

**I B.Tech Regular Examinations, Apr/May 2007**  
**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**

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1. Write about space requirements for variables of different data types. [16]
2. (a) Distinguish between user defined and built-in functions.  
 (b) What is meant by function prototype. Give an example function prototype. [8+8]
3. (a) Explain the process of declaring and initializing pointers. Give an example.  
 (b) Write a C program that uses a pointer as a function argument. [8+8]
4. (a) Explain the advantages of structure type over the array type variable.  
 (b) Define a structure that represent a complex number (contains two floating-point members, called real and imaginary). Write a C program to add, subtract, and multiply two complex numbers. [6+10]
5. Declare two stacks of varying length in a single array. Write C routines push1, push2, pop1 and pop2 to manipulate the two stacks. [4x4=16]
6. (a) Find an iterative formula to find the cube root of a number using Newton's Raphson's method. Hence evaluate cube root of 15  
 (b) Find a root of the equation  $3x - e^x + \sin x = 0$  using Regula falsi method. [8+8]
7. (a) Find  $y(1.85)$  using Newton's interpolation formula
 

|   |       |      |       |       |       |       |
|---|-------|------|-------|-------|-------|-------|
| x | 1.7   | 1.8  | 1.9   | 2.0   | 2.1   | 2.2   |
| y | 5.474 | 6.05 | 6.686 | 7.389 | 8.166 | 9.025 |
- (b) Find  $y(30)$  using Gauss forward interpolation formula given that  $y(21)=18.4708$ ,  $y(25)=17.8144$ ,  $y(29)=17.107$ ,  $y(33)=16.3432$ ,  $y(37)=15.5154$ . [8+8]
8. Find  $y(.1), y(.2), y(.3)$  and  $y(.4)$  using Taylor's series method given that  $\frac{dy}{dx} = 1 + xy$  and  $y(0)=1$  [16]

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1. (a) What is the purpose of for statement? How does it differ from the while statement and the do-while statement.  
(b) How many times will a for loop be executed? What is the purpose of the index in a for statement.  
(c) Can any of the three initial expressions in the for statement be omitted? If so, what are the consequences of each omission? [6+5+5]
  
2. (a) Write a program to demonstrate passing an array argument to a function. Consider the problem of finding the 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. (a) What is a pointer? How is a pointer initiated? Give an example.  
(b) State whether each of the following statements is true or false. Give reasons.
  - i. An integer can be added to a pointer.
  - ii. A pointer can never be subtracted from another pointer.
  - iii. When an array is passed as an argument to a function, a pointer is passed.
  - iv. Pointers can not be used as formal parameters in headers to function definitions.(c) If m and n have been declared as integers and p1 and p2 as pointers to integers, then find out the errors, if any, in the following statements.
  - i. p1 = &m;
  - ii. p2 = n;
  - iii. m=p2-p1;
  - iv. \*p1 = &n; [4+6+6]
  
4. Define a structure that can describe a hotel. It should have members that include the name, address, grade, average room charge, and number of rooms. Write a C program to perform the following operations:
  - (a) To print out hotels of a given grade in order of charges.
  - (b) To print out hotels with room charges less than a given value. [8+8]
  
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) Establish the formula  $x_{i+1} = \frac{1}{2} \left[ x_i + \frac{N}{x_i} \right]$  and hence compute the value of  $\sqrt{10}$  using Newton Raphson method  
 (b) Find a real root of  $x^3+x-1=0$  using bisection method [8+8]
7. (a) Derive the formula to estimate the polynomial of degree n using Lagrange's interpolation method.  
 (b) Find f(1.6) using Lagrange's formula from the following data.

|      |      |     |     |     |
|------|------|-----|-----|-----|
| x    | 1.2  | 2.0 | 2.5 | 3.0 |
| f(x) | 1.36 | .58 | .34 | .20 |

[6+10]

8. (a) Find  $f'(3.5)$

|      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|
| x    | 3.47 | 3.48 | 3.49 | 3.5  | 3.51 | 3.52 | 3.53 |
| f(x) | .193 | .195 | .198 | .201 | .203 | .206 | .208 |

- (b) Evaluate  $\int_0^1 \frac{dx}{1+x}$  taking  $h = .25$  using cubic splines. [8+8]

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1. (a) What are the commonly used input functions in C? How are they accessed?  
 (b) What is the purpose of getchar, putchar functions? How is it used in a C program? How is it different from getc ( ) and putc ( ) functions?  
 (c) Write a C program to accept a string up to any termination character and count the number of termination character and count the number of blank spaces, lines and characters in the string. [4+4+8]
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. (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) Write a C program to illustrate the comparison of structure variables.  
 (b) What is the use of a structure? Given an example for a structure with initialized values. [8+8]
5. Write a C program to convert the infix expression into postfix expression. [16]
6. (a) Find a real root of  $x^3-x-4=0$  using bisection method  
 (b) Find a root of the equation  $x=\cos x$  by Regula falsi method. [8+8]
7. (a) Construct difference table for the following data:

|      |       |       |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|-------|-------|
| x    | 0.1   | 0.3   | 0.5   | 0.7   | 0.9   | 1.1   | 1.3   |
| F(x) | 0.003 | 0.067 | 0.148 | 0.248 | 0.370 | 0.518 | 0.697 |

And find F(0.6) using a cube that fits at x=0.3, 0.5, 0.7 and 0.9 using Newton's forward formula.

- (b) Find f(35) using Lagranges interpolation formula

|      |     |      |      |      |
|------|-----|------|------|------|
| x    | 25  | 30   | 40   | 50   |
| f(x) | .52 | 67.3 | 84.1 | 94.4 |

[8+8]

8. (a) Find
- $f'(1.25)$
- and
- $f''(1.25)$

|      |     |        |         |         |         |         |         |
|------|-----|--------|---------|---------|---------|---------|---------|
| x    | 1.0 | 1.05   | 1.1     | 1.15    | 1.2     | 1.25    | 1.3     |
| f(x) | 1.0 | 1.0247 | 1.04381 | 1.07238 | 1.09544 | 1.11803 | 1.14017 |

- (b) The velocity V of a particle at disitances from a point in its path is given by

|   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| t | 0  | 10 | 20 | 30 | 40 | 50 | 60 |
| v | 47 | 58 | 64 | 65 | 61 | 52 | 38 |

Estimate the time taken to travel 60ft using simpson's  $\frac{1}{3}$ rd rule [8+8]

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1. Write about space requirements for variables of different data types. [16]
2. (a) Write a program to compute Fibonacci numbers which are defined by the recurrence relation.  

$$fib_{n+1} = fib_n + fib_{n-1} \text{ for } n > 0$$
 (b) What is the scope of variables of type: auto, register and static. [10+6]
3. (a) What is a pointer variable? How is a pointer variable different from an ordinary variable.  
 (b) Write a C program to read in an array of integers. Instead of using subscripting, however, employ an integer pointer that points to the elements currently being read in, and which is incremented each time. [8+8]
4. (a) When are array of structures are used? Declare a variable as array of structure and initialize it?  
 (b) Write a C program to calculate student-wise total for three students using array of structure. [8+8]
5. Write a C program to evaluate the postfix expression. [16]
6. (a) Find a real root of the equation  $f(x)=x+\log x-2$  using Newton Raphson method  
 (b) Find a root of the equation  $x=\cos x$  using Regula falsi 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) Derive a formula to evaluate  $\int_a^b y dx$  using simpson's  $\frac{1}{3}$  rule

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**Set No. 4**

- (b) By dividing the range into ten equal parts, evaluate  $\int_0^{\pi} \sin x dx$  by Simpson's  $\frac{1}{3}$ rd rule. Verify your answer with integration.

[8+8]

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