# 2015

## COMPUTER SCIENCE

[ **Honours** ]

PAPER – I (New)

*Full Marks* : 100

*Time* : 4 hours

*The figures in the right hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

*Illustrate the answers wherever necessary*

[ NEW SYLLABUS ]

GROUP – A

Answer any **two** questions : $15 \times 2$

**1.** (*a*) Differentiate calloc( ) and malloc( ) functions in C. Write a C program to swap the values of two integers using call by Reference method. $2 + 6$

(*b*) Define radius and diameter of a graph. Prove that every tree has either one or two centers. 2 + 5

2. (*a*) Solve the following problem of simplex method :

Maximize $Z = 2x_1 + 3x_2$

subject to, $x_1 + x_2 \leq 8$

$x_1 + 2x_2 = 5$

$2x_1 + x_2 \leq 8$

$x_1, x_2 \geq 0$ 8

(*b*) Compute

$$\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$$

by Simpson's $\frac{1}{3}$ rd rule by taking $h = \frac{\pi}{12}$. 7

3. (*a*) Use Lagrange's interpolation to find the value of $f(x)$ for $x = 0$ from the following table : 5

| $x$ | $-1$ | $-2$ | $2$ | $4$ |
|---|---|---|---|---|
| $f(x)$ | $-1$ | $-9$ | $11$ | $69$ |



( Continued )

(*b*) Calculate by Simpson's one-third rule, the value of the integral

$$\int_0^1 \frac{x dx}{1+x}$$

correct to three significant figures, by taking six subintervals. 5

(*c*) Find a real root of the equation

$$3x^3 + 5x - 4 = 0$$

by Newton-Raphson method. 5

4. (*a*) What is Euler graph ? Prove that a connected graph is an Euler graph if and only if it can be decomposed into circuits. 8

(*b*) Write a program in C to multiply two matrices. 7

## GROUP – B

Answer any **five** questions : $8 \times 5$

5. Find the minimum cost of transportation for the transportation problem 8

| | 1 | 2 | 3 | 4 | 5 | $a_i$ |
|---|---|---|---|---|---|---|
| 1 | 4 | 1 | 3 | 4 | 4 | 60 |
| 2 | 2 | 3 | 2 | 2 | 3 | 35 |
| 3 | 3 | 5 | 2 | 4 | 4 | 30 |
| $b_j$ | 22 | 45 | 20 | 18 | 30 | |

**6.** Show that a simple graph with $n$ vertices (where $n > 2$) is Hamiltonian if the sum of the degrees of every pair of non-adjacent vertices is at least $n$. 8

**7.** (*a*) Write a program in C to reverse a string using recursion. 6

(*b*) What do you mean by conditional operator ? Give an example. 2

**8.** Evaluate $y(1{\cdot}1), y(1{\cdot}2), y(1{\cdot}3)$ using Runge-Kutta method of order 4 for the initial value problem :

$$\frac{dy}{dx} = x^2 + y^2, \quad y(1) = 0. \qquad 8$$

**9.** (*a*) Explain the working principle of nested loop using an example. 4



( *Continued* )

(*b*) Define Recursion with an example. Write down its advantage. 4

**10.** (*a*) Perform the following subtraction using 1's and 2's complement :

10010 – 10011 4

(*b*) Subtract the following decimal numbers using 9's and 10's complement :

23 – 12 4

**11.** Explain Gauss Elimination method mentioning pivoting process in general way for three variables. 8

**12.** (*a*) Explain the use of following string functions with proper arguments :

Strcat ( ), Strcmp ( ). 4

(*b*) Write short notes on :

f scanf ( ), f printf ( ). 4

## GROUP – C

Answer any **five** questions : 4×5

13. Write a program in C to count the number of vowels in a word. 4

14. What are the advantages of 2's complement system over 1's complement system ? 4

15. Discuss the Kruscal's algorithm for finding the shortest spanning tree in a connected graph. 4

16. What is meant by 'scope of a variable' ? Explain the local, global and external scope of variable. 4

17. Write an algorithm to find the first $n$ Fibonacci numbers. 4

18. Let $G$ be a $r$-regular graph where $r$ is an odd integer. Show that the number of edges of $G$ is a multiple of $r$. 4

**19.** Write down the output of the following program : 4

```
# include ⟨stdio. h⟩
 main ( )
 {
  int a = 6 ,  b = 4 ;
  while (a + b)
    {
    print f ("a = % d,  b = % d \ n", a, b) ;
    a = a/2 ;
    b % = 3 ;
     }
    }
```

**20.** What are source and object programs ? Write the difference between compiler and interpreter. 4

[ *Internal Assessment* : 10 marks ]