

I B.Tech Supplementary Examinations, Aug/Sep 2008
COMPUTER PROGRAMMING AND NUMERICAL METHODS
 (Common to Mechanical Engineering, Chemical Engineering, Mechatronics,
 Metallurgy & Material Technology, Production Engineering and Automobile
 Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Write the various steps involved in executing a C program and illustrate it with a help of flowchart.
 (b) Candidates have to score 90 or above in the IQ test to be considered eligible for taking further tests. All candidates who do not clear the IQ test are sent reject letters and others are sent call letters for further tests. Represent the logic for automating this task. [8+8]
2. (a) What are the advantages and disadvantages of recursion.
 (b) Write a C program to find the factors of a given integer using a function. [6+10]
3. (a) Write a 'C' Program to compute the sum of all elements stored in an array using pointers.
 (b) Write a 'C' program using pointers to determine the length of a character string. [8+8]
4. (a) What is meant by self-referential structure. What are its advantages.
 (b) What is the general declaration syntax of a structure.
 (c) What is a union in C? How is data stored using union. [6+4+6]
5. Use the operations push, pop, stacktop, and empty to construct operations on stack, which do each of the following:
 Given an integer n, set i to the n the element from the top of stack, leaving the stack unchanged Set I to the bottom element of stack, leaving the stack empty.[16]
6. (a) Find a real root of $x + \log x - 2 = 0$ using Newton Raphson method.
 (b) Find a real root of $x^3 - 4x - 9 = 0$ using bisection method. [8+8]
7. (a) Prove that $(1 + \Delta)(1 - \nabla) = 1$
 (b) Find $f(3.4)$ from the following table using Newton's forward formula

x	3	4	5	6
y	31	69	131	223

- (c) Given that $f(7) = -2$, $f(0) = -1$, $f(2) = 1$, $f(3) = 4$ find the polynomial for these points using Lagranges interpolation formula [5+6+5]

8. (a) Evaluate $\int_0^1 \frac{dx}{1+x}$, taking $h=.25$ using cubic splines
- (b) Fit a parabola of the form $y=a+bx+cx^2$ for the following data.

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

[8+8]

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1. Write about space requirements for variables of different data types. [16]
2. (a) Write a program to demonstrate passing an array argument to a function. Consider the problem of finding largest of N numbers defined in an array.
 (b) Write a recursive function power (base, exponent) that when invoked returns base exponent. [8+8]
3. The roots of a quadratic equation of the form $ax^2+bx+c = 0$ are given by the following equations:

$$X1 = -b + \sqrt{(b^2 - 4ac)}/2a$$

$$X2 = -b - \sqrt{(b^2 - 4ac)}/2a$$

Write a function to calculate the roots. The function must use two pointer parameters, one to receive the coefficients a,b and c and the other to send the roots to the calling function. [16]

4. (a) What is the use of struct keyword? Explain the use of dot operator? Give an example for each.
 (b) Write a C program to accept records of the different states using array of structures. The structure should contain char state, population, literary rate, and income. Display the state whose literary rate is highest and whose income is highest. [6+10]
5. Write a C program to evaluate the postfix expression. [16]
6. (a) Find a real root of the equation $x-\cos x=0$ by bisection method.
 (b) Evaluate $\sqrt{12}$ to four decimal places by Newton's Raphson method. [8+8]
7. (a) Use Newton's forward difference formula to find $f(22)$ and $f(42)$ from the following table

x	20	25	30	35	40	45
y	354	332	291	260	231	204

- (b) Find $y(35)$ using Lagranges interpolation formula

x	25	30	40	50
y	52	67.3	84.1	94.4

[8+8]

8. (a) Find $f'(x)$ at $x=.4$

x	.1	.2	.3	.4
f(x)	1.10517	1.2214	1.34986	1.49182

- (b) Using trapezoidal rule, approximately calculate the value of $\int_1^3 dx/\sqrt{(1+x)}$ with

- i. four intervals and
- ii. six intervals.

[8+8]

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1. (a) Name and describe any four basic data types in C.
(b) Name and describe the four data type qualifiers. To which data types can each qualifier be applied?
(c) What are constants? Explain any four basic types of constants. [4+8+4]
2. (a) Distinguish between getchar and scanf functions for reading strings.
(b) Write a program to count the number of words, lines and characters in a text. [8+8]
3. (a) Write a C program to illustrate the use of structure pointer.
(b) Explain the effects of the following statements:
 - i. `int a, *b = &a;`
 - ii. `int p, *p;`
 - iii. `char *s;`
 - iv. `a = (float*)&X;` [8+8]
4. Write a C program to add the two given complex numbers. Define functions add and print with pointers as arguments. The complex number is a structure object with real and image fields. [16]
5. What is a stack? Explain two different representations of a stack. List the operations performed on a stack and write functions for implementing these operations. [16]
6. (a) Find a real root of $x^3 - x^2 - 2 = 0$ using Regula falsi method.
(b) Find a root of the equation $x^4 - x - 13 = 0$ by Newton Raphson method. [8+8]
7. (a) Find $f(3.8)$ given $x = 1, 2, 3, 4, 5$ $f(x) = 6, -3, 6, 2, -6$. Using Gauss forward difference method
(b) Write down the polynomial of lowest degree which satisfies the following set of numbers.
 $f(0) = 0, f(1) = 7, f(2) = 26, f(3) = 63, f(4) = 124, f(5) = 215, f(6) = 342, f(7) = 511$ [8+8]

8. (a) Find the first and 2nd derivatives at $x=1.5$

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

- (b) Evaluate $\int_2^{10} \frac{dx}{1+x}$ by dividing the range in to 8 equal parts using

i. Trapezoidal rule

ii. Simpson's $\frac{1}{3}$ rule.

[8+8]

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1. (a) What is the conditional operator. What is its general syntax.
 (b) Write a C program to find the largest of three input numbers using conditional operator. [8+8]
2. (a) What do you mean by functions? Give the structure of the functions and explain about the arguments and their return values.
 (b) Write a C program that uses a function to sort an array of integers. [8+8]
3. (a) How to use pointers as arguments in a function? Explain through an example.
 (b) Write a 'C' function using pointers to exchange the values stored in two locations in the memory. [8+8]
4. (a) What is meant by self-referential structure. What are its advantages.
 (b) What is the general declaration syntax of a structure.
 (c) What is a union in C? How is data stored using union. [6+4+6]
5. Declare a queue of integers. Write functions
 (a) To insert an element in to queue
 (b) To delete an element from queue [8+8]
6. (a) Find a root of $e^x \sin x = 1$ using Newton Raphson's method.
 (b) Find a root of the equation $x \tan x = -1$ using Regula falsi method. [8+8]
7. (a) Given

x	0	5	10	15	20	25	30
Tan x	0	.0875	.1763	.2639	.364	.4663	.5774

- (b) Use Lagrange's formula to calculate $f(3)$ from the following table

x :	0	1	2	4	5	6
f(x) :	1	14	15	5	6	19

[8+8]

8. Find $y(.1)$ and $y(.2)$ using picard's mehod given that $\frac{dy}{dx} = 1 - 2xy$, $y(0)=0$ [16]
