

**CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN,  
NUVEM-GOA**

**SEMESTER END EXAMINATION, JUNE 2022**

**Semester: II of BSC**

**Course Title: Numerical Computations**

**Course Code: GE 02**

**Total marks: 60**

**Date:**

**Duration: 2hrs**

**Total No of pages:3**

**Instructions:** 1. All questions are compulsory however internal choice is available.  
2. Figures to the right indicate marks allotted to each question/ subquestion.  
3. Use of non-programmable calculator is allowed.

**Q. 1. Answer any five of the following.**

(2X5=10)

- a. Construct a difference table for the data given below.

X	0	10	20	30
Y	0	2	4	7

- b. Evaluate the sum  $S = \sqrt{2} + \sqrt{3} + \sqrt{5}$  to 4 significant digits and find the absolute error.  
c. Explain the term round-off error. Round off the following numbers to four significant figures.  
i) 1.6583    ii) 0.859378  
d. Prove that  $\Delta = E - 1$ , where  $\Delta$  is a forward difference operator and E is the shift operator.  
e. If  $y(1)=4$ ,  $y(3)=12$ ,  $y(4)=19$  and  $y(x)=7$ . Find x using Lagrange's formula.  
f. Explain the following terms:    i) percentage error    ii) Relative error  
g. Estimate the missing terms in the following table

x	0	1	2	3	4
y	1	3	9	---	81

**Q. 2. Answer any five of the following.**

(2X5=10)

- a. The table given below gives the temperature as a function of time, f(t)

t	1	2	3	4	5
f(t)	81	75	80	83	78

Find  $\int_1^5 f(t) dt$  using trapezoidal rule.

- b. Find the value of  $f'(8)$  from the data given below.

x	6	7	9	12
f(x)	1.556	1.690	1.908	2.158

- c. Explain the bisection method to find the real root of  $f(x)=0$   
d. Find the second order polynomial which satisfies the set of values (0,1), (1,2) and (2,1).  
e. State Newton's Backward interpolation formula with assumptions.

f. Given that

X	1	2	3	4	5
Y	2	5	10	17	26

Find  $\nabla^2 y_5$

g. Three approximate values of the number  $1/3$  are given as 0.30, 0.33 and 0.34. Which of these three values is a best approximation?

**Q.3. Answer the following questions.**

A. Answer any one of the following questions.

(5)

i. Prove that  $(1 + \Delta)(1 - \nabla) = 1$

ii. Find the missing values in the following table.

X	1	1.5	2	2.5	3	3.5	4
Y	6	--	10	20	--	1.5	5

B. The table below gives the values of the function  $f(x)$  for some equally spaced values of the argument  $x$ . Use Newton's formula for interpolation to find  $f(7.5)$

(5)

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

**Q.4. Answer the following questions.**

A. Answer any one of the following questions.

(5)

i. Find the polynomial which approximates the following values.

X	3	4	5	6	7	8	9
Y	13	21	31	43	57	73	91

ii. The table gives the distances in nautical miles of the visible horizon for the given height in feet above the earth's surface. Find the value of  $y$  when  $x=160$ .

x= height	100	150	200	250	300	350	400
y= distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

B. Given the values, evaluate  $f(9)$ , using Newtons divided difference formula. (5)

X	5	7	11	13	17
f(X)	150	392	1452	2366	5202

**Q. 5. Answer the following questions.**

A. Answer any one of the following questions. (5)

i. Given that  $y(1.0)=7.989$ ,  $y(1.1)=8.403$ ,  $y(1.2)=8.781$ ,  $y(1.3)=9.129$ ,

$y(1.4)=9.451$ ,  $y(1.5)=9.9750$ ,  $y(1.6)=10.031$ . Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x=1.1$

ii. Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  using Simpson's 3/8<sup>th</sup> rule

B. Evaluate  $\int_4^{5.2} \log x \, dx$  by Weddle's rule. (5)

**Q.6. Answer the following questions.**

A. Answer any one of the following questions. (5)

i. Find a real root of  $x^3 - 2x - 5 = 0$  by regular falsi method.

ii. Use Newton Raphson's method to find a real root of  $x^3 - 3x + 1 = 0$

B. Use the method of bisection to find the real root of  $e^x - x - 2 = 0$ . (5)

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