

OLD

2015

Part I 3-Tier

COMPUTER SCIENCE

PAPER—I

(Honours)

Full Marks : 100

Time : 4 Hours

The figures in the right hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Group—A

Answer any *two* questions.

15×2

1. (a) Establish Trapezoidal formula with error term for numerical integration of $f(x)$ on $[a, b]$. 8

- (b) The density function of the random variables X and Y are given by

$$f(x, y) = \begin{cases} kxy(x+y), & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

Find (i) The value of k.

(ii) The marginal density function of X and Y.

(iii) $P\left(\frac{1}{2} \leq X \leq \frac{3}{4}, \frac{1}{3} \leq Y \leq \frac{2}{3}\right)$. 7

2. (a) What are the features of an algorithm? Explain the concept of modular design. What are the differences between recursive and non-recursive algorithm?

5

- (b) Explain how data is organized on a hard disk. Write down the procedure of BCO addition with examples.

3+2

- (c) Represent the following numbers using floating point notation. Assume 16 bit word.

10110.1101, 1101100.10, 0.000011011011. 5

3. (a) Solve the assignment problem

	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4

7

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

8

4. (a) Briefly, describe Bisection method.

$$\text{Find real root of } f(x) = x \log_{10} x - 1.2 = 0$$

by bisection method.

8

- (b) Write a C program to count the number of vowels in a given sentence.

7

Group—BAnswer any *five* questions.

5×8

5. Solve the transportation problem using VAM :

	D ₁	D ₂	D ₃	D ₄	a _i
O ₁	10	7	3	6	3
O ₂	1	6	8	3	5
O ₃	7	4	5	3	7
b _j	3	2	6	4	

8

6. Write down the use of following library functions :

ftell (), fseek (), Calloc (), str cat ()

8

7. (a) Prove that if there is one and only one path between every pair of vertices then it is a tree.

(b) Prove that a tree with n vertices has (n - 1) edges.

3+5

8. Compute y(0.4), by fourth order Runge-Kutta method correct to five decimal places, from the equation

$$\frac{dy}{dx} = xy, y(0) = 2$$

taking $h = 0.2$.

8

9. (a) For what value of k , $f(x, y)$ represents a probability density for of two continuous random variables X and Y where

$$f(x, y) = k(4 - 2x + y), 0 < x < 3, 2 < y < 4$$

$$= 0, \text{ elsewhere}$$

and find $P(X < 2 / Y < 3)$.

- (b) Explain the difference between entry control and exit control loops in C.

5+3

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

8

11. (a) What is cache memory? What is the use of cache memory?

- (b) What is structure? How does a structure differ from an array?

4+4

12. Solve the LPP by simplex method

$$\text{Maximize } z = 3x_1 + 4x_2 + x_3 + 5x_4$$

$$\text{Subject to } 8x_1 + 3x_2 + 2x_3 + 2x_4 \leq 10$$

$$2x_1 + 5x_2 + x_3 + 4x_4 \leq 5$$

$$x_1 + 2x_2 + 5x_3 + x_4 \leq 6,$$

$$x_1, x_2, x_3, x_4 \geq 0.$$

8

Group—C

Answer any *five* questions.

4×5

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

14. (a) If A and B are two events then show that

$$P(AB) \geq P(A) + P(B) - 1.$$

(b) Prove that there exists no graph with four edges having vertius of degree 4, 3, 2, 1. 2+2

15. What are source and object program ? Write the difference between compiler and interpreter.

16. Solve the following L.P.P using graphical method :

$$\text{Maximize } Z = x_1 + 4x_2$$

$$\text{Subject to, } 2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0.$$

4

17. What do you mean by storage class in C? Distinguish between the following pair : Automatic variable and static variable.

2+2

18. What are ASCII codes? Discuss the utility of ASCII codes.

19. Find out the output :

```
void main ( )
{
int a = 4, b = 5, C ;
C = ++a + b-- ;
printf("a = %d, b = %d, c = %d", a, b, c) ;
}
```

4

20. Perform the following subtraction using 1's and 2's complement : $10010 - 10011$. 4

[Internal Assessment — 10 marks]
