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PES UNIVERSITY

UE17CS151

End Semester Assessment (ESA) B. Tech. 2nd SEMESTER – Jan - May-2018
UE17CS151 - PROBLEM SOLVING WITH C

Time: 3 Hrs. | Answer All Questions | Max Marks: 100

1	a	Find the values of expression and/or variables or indicate errors if any.
		i) 10 / 3 * 3
		ii) 10 == 10 == 10
		iii) int a = 10; a ++ ++;
		iv) int a = 1; int res = a-- == 0 || 2;
		v) ~~5
			5

	b	A rectangle is defined by co-ordinates of the bottom left corner (x1, y1) and of the top right corner (x2, y2). i) Given a point (x, y), write an expression in C which returns true if the point lies within the rectangle otherwise false. ii) find the length of the diagonal of the rectangle	4

	c	int c = 0;
		for(int x = n; x; x -= 2)
		c++;
		printf("c : %d\n", c);
		
		Study the code and answer the following questions.
		i) what happens if n = 10 ?
		ii) what happens if n = 11 ?
		iii) what is the semantics of c?
			2+ 2+2

	d	A chess board has 8 rows and 8 columns. A queen in chess can move rowwise, columnwise and diagonally. If a queen is placed at position (r, c), 1 <= r <= 8 and 1 <= c <= 8, write a C program to find all squares which are under control of the queen. Express each square as a pair of numbers – row number and column number.	5

2	a	int foo(int n)
		{
		if(n == 0)
		return 0;
		else
		return 1 + foo(n / 10);
		}
		What does the function return for the following? Show the stackframes.
		foo(123)?
		What does the function do?
			3 + 1

	b	int what(int a[], int n)
		{
		int res = 0;
		for(int i = 0; i < n; ++i)
		{
		res = res ^ a[i];
		}
		return res;
		}
			4 + 1

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		Find the output. int a[] = {11, 44, 11, 33, 44}; printf("%d", what(a, 5)); What does the function do?	

	c	Write a function to replicate a given string n times. Assume that the given string has enough space. You may use functions in the string library.
		void str_replicate(char* s, int n)
		{
		// ToDo
		}
			4

	d	i) State the three pointer arithmetic operations allowed.
		ii) What is the output and what will change?
		int a[] = {11, 22, 33, 44}; int *p = a + 2; printf("%d", (*p)++);
		iii) What is the output and what will change?
		int a[] = {11, 22, 33, 44}; int *p = a + 2; printf("%d", *p++);
			3 + 2 + 2

3	a	int is_magic(int a[][20], int n, int sum)
		{
		// TODO
		}
		Write a function to check whether given two dimensional square matrix(n X n) is magic square where each row, each column and every diagonal add upto the same sum.
		Return 1 if it is a magic square, 0 otherwise.
			5

	b	struct person
		{
		char name[20];
		int age;
		};
		typedef struct person person_t;
		int are_equal(const person_t* x, const person_t* y)
		{
		// to fill
		}
		We would like to compare the two structures for equality. Comment about the following possibilities.
		i) return x == y;
		ii) return x→name == y→name && x→age == y→age
		iii) return strcmp(x→name, y→name) == 0 && x→ age == y→age;
			6

	c	struct person
		{
		char name[20];
		int age;
		};
		typedef struct person person_t;
		double find_average(const person_t a[], int n)
		{
		// TODO
		}
		Write a function to find the average age of n persons.
			4

	d	struct node	2 + 3

		{
		int key;
		struct node* link;
		};
		typedef struct node node_t;
		node_t* find(node_t* head, int key)
		{
		while(head->key != key && head != NULL)
		{
		head++;
		}
		return head;
		}
		The above code is supposed to find the leftmost occurrence of key in a linked list.
		i) This function has two logical errors. Indicate and correct them
		ii) Change this to find the rightmost occurrence of the key.	

4	a	int is_sorted(int a[], int n)
		{
		int sorted = 0;
		for(int i = 0; i < n; ++i)
		sorted = a[i] < a[i + 1];
		return sorted;
		}
		This function is supposed to find whether the array is sorted in non-decreasing order. Comment and correct if there are logical errors.
			4

	b	struct Rect
		{
		int length;
		int breadth;
		};
		typedef struct Rect rect_t;
		void sort_rect(rect_t r[], int n, int (*compare)(const rect_t*, const rect_t*));
		The function sort_rect sorts an array of rectangles based on the callback compare.
		
		Write functions which can be passed as the argument for the callback compare of sort_rect which will arrange the rectangles
		i) in the increasing order of area
		ii) in the order of length and if lengths are same, in the order of breadth
			4

	c	struct student
		{
		char name[20];
		unsigned int p : 8;
		unsigned int c : 8;
		unsigned int m : 8;
		unsigned int b : 8;
		};
		typedef struct student student_t;
			6

		student_t find_highest(const student_t s[], int n)
		{
		// TODO
		}
		The student structure holds the name and the marks in subjects p, c, m and b. The last 4 are stored in bitfields to save space.
		Complete the function to find the student with the total highest score.	

	d	An array has 0s and 1s and has been sorted. Write a function to find the rightmost 0 using the concept of binary search.	6

5	a	Find the outputs or undefined behavior when the following block is executed.
		{
		int a = 10;
		int *p = &a;
		int b = 20;
		{
		int a = 30; int c = 50;
		printf("%d %d %d\n", a, b, *p);
		p = &c; b = c;
		}
		printf("%d %d %d\n", a, b, *p);
		}
			6

	b	You are given a file in.dat which has a few integers. Write a program to process this file, read the integer values and write them back in reverse to a file called out.dat. Example: if in.dat contains the following in.dat : 10 40 20 50 30 then when the program is executed, the out.dat should contain out.dat: 30 50 30 40 10	5

	c	#define mul(x, y) x * y
		#define MAX 10
		#define MIN 5
		#define TEMP MAX + MIN
		int main()
		{
		printf(“val : %d\n”, mul(MAX + 1, MIN – 1));
		#define MAX 20
		printf(“val : %d\n”, mul((MAX + 1), MIN – 1));
		printf(“temp : %d\n”, TEMP);
		}
			2 + 2 + 1

	d	This file x.c is compiled as follows.
		$ gcc x.c -o x
		int main(int argc, char* argv[])
		{
		// has some code
		}
		and is run as
		$ ./x we love all
		i) what type is argv[0] and what is its value?
		ii) What are the values of argc and argv[argc]?
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