

[There are *seven* questions. Answer *any five*. Marks are indicated in the right margin. Assume that notation and terms used in this question paper refer to those of the programming language *C*.]

1. a. What is a statement? Cite examples of four different types of simple statements. 1+2
 b. Explain the types of functions that are used in programs. 3
 c. What do you know about binary arithmetic operators? 4
 d. Write a program that receives a whole number x and a big number y that may have a fractional part. The program calculates and displays $(x + \sqrt{y})^2$. All input and output are arranged with appropriate text messages. 4
2. a. When a selection statement is said to be nested? Explain the concept of nested selection statements with the help of a flowchart diagram. 1+2
 b. How do the '++' and '!' operators work? 3
 c. Comment on each of the components of the following line taken from a program. 3


```
while(ch != '.' && i < 25)
```
3. A character and two numbers are entered through keyboard. If the character is 'a' or '+', the sum of the numbers are displayed, but if it is 'm' or '*' then the product of the numbers are displayed. In all other cases, 'No action performed!' is displayed. Note that small and capital letters are treated equivalently. Further, all input are arranged in the 'main', but the calculations and output are arranged in another function. Write a program to perform all those. 5
- a. Explain the general form of a 'do-while' loop with the help of a flowchart diagram. 3
 b. Illustrate with three different examples the fact that the 'for' loop is very flexible. 4
 c. Develop a program, with a discussion about memory requirements and a pseudo code that describes the major steps of calculation, to find the sum of 1st n terms of the following series. 1+2+4

$$1/(2+1^2), 1/(3+2^2), 1/(4+3^2), 1/(5+4^2), 1/(6+5^2), \dots$$
- Assume that m players of a cricket team have batted in all n matches of a tournament. Scores of runs by each player in each match are known. You need to arrange entry of m, n and the scores, and display the average score of each player and also the average score of the team per match. Write a program to arrange all those. 5

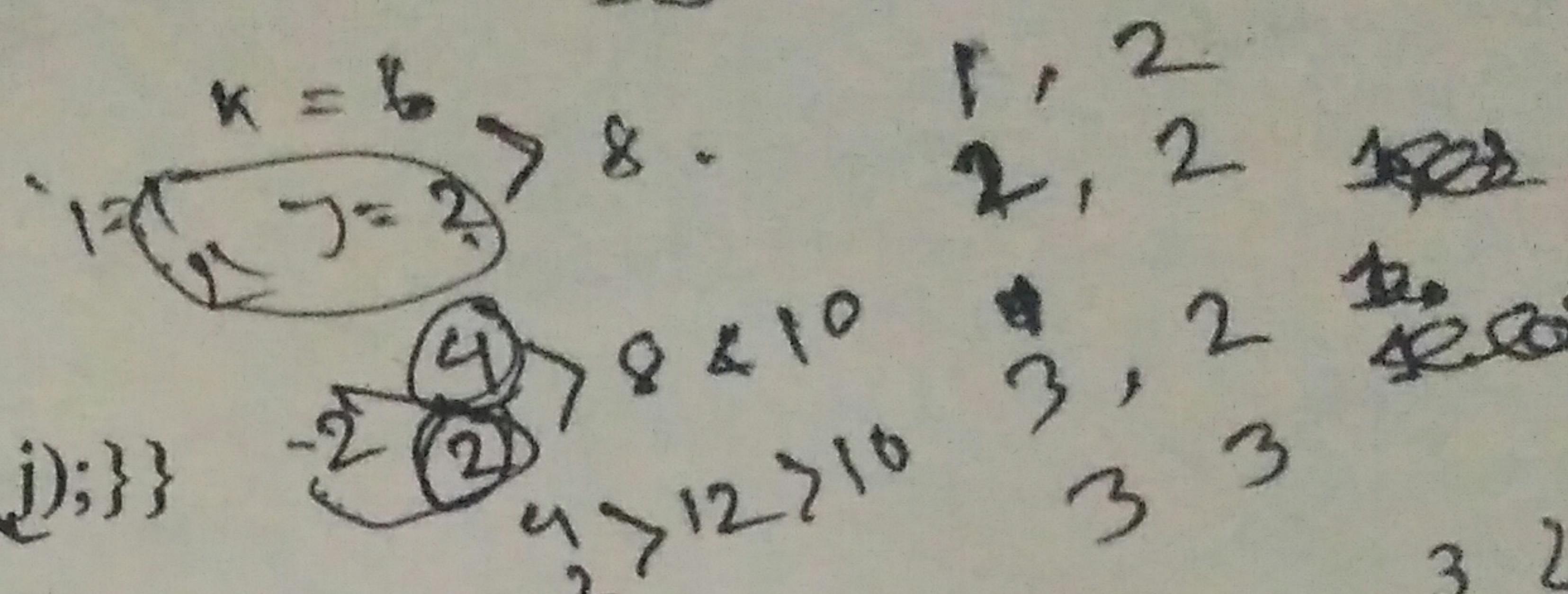
Sample data:
 3 → m
 2 → n
 1 → p1
 2 → p2
 3 → p3
 55 → s1
 31 → s2
 43 → s3
 9 → s4
 26 → s5
 17.5 → s6
 68 → s7
 13 → s8
 40.5 → s9

Player	Match		Player average	Team average
	1	2		
1	55	31	43	101
2	9	26	17.5	
3	68	13	40.5	

6. Show the output of the following code segment as will be displayed upon its execution with necessary support and input sequence of three numbers 6, 4, 3.

```

int i, j, k;
for(i=1; i<=3; i++)
{ scanf("%d", &k);
  for(j=2; j<=5; j=j+2)
    { if (j*k >= 10) break; printf("%d\t%d\n", i, j); }}
```



- c. Describe the characteristics of recursive functions.

- d. What do you know about 'case' and 'default'?

5. a. Write a program that arranges entry into a one-dimensional array of 1000 whole numbers and then stores sequentially in another array the average of each 25 consecutive elements of the 1st array. The content of the 2nd array needs to be displayed.

Reduced (1000 to 6, 25 to 2) sample :

1 st array						2 nd array		
0	1	2	3	4	5	0	1	2
9	3	2	21	7	11	6	11.5	9

- b. Explain with examples in diagrams how 'strcmp' and 'strstr' functions work.

- c. Give an illustrative example of declaration, memory allocation, initialization and accessing of global and local structure variables and arrays of structures.

6. a. Hourly visit counts to a website for 7 days of a week have been recorded in a 7x24 matrix. You need to get the matrix data into a two-dimensional array and store the count of the busiest hour of each day as an element of another array. You need also to display the busiest hour with its visit count for each of the days. Write a program to perform all those.

Reduced 1st array (for visit counts):

Day index	Hour index				
	0	1	2	3	4
0	5	9	25	18	6
1	3	2	8	12	28
2	5	10	6	4	1

Reduced 2nd array
(for busiest hours):

0	3
1	5
2	2

Display:

3: 25
5: 28
2: 10

- b. What do you know about tables of strings?

- c. Illustrate how strings can be converted to numbers.

- d. Describe one important application of arrays in data management.

7. a. Explain with examples and memory maps the use of pointer operators.

- b. Write a two-function program to find the average of the central 25 elements of an array of 75 floating point numbers. You need to arrange input and output in the 'main', while the calculation in the other function.

- c. Illustrate using diagrams how an ordered linked list can be managed using pointers.