choose one

To apply Simpson's 1/3 rule, the number of intervals in the following must be

- ► 2
- ► 3
- ► 5
- ► 7

Question No: 20 (Marks: 1) - Please choose one

To apply Simpson's 3/8 rule, the number of intervals in the following must be

- ► 10
- ► 11
- ► 12
- ► 13

Question No: 21 (Marks: 1) - Please choose one

If the root of the given equation lies between a and b, then the first approximation to the root of the equation by bisection method is ……

- ► $\frac{(a+b)}{2}$
- ► $\frac{(a-b)}{2}$
- ► $\frac{(b-a)}{2}$
- ► None of the given choices

Question No: 22 (Marks: 1) - Please choose one

.....lies in the category of iterative method.

- ► Bisection Method
- ► Regula Falsi Method
- ► Secant Method
- ► None of the given choices

Question No: 23 (Marks: 1) - Please choose one

For the equation $x^3+3x-1=0$, the root of the equation lies in the interval.....

- ► (1, 3)
- ► (1, 2)
- ► (0, 1)
- ► (1, 2)

Question No: 24 (Marks: 1) - Please choose one

Rate of change of any quantity with respect to another can be modeled by

- ► An ordinary differential equation
- ► A partial differential equation
- ► A polynomial equation
- ► None of the given choices

Question No: 25 (Marks: 1) - Please choose one

If

$\frac{dy}{dx} = f(x, y)$

Then the integral of this equation is a curve in

- None of the given choices
- xt-plane
- yt-plane
- xy-plane

Question No: 26 (Marks: 1) - Please choose one

In solving the differential equation

$y' = x + y \;;\; y(0.1) = 1.1$

$h = 0.1$, By Euler's method $y(0.2)$ is calculated as

- 1.44
- 1.11
- 1.22
- 1.33

Question No: 27 (Marks: 1) - Please choose one

In second order Runge-Kutta method

k_1 is given by

- $k_1 = hf(x_n, y_n)$
- $k_1 = 2hf(x_n, y_n)$
- $k_1 = 3hf(x_n, y_n)$
- None of the given choices

Question No: 28 (Marks: 1) - Please choose one

In fourth order Runge-Kutta method, k_2 is given by

$k_2 = hf(x_n + \frac{h}{2}, y_n + \frac{k_1}{2})$

▶

$k_2 = hf(x_n + \frac{h}{3}, y_n + \frac{k_1}{3})$

▶

$k_2 = hf(x_n - \frac{h}{3}, y_n - \frac{k_1}{3})$

▶

$k_2 = hf(x_n - \frac{h}{2}, y_n - \frac{k_1}{2})$

▶

Question No: 29 (Marks: 1) - Please choose one

In fourth order Runge-Kutta method, k_4 is given by

▶ $k_3 = hf(x_n + 2h, y_n + 2k_3)$

▶ $k_3 = hf(x_n - h, y_n - k_3)$

▶ $k_3 = hf(x_n + h, y_n + k_3)$

▶ None of the given choices

Question No: 30 (Marks: 1) - Please choose one

Adam-Moulton P-C method is derived by employing

▶ Newton's backward difference interpolation formula
▶ Newton's forward difference interpolation formula
▶ Newton's divided difference interpolation formula
▶ None of the given choices

Question No: 31 (Marks: 2)

If $F(h) = 256.2354$ and $F(\frac{h}{2}) = 257.1379$, then find $F_1(\frac{h}{2})$ using Richardson's extrapolation limit.

Question No: 32 (Marks: 2)

Evaluate the integral

$$\int_0^{\frac{\pi}{2}} (\cos x + 2)dx$$

Using Simpson's 3/8 rule

Take h= $\frac{\pi}{4}$

Question No: 33 (Marks: 2)

Write a general formula for Modified Euler's method of solving the given differential equation.

Question No: 34 (Marks: 3)

Evaluate the integral

$$\int_0^4 x^2 dx$$

Using Trapezoidal rule
Take h=1

Question No: 35 (Marks: 3)

Evaluate the integral

$$\int_3^5 (\log x + 2)dx$$

Using Simpson's 3/8 rule
Take h=1

Question No: 36 (Marks: 3)

Write a formula for finding the value of k_3 in Fourth-order R-K method.

Question No: 37 (Marks: 5)

Find Newton's forward difference table from the following data.

x	0.0	0.1	0.2	0.3	0.4
$f(x)$	1	0.9048	0.8187	0.7408	0.6703

Question No: 38 (Marks: 5)

Evaluate the integral

$$\int_0^3 (x^2 + x)dx$$

Using Simpson's 3/8 rule

Take h=1

Question No: 39 (Marks: 5)

Use Runge-Kutta Method of order four to find the values of k_1, k_2, k_3 *and* k_4 for the initial value problem

$$y' = \frac{1}{2}(2x^3 + y), y(1) = 2$$

taking $h = 0.1$