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2 SEM TDC CSC G 1 (N/O)

2017

(May)

COMPUTER SCIENCE

(General)

Course : 201

The figures in the margin indicate full marks for the questions

(New Course)

(Programme and Problem Solving with C)

Full Marks : 48
Pass Marks : 14

Time : 2 hours

1. Answer the following questions? 1×5=5

(a) What is keyword?

(b) What is constant?

(c) Name the storage classes in C.

(d) What is union?

(e) What is string?

2. Answer the following questions : $2 \times 5 = 10$

(a) Write the differences between 'while' and 'do-while' loops.

(b) Write the differences between 'switch' and 'if' statements.

(c) Define structure.

(d) What are bitwise operators?

(e) What is type casting?

3. Answer any *three* of the following questions : $11 \times 3 = 33$

(a) *(i)* Explain with examples about the use of loops in C. 6

(ii) Write a C program to find the factorial of number using recursion. 5

(b) *(i)* Write a C program to find whether a given string is palindrome or not. 6

(ii) Write a C program to find the sum of all digits of a positive number. 6

(c) *(i)* Write a C program to add the positive numbers stored in an array. 5

(ii) Write a C program to copy the structure variable to another structure variable. 6

(Continued)

(d) *(i)* Write a C program to display all the even numbers between 100 and 200. 4

(ii) Write a C program to display numbers between 1 to 100 which are divisible by 7. 4

(iii) Explain three string handling functions. 3

(e) *(i)* Define pointers and files in C. 4

(ii) Write C program to display the following : 4

```
1  *
2  *  *
3  *  *  *
4  *  *  *  *
5  *  *  *  *  *
```

(iii) Mention the differences between break and continue statements. 3

(Turn Over)

(Old Course)

(Discrete Structure)

Full Marks : 80
Pass Marks : 32

Time : 3 hours

1. Select the correct option : 1×8

(a) The power set 2^8 of the set $s = \{3, \{1, 4\}, 5\}$ is

(i) $\{s, 3, 1, 4, \{1, 3, 5\}, \{1, 4, 5\}, \{3, 4\}, \phi\}$

(ii) $\{s, 3, \{1, 4\}, 5\}$

(iii) $\{s, 3, \{3, \{1, 4\}, \{3, 5\}, \phi\}$

(iv) None of the above

(b) If $A = \{1, 2, 3, 4\}$, $B = \{2, 3, 4, 5\}$, $C = \{1, 3, 4, 5, 6, 7\}$, then $A \cap (B \cup C)$ is equal to

(i) $\{1, 4, 5, 7\}$

(ii) $\{1, 2, 3, 4\}$

(iii) $\{1, 2, 3, 5\}$

(iv) $\{1, 2, 3, 6\}$

(c) If A is a finite set with n elements, the number of elements in the largest equivalence relation of A is

(i) 1 *(ii)* n

(iii) n^2 *(iv)* $n+1$

(d) If R be a symmetric and transitive relation on a set A, then

(i) R is reflexive and hence an equivalence relation

(ii) R is reflexive and hence a partial order

(iii) R is not reflexive and hence not an equivalence relation

(iv) None of the above

(e) If $f : A \to B$ be a function, and let E and F be subset of A, consider the following statement about image :

$S_1 : f(E \cup F) = f(E) \cup f(F)$

$S_2 : f(E \cap F) = f(E) \cap f(F)$

Which of the following is 'true' about S_1 and S_2

(i) Only S_1 is correct

(ii) Only S_2 is correct

(iii) Both S_1 and S_2 are correct

(iv) None of S_1 and S_2 are correct

(f) If n elements are to be sorted using merge sort, the worst case time complexity could be

(i) $O(n)$

(ii) $O(1)$

(iii) $O(\log_2 n)$

(iv) $O(n^2)$

(g) The number of distinct simple graph with up to three node is

(i) 10

(ii) 15

(iii) 7

(iv) 9

(h) The total number of edges in a complete graph of n vertices is

(i) n

(ii) $\frac{n}{2}$

(iii) $n^2 - 1$

(iv) $\frac{n(n-1)}{2}$

(Continued)

2. Answer any *four* of the following questions : 4×4=16

(a) Show that

$$A \cap (B - C) = (A \cap B) - (A \cap C)$$

(b) Solve the recurrence relation

$$t_n = 4(t_{n-1} - t_{n-2})$$

subject to initial condition $t_n = 1$ for $n = 0$ and $n = 1$.

(c) Find the generating function of a sequence

$$a_r = \frac{1}{(r+1)!},\ r = 0, 1, 2, \cdots$$

(d) Find the coefficient of x^{18} in

$$(x + x^2 + x^3 + x^4 + x^5)(x^2 + x^3 + x^4 + \cdots)^5$$

(e) Show that 2^x is in $O(3^x)$ but 3^x is not in $O(2^x)$.

(f) A connected planar graph has 6 vertices each of degree 4. Determine the number of regions into which this planar graph can be splitted.

(Turn Over)

3. Answer any *eight* of the following questions : $7\times8=56$

(a) What is composition of function? If A, B, C and D are four sets and f, g and h are three functions (or mappings) defined as

$$f : A \to B,\ g : B \to C \text{ and } h : C \to D$$

then prove that $(h \circ g) \circ f = h \circ (g \circ f)$.

(b) Show that a connected planar graph with n vertices and e edges has $e - n + 2$ faces.

(c) Explain the shortest path algorithm of a graph.

(d) Use generating function to solve the recurrence relation

$$a_{n+2} - 2a_{n+1} + a_n = 2^n,\ a_0 = 2,\ a_1 = 7$$

(e) What is meant by growth of functions? If $f(x) = (x+1)\log(x^2+1)$, estimate the growth of $f(x)$.

(f) Explain floor and ceiling functions with their graph.

(Continued)

(g) Use recursive formula of summation together with mathematical induction to prove that for all positive integers n, if $a_1, a_2, \cdots, a_n$ and c are real numbers, then

$$\sum_{i=1}^{n} ca_i = c\left(\sum_{i=1}^{n} a_i\right)$$

(h) What are tautology and logical equivalence? Show that

$$[(p \wedge q) \vee (q \wedge r) \vee (r \wedge p)] \Leftrightarrow [(p \vee q) \wedge (q \vee r) \wedge (r \vee p)]$$

(i) What is spanning tree? Write the algorithm to find a minimum spanning tree for connected weighted graph with n vertices and m edges.

(j) What is inverse function? If the function $f : R \to R$ be defined by $f(x) = x^2 + 3$, then find $f^{-1}(3)$ and $f^{-1}(11)$.

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