Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering Second Year Even Semester Examination, 2019

CE 2201

Numerical Methods & Computer Programming

Full Marks: 72 **Time: 3 Hours**

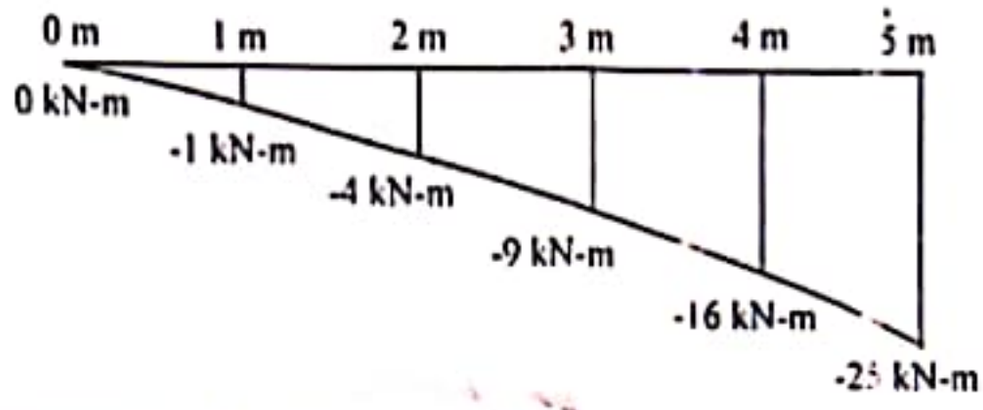
N.B.:-
(i) Answer any SIX questions, taking THREE from each section.
(ii) Figure in the margin indicate full marks
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 (a) Describe the graphical representation of Bisection method. Also determine the real root of the equation $e^x - 4x = 0$ using the Bisection method. 8.00

(b) Use the iteration method to find the root of equation $x^3 + x^2 - 1 = 0$ on the interval [0, 1] with an accuracy of 10^{-4}. 4.00

Q.2 (a) The bending moment diagram for a certain load on a cantilever beam is shown in Figure below. Determine the bending moment at 3.5 m. 7.00



(b) You are designing a spherical tank to hold water for a small village in a developing country. The volume of liquid it can hold be computed as, $v = \pi h^2 \frac{(3R - h)}{3}$. If R=3 m, to what depth must the tank be filled so that it holds 30 m^3? (Use Newton-Raphson method). 5.00

Q.3 (a) Determine the constants a, b and c, so that the equation $Y = a + bx + cx^2$ fits the following data: 4.00

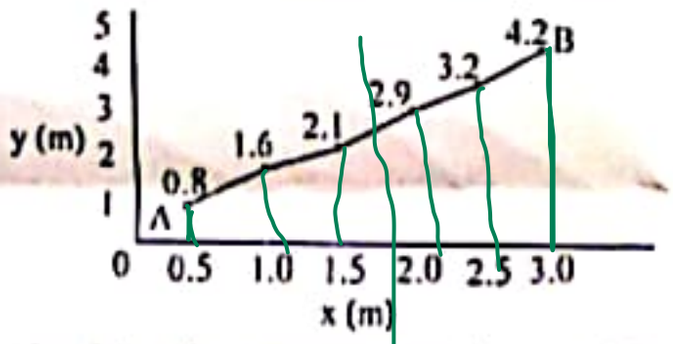
x	0	1	2	3	4	5	6
y	71	89	67	43	31	18	9

(b) What is Gauss Central difference formula? Derive Gauss forward difference formula. 4.00

(c) Use the inversion of matrix method to solve the equation 4.00

$2x + 2y + z = 5;\quad 3x - 2y + z = 2;\quad 4x + 4y - z = 7$

Q.4 (a) Determine the slope of the curve at x=2.5 m as shown in figure 10.00



Also determine the volume if the curve AB rotates about axis x.

(b) "Simpson's rule yields more accurate results than trapezoidal rule"-explain why. 2.00

SECTION-B

Q.5 (a) Write short notes on (i) functions, (ii) variables, (iii) identifier, (iv) keywords. 4.00

(b) "Civil engineers should learn the programming language like C/C++" justify the statement. 4.00

(c) Write a program to determine and print the sum of the following series: 4.00

$\frac{1}{1!} + \frac{2}{2!} + \frac{3}{3!} + \ldots\ldots\ldots\ldots + \frac{N}{N!}$, where N=100.

Q.6 (a) What is "if--- else" statement? Explain it using flow diagram and example. 3.00

(b) Write a program to check whether a given number is prime or not. 3.00

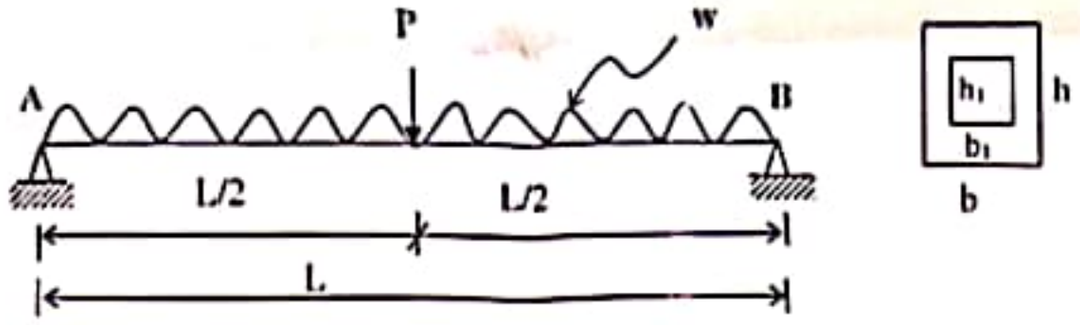
(c) Write a C program to find the total head of a flow through pipe which is at 5 m height from the datum line considering 5 cm diameter under a pressure of 29.43 N/cm^2 with a mean velocity of 2 m/s. 3.00

(d) What is unsigned constant? Write the significance of declaring a constant is unsigned. 3.00

Q.7 (a) What is an array? Classify array with examples. 3.00

(b) Write a program to calculate the largest and smallest number form a set of given numbers using array. 3.00

(c) Write a program to calculate (i) shear force, (ii) bending moment, (iii) shearing stress, (iv) flexural stress of the following beam at every L/10 distance. 6.00



Q.8 (a) Write a C program to find the root of equation $\sin x = 1 - x$ by bisection method. Use at least two functions. 6.00

(b) Describe the elements of user defined functions with examples. 2.00

(c) Write a program to find out the average of best three class tests out of four class tests of a student using array. 4.00

Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **SECOND** Year **EVEN SEMESTER** Examination, 2018

CE 2201

Numerical Methods & Computer Programming

Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

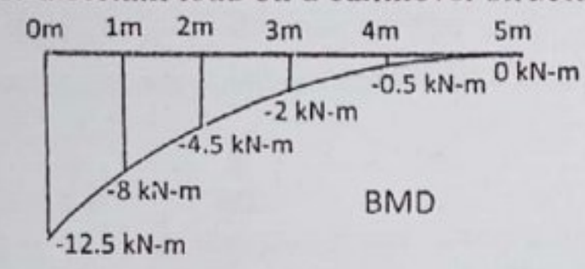
SECTION-A

Q.1 (a) Show the graphical representation of Bisection method and Method of False Position. Describe it briefly. 6.00

(b) Find the real root of the equation $e^x - 3x = 0$, using iteration method. 6.00

Q.2 (a) What do you understand by finite differences? Derive the Newton's interpolation formula which is useful for interpolation near the beginning of a set of tabular values. 5.00

(b) The bending moment diagram for a certain load on a cantilever structure is shown in the figure below. 7.00



Determine the bending moment at 0.5 m.

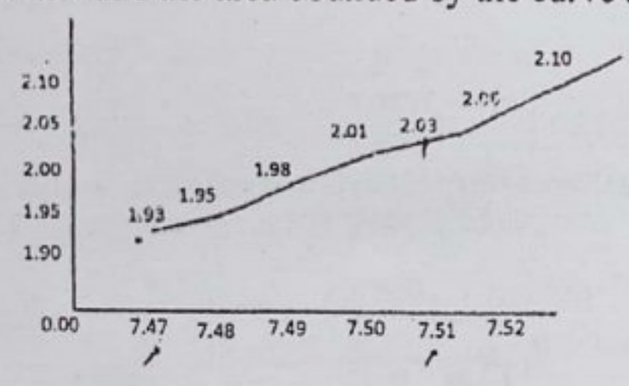
Q.3 (a) Derive the equation for fitting a straight line in least-squares curve fitting procedure. 3.00

(b) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data 5.00

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.60

(c) Solve the following equations by inversion of matrix method. $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$. 4.00

Q.4 (a) From the figure shown below, determine the area bounded by the curve and x axis where x from 7.47 to 7.51. 8.00



Also, determine the slope of the curve at $x = 7.49$.

(b) Using Newton's-Forward difference formula, find the sum $S_n = 1^3 + 2^3 + 3^3 + 4^3 + \cdots \ldots + n^3$. 4.00

SECTION-B

Q.5 (a) Differentiate between (i) floating point constant and string constant (ii) complier and interpreter. 3.00

(b) Four different class tests are given to a class of CE 2201 of 120 students. Write a program to calculate the average of the best 3 class tests. 4.00

(c) Write a program to multiply two matrices A(4,3) and B(3,4), use at least 3 functions. 5.00

Q.6 (a) How a variable can be declared as constant? Explain with example. 2.00

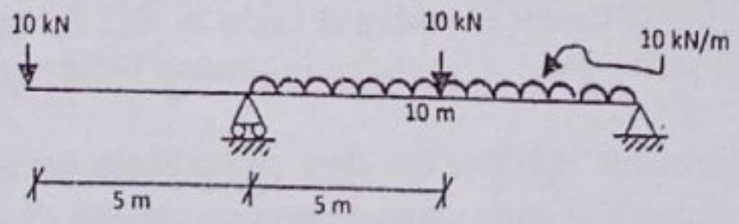
(b) Differentiate between Prefix and Postfix notation with an example program. 4.00

(c) Write a program to find the sum of the following series: 4.00

$$\frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + \cdots \ldots \ldots + \frac{1}{(2n-1)!}$$

(d) Define Recursion. Write a C program to find the factorial of any given number n using recursion technique. 2.00

Q.7 (a) Write a general program to calculate shear force, bending moment, shearing stress and flexural stress at anywhere of the following beam. 6.00



(b) Write a program to find roots of equation $x^2 - 3x + 10 = 0$, by bisection method. Use at least two functions. 4.00

(c) Differentiate between low level and high level language. 2.00

Q.8 (a) Define Qualifier. Write short notes on size qualifier and sign qualifier. 4.00

(b) Write a program that prints even numbers from 1 to 100. 4.00

(c) Write a C Program having arguments and return values with a user defined functions and explain the significance of having different return values. 4.00

Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **SECOND** Year **EVEN SEMESTER** Examination, 2018

CE 2201

Numerical Methods & Computer Programming

Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

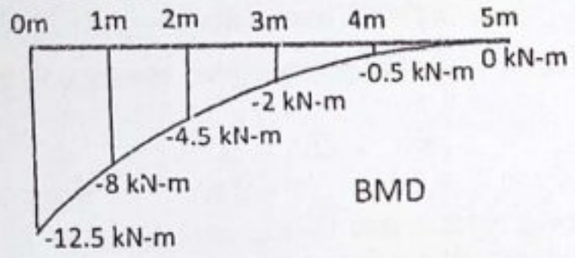
SECTION-A

Q.1 (a) Show the graphical representation of Bisection method and Method of False Position. Describe it briefly. 6.00

(b) Find the real root of the equation $e^x - 3x = 0$, using iteration method. 6.00

Q.2 (a) What do you understand by finite differences? Derive the Newton's interpolation formula which is useful for interpolation near the beginning of a set of tabular values. 5.00

(b) The bending moment diagram for a certain load on a cantilever structure is shown in the figure below. 7.00



Determine the bending moment at 0.5 m.

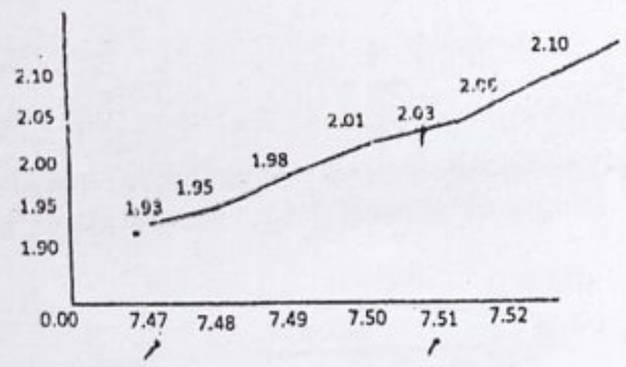
Q.3 (a) Derive the equation for fitting a straight line in least-squares curve fitting procedure. 3.00

(b) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data 5.00

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.60

(c) Solve the following equations by inversion of matrix method. $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$. 4.00

Q.4 (a) From the figure shown below, determine the area bounded by the curve and x axis where x from 7.47 to 7.51. 8.00



Also, determine the slope of the curve at $x = 7.49$.

(b) Using Newton's-Forward difference formula, find the sum $S_n = 1^3 + 2^3 + 3^3 + 4^3 + \cdots \ldots + n^3$. 4.00

SECTION-B

Q.5 (a) Differentiate between (i) floating point constant and string constant (ii) complier and interpreter. 3.00

(b) Four different class tests are given to a class of CE 2201 of 120 students. Write a program to calculate the average of the best 3 class tests. 4.00

(c) Write a program to multiply two matrices A(4,3) and B(3,4), use at least 3 functions. 5.00

Q.6 (a) How a variable can be declared as constant? Explain with example. 2.00

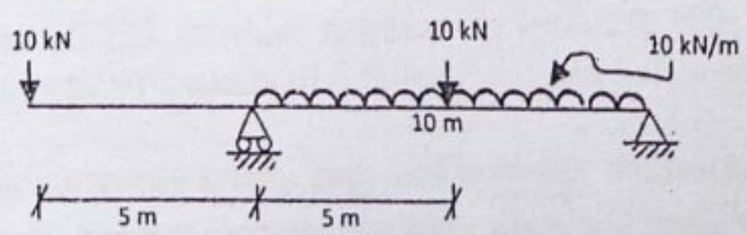
(b) Differentiate between Prefix and Postfix notation with an example program. 4.00

(c) Write a program to find the sum of the following series: 4.00

$\frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + \cdots \ldots \ldots + \frac{1}{(2n-1)!}$

(d) Define Recursion. Write a C program to find the factorial of any given number n using recursion technique. 2.00

Q.7 (a) Write a general program to calculate shear force, bending moment, shearing stress and flexural stress at anywhere of the following beam. 6.00



(b) Write a program to find roots of equation $x^2 - 3x + 10 = 0$, by bisection method. Use at least two functions. 4.00

(c) Differentiate between low level and high level language. 2.00

Q.8 (a) Define Qualifier. Write short notes on size qualifier and sign qualifier. 4.00

(b) Write a program that prints even numbers from 1 to 100. 4.00

(c) Write a C Program having arguments and return values with a user defined functions and explain the significance of having different return values. 4.00

DEPARTMET OF CIVIL ENGINEERING

RAISHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering SECOND Year EVEN SEMESTER Examination, 2017

CE 2201

Numerical Methods & Computer Programming

Full Marks: 72 Time: 3 Hours

N.B.:-
(i) Answer any SIX questions, taking THREE from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 (a) Show the graphical representation of Bisection method and Newton-Raphson method. Describe it briefly. 4.00

(b) Which method is effective to remove divergence problem in Newton-Raphson method? Explain with derivation. 3.00

(c) The meanings equation can be written for a rectangular open channel as $Q = \frac{\sqrt{S}(BH)^{5/3}}{n(B+2H)^{2/3}}$ where $Q = 5$ m^3/s ; $S = 0.0002$ (m/m) ; n = Meaning's roughness coefficient = 0.03. Use 5 iterations of Bisection method to determine your answer. 5.00

Q.2 (a) Derive Newton-Backward interpolation formula for equidistant values. 4.00

(b) The bending moments of various sections of a beam are given below. Use Lagrange interpolation to locate the point of contraflexure. 4.00

Distance (X) in (m)	6	8	14	15.50	16
Bending moment (kN-m)	46.5	42	10.5	-1.59	-6

(c) An engineer needs 4800, 5810 and 5690 m^3 of sand, fine gravel and coarse gravel respectively. There are these sources where these materials can be obtained and the composition of the material from these sources is:

Source	% Sand	% Fine Gravel	% Coarse gravel
1	52	30	18
2	20	50	30
3	25	20	55

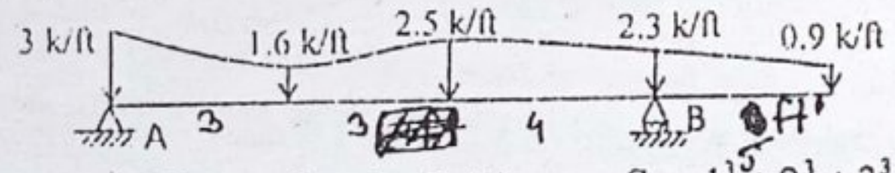
How many cubic meters must be hauled from each source in order to meet the engineer's needs? 3.00

Q.3 (a) Derive the equations for fitting a straight line in Least-squares curve fitting procedure. 4.00

(b) Given the following; noisy data, fit a straight line to this data by using least squares and write down the equation:

i	1	2	3	4	5
x	2.10	6.22	7.17	10.32	13.65
f(x)	2.90	3.83	5.98	5.71	7.74

(c) For the beam loaded as shown in figure below, calculate the vertical reaction at supports A and B using Simpson's 1/3rd rule (take that total load passes through 5.5 ft from left support). 5.00



Q.4 (a) Using Newton's-Forward Difference formula, find the sum: $S_n = 1^3 + 2^3 + 3^3 + \ldots\ldots + n^3$ 6.00

(b) What are the basic differences between Euler's method and Modified Euler's method? Solve by Euler's method the equation $\frac{dy}{dx} = x + y$, $y(0) = 0$, choose, $h = 0.2$ and compute $y(0.4)$ and $y(0.6)$. 6.00

SECTION-B

Q.5 (a) Differentiate between (i) void main(void) and int main(void) (ii) RAM and ROM. 4.00

(b) Write a program to find the summation of the series: $SUM = 1 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{3}\right)^3 + \left(\frac{1}{4}\right)^4 + \ldots\ldots$ 4.00

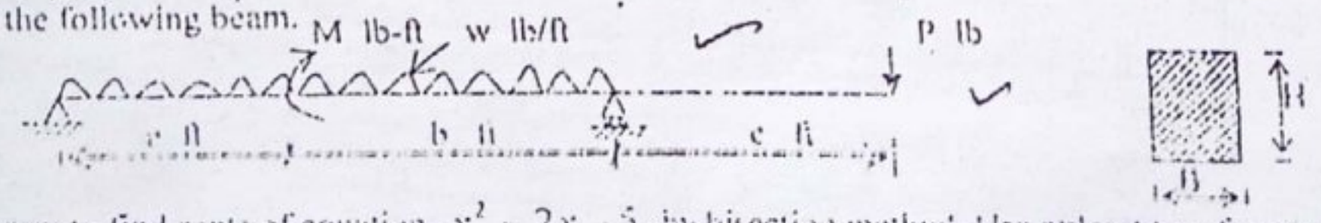
(c) A number is considered as prime number when it satisfies the following conditions: (i) it should be a whole number (ii) it should be greater than 1 (iii) it should have only two factors, they are 1 and the number itself. Write a C program to find whether an input number is prime number or not. 4.00

Q.6 (a) The numbers in the sequence 1 1 2 3 5 8 13 ..... are called Fibonacci numbers. Write a program using a do... while loop to calculate and print the Fibonacci number. 4.00

(b) A class of 60 students takes an examination on CE 220 in which scores range from 0 to 100. Write a C/C++ program to find (i) the highest score (ii) the number of students who failed (i.e. score below 40). Use at least 2 functions. 4.00

(c) Write short notes on goto statement. Differentiate among break, goto and continue statement. 4.00

Q.7 (a) Write a general program to calculate shear force, bending moment, shearing stress and flexural stress at anywhere of the following beam. 6.00



(b) Write a program to find roots of equation $x^2 - 2x - 5$ by bisection method. Use at least two functions. 4.00

(c) Define recursion. Explain recursion with an example program. 2.00

Q.8 (a) Define user defined function. Why is it necessary to use user defined function? 2.00

(b) Write a program to multiply two matrices $A(4,3)$ and $B(3,4)$. Use at least three functions. 6.00

(c) Write a C program having arguments and return values with a user defined function and explain the significance of having different return values. 4.00

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering SECOND year EVEN semester Examination, 2015

CE 2201

Numerical Methods & Computer Programming

Full Marks: 72 **Time: 3 Hours**

N.B.:- (i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q. 1(a) How will you differentiate high level language with low level programming language? 2.00

(b) Explain the basic structure of C programming language. 2.00

(c) Write a program to calculate the average of n numbers, then compute the deviation of each number about the average. 4.00

(d) Write a program using C to (i) scan the marks of four class tests of 120 students, (ii) find the average of best three class test, and (iii) count the number of students who obtain the highest marks on CE2201. 4.00

Q. 2(a) What is an array? Explain the needs of array variables. 2.00

(b) Differentiate between while and do.....while statements. 2.00

(c) Two matrices A and B are given. Write a program to (i) check whether matrix multiplication is possible with A and B, and (ii) find the summation of diagonals of the new matrix C = AB using C program, if matrix multiplication is possible. 5.00

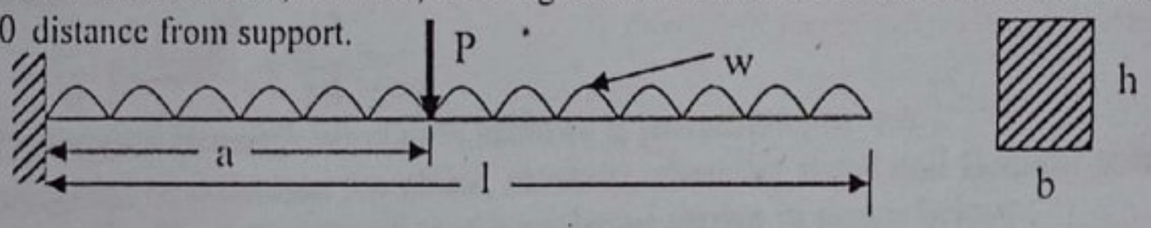
(d) Write a program to reverse a given number. 3.00

Q. 3(a) Differentiate between compiler and decompiler. 2.00

(b) What is backslash character constant? Mention their applicability using a very simple C program. 3.00

(c) Write a program to implement the use of fscanf()and fprintf() statements using C language. 2.00

(d) Write a program to calculate the shear, moment, shearing stress and flexural stress of a beam as shown in figure below at every //10 distance from support. 5.00



Q. 4(a) What is break statement? Mention its usefulness in C programming. 2.00

(b) Write a program to find the root of the equation $x^3 + x^2 + x + 7 = 0$ by bisection method using C language 4.00

(c) Differentiate between library function and user define function. 2.00

(d) Write a program to (i) find the summation of first 100 positive integers, (ii) summation of those numbers which are divided by 7, and (iii) count the numbers which are divided by 3 and 5 from the first 100 positive integers. Use at least three user defined functions. 4.00

SECTION-B

Q. 5(a) You are designing a spherical tank to hold water for a small village in a developing country. The volume of liquid it can hold be computed as $V = \pi h^2 \frac{(3R - h)}{3}$. If R = 3 m, to what depth must the tank be filled so that it holds 30 m^3? (Use Newton-Raphson method) 6.00

(b) Use Bisection method to determine the drag co-efficient c needed for a parachutist of mass m = 68.1 kg to have a velocity of 40 m/s after free falling for time t = 10 sec. (g = 9.8 m/sec^2). Velocity v of a falling parachutist is given by $v = \frac{gm}{c}\left\{1 - e^{-(c/m)t}\right\}$. 6.00

Q. 6(a) "Simpson's rule yields more accurate results than the trapezoidal rule"- explain why? Apply trapezoidal and Simpson's rules to the integral $I = \int_0^1 \sqrt{1 - x^2}\,dx$. 8.00

(b) Find the inverse of the matrix using Gaussian estimation $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & 4 \\ 1 & 2 & 2 \end{bmatrix}$. 4.00

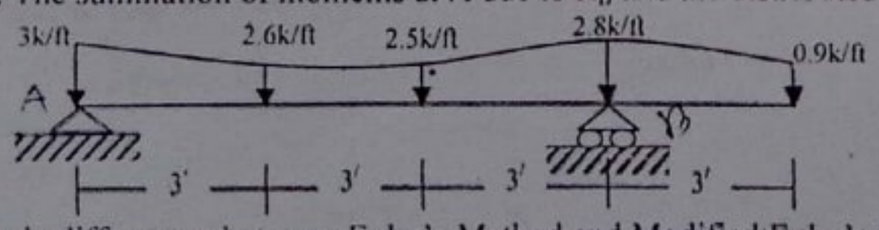
Q. 7(a) Write down the differences between analytical method and numerical method. 1.00

(b) Fit a function of the form $y = A_1 e^{x_1 x} + A_2 e^{x_2 x}$ to the data given by 7.00

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	.8
y	1.54	1.67	1.81	1.97	2.15	2.35	2.58	2.83	3.11

(c) A student takes three courses (Surveying, Math and Drawing) of credit hours 4, 3 and 1.5 respectively in a summer semester. He gets equal scores in Surveying and Math, and scores 80% in Drawing. If his average semester grade is 70%, calculate scores in all subjects using Gauss-Jordan method. 4.00

Q. 8(a) For the beam loaded as shown in the figure below, calculate the vertical reaction R_B at support B using Simpson's rule. The summation of moments at A due to R_B and the distributed loads equal to zero. 6.00



(b) What are the basic differences between Euler's Method and Modified Euler's Method? Solve by Euler's method, the equation $\frac{dy}{dx} = x + y$, $y(0) = 0$. Chose h = 0.2 and compute y(0.4) and y(0.6). 6.00

The End

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **SECOND** year **FOURTH SEMESTER** Examination, 2013

CE 205

Numerical Methods & Computer Programming

Full Marks: 70 **Time: 3 Hours**

N.B.:-
(i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data not given.

SECTION-A

Q.1(a) Describe the process of compiling and executing a C program 3.67

(b) What is unsigned constant? Write the significance of declaring a constant is unsigned. 2.00

(c) Write a program to determine whether a number is odd or even using C/C++. 3.00

(d) Write a program to determine and print the sum of the following series: 3.00

$$\frac{1}{2}\times\frac{3}{4}+\frac{2}{3}\times\frac{4}{5}+\frac{3}{4}\times\frac{5}{6}+\ldots\ldots\ldots\ldots+\frac{10}{11}\times\frac{12}{13}$$

Q.2(a) Distinguish between : i) Prefix and Postfix operator ii) Entry-controlled and Exit-controlled loop. 4.00

(b) Write short note on Nested if.....else statement. 3.00

(c) Write a C program to read and print a matrix and to determine the transpose of that matrix. 4.67

Q.3(a) Write short note on i) array and ii) pointer. 3.67

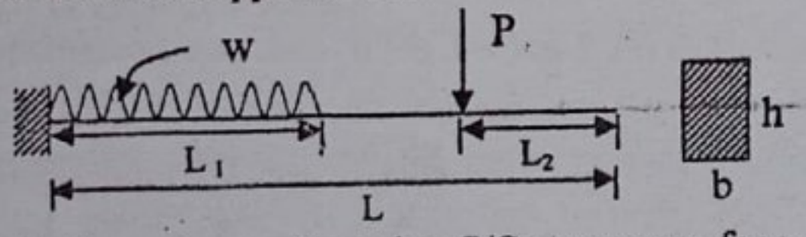
(b) Write a program to find the root of $x+\log x=2$ by Newton–Raphson method using C/C++. 4.00

(c) Write a program to find the summation of the following series, where N is a positive number 4.00

$$\frac{1^2}{1!}+\frac{2^2}{2!}+\frac{3^2}{3!}+\ldots\ldots\ldots\ldots+\frac{N^2}{N!}$$

Q.4(a) Write a C program to check whether a number is palindrome or not. 4.00

(b) Write a program to calculate the shear, moment, shearing stress and flexural stress at every L/4 distance from the fixed support of cantilever beam shown in figure below: 5.67



(c) Write down the importance of learning C/C++ program for a civil engineer. 2.00

SECTION-B

Q.5(a) What is Gauss Central difference formula? Derive Gauss forward difference formula. 6.00

(b) From the following table, find the value of $e^{1.17}$ using Stirling's formula. 5.67

x	1	1.05	1.10	1.15	1.20	1.25	1.30
e^x	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

Q.6(a) Find the real root of $x^{\sin 2}-4=0$, correct up to three decimal places by the Newton-Raphson Method. 5.67

(b) Using Lagrange's interpolation formula, evaluate $\sqrt{155}$ from the following table. 6.00

x	150	152	154	156
$y=\sqrt{x}$	12.247	12.329	12.410	12.490

Q.7(a) Find a formula of the form $y = a+bx+cx^2$ which will fit the following data: 6.00

X:	0	5	10	15	20
Y:	5.213	7.321	16.475	19.027	28.879

(b) Solve the following system of equation using Gauss- Elimination method. 5.67

$x_1+7x_2-4x_3=-51$; $4x_1-4x_2+9x_3=62$; $12x_1-x_2+3x_3=8$

Q.8(a) Why numerical integration is necessary over analytical solution? Derive an expression for Simpson's 1/3 rule in numerical problem solution. 6.00

(b) Given $\frac{dy}{dx}=3x+y/2$, where, y(0) = 1, using Range-Kutta method find y(0.1), y(0.3) and y(0.6) correct to four decimal places. 5.67

***