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MCA II Sem. (Main) Exam., May 2019

MCA – 201 Computer Oriented Numerical & Methods

Time: 3 Hours   **Maximum Marks: 80**
Min. Passing Marks: 32

Instructions to Candidates:
Attempt all questions. Marks of question are indicated against each question. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

Q.1   Answer the following in 1-2 lines: [10×1=10]

(a)   Multiply $x = 1.000 \times 2^{-2}$ and $y = -1.010 \times 2^{-1}$.

(b)   Define relative error with an example.

(c)   Explain pivoting in system of linear equations.

(d)   Calculate $\Delta^3[(1 - ax)(1 - bx)(1 - cx)]$.

(e)   Prove $(\Delta - \nabla) \equiv \Delta\nabla$.

(f)   Explain principle of least squares.

(g)   Write down Newton Raphson Formula for calculating squares root of a Number N.

(h)   Approximate $\int_1^5 (1 + x^2)dx$ with n = 4 using Trapezoidal rule.

(i)   Estimate y(2) with step size h = 1, where y(x) is the solution to the initial value problem: $y' - y = 0$, y(0) = 1, using Euler's method.

(j)   Find Lagrange polynomial for the following data :

x	0	2	3
f (x)	1	5	10

Q.2 Answer the following questions: [3×5=15]

(a) Construct divided difference table for

x	-3	-1	0	3	5
f(x)	-30	-22	-12	330	3458

(b) If a speedometer's absolute error is 1 mph and it measures a speed of 55 mph, what is the relative error of this measurement expressed as a percentage?

(c) Solve the equation $xe^x = \cos x$ by Regula – Falsi method correct up to two decimal places.

(d) Write normal equations according to principle of least squares for the parabola.

$$y = a_0 + a_1 x + a_2 x^2$$

(e) Prove $E = e^{hD}$, where E is shifting operator and $D = \frac{d}{dx}$. (h = interval)

Q.3 Answer the following questions- http://www.mgsuonline.com [4×5=20]

(a) Using Milne's predictor corrector method evaluate $y' - 4y = 0$ at $x = 0.4$ given that $y(0) = 1$, $y(0.1) = 1.492$; $y(0.2) = 2.226$ $y(0.3) = 3.320$.

(b) Evaluate $\int_0^6 \frac{dx}{1+x}$ using Simpson's $\frac{3}{8}$ rule.

(c) Using forward differences, find the first and second derivative of y at x = 2 for the data given below :

x: 2 4 6 8 10

y: 0 0 1 0 0

(d) If $f(x) = x^3 + 5x - 7$ then find $\Delta f(x)$.

Q.4 (a) Using Stirling's formula, compute $f(1.22)$ from the following data: [10]

x	1.0	1.1	1.2	1.3	1.4
f(x)	0.841	0.891	0.932	0.963	0.985

(b) Integrate $y' = x + y$, $y(0) = 0$, $h = 1$ by Runge – Kutta method for $x = 1$. [10]

Q.5 Attempt any one out of two: [15]

(a) Find the approximate value of the real root of the equation $e^{-x} = \sin x$ using Newton - Raphson method correct upto four places of decimal.

OR

(b) Using Gauss – Seidel method solve –

$$5x_1 - x_2 + 2x_3 = 12$$
$$3x_1 + 8x_2 - 2x_3 = -25$$
$$x_1 + x_2 + 4x_3 = 6$$

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[60]