



Note: Assume any data required, state your assumption clearly.

Answer all the following Questions:-

Question (1) (16 Marks)

1-a) What will be displayed when the following programs are executed? (Write also the processes made in the computer) (All parts carry equal Marks)

i)
 $d = 3 : p = 5 : r = 3 : t = 5 : s = 6 : y = 3$
 IF $s > y$ OR $t = d$ AND $p < 5$ OR NOT $y = r$ THEN
 PRINT "True"
 ELSE
 PRINT "False"
 END IF
 ")
 DIM a(3)
 READ n
 FOR i = 1 TO 3
 $a(i) = n \text{ MOD } 10$
 $n = \text{INT}(n / 10)$
 NEXT i
 FOR i = 0 TO 2
 FOR j = 0 TO 2
 IF $i = j$ THEN 1
 FOR k = 0 TO 2
 IF $k = i$ OR $k = j$ THEN 2
 PRINT $a(1) * 10^i + a(2) * 10^j + a(3) * 10^k$;
 2 NEXT k
 1 NEXT j
 NEXT i
 DATA 456
 ND

iii)
 $a\$ = \text{"ahmad mohammad ALY ibrahim"}$
 $n = \text{LEN}(a\$)$
 $b\$ = \text{LEFT\$}(a\$, 1)$
 $c\$ = \text{UCASE\$}(b\$)$
 FOR i = 2 TO n
 $b\$ = \text{MID\$}(a\$, i, 1)$
 IF $k \geq 1$ THEN $m = 1$ ELSE $m = 0$
 IF $b\$ = \text{" "}$ THEN $k = k + 1$ ELSE $k = 0$
 IF $m = 1$ THEN $c\$ = c\$ + \text{UCASE\$}(b\$)$ ELSE
 $c\$ = c\$ + \text{LCASE\$}(b\$)$
 NEXT i
 PRINT c\$

iv)
 READ n
 FOR i = 2 TO n
 FOR j = 2 TO i - 1
 IF $i \text{ MOD } j = 0$ THEN 1
 NEXT j
 DO UNTIL $n \text{ MOD } i < > 0$
 PRINT i
 $n = n / i$
 LOOP
 IF $n = 1$ THEN END
 1 NEXT i
 DATA 60

Question (2) (14 Marks)

2-a) What the following QBASIC functions do: (write your answer in a table) (4 Marks)

SGN(x), ATN(x), LOG(x), EXP(x), INSTR(a\$, b\$), SQR(x), ASC("a"), STR\$(12345)

2-b) what the output of the following functions (write your answer in a table) (3 Marks)

INT(-5.7), CINT(-5.7), FIX(-5.7), INT(5.7), CINT(5.7) and FIX(5.7)

2-c) Write a computer program to calculate the series $S = 1 + 1/2! + 1/3! + 1/4! + 1/5! + \dots + 1/N!$
 For any number N (N should be positive integer input) (7 Marks)

Question (3) (15 Marks)

3-a) Differentiate between user defined functions and subroutines (3 Marks)

3-b) Gauss-Jordan elimination is a method to find the inverse of a matrix, A in the following steps:

Step 1: Write the matrix in the following form

$$[A \ I] \equiv \begin{bmatrix} a_{11} & \dots & a_{1n} & 1 & 0 & \dots & 0 \\ a_{21} & \dots & a_{2n} & 0 & 1 & \dots & 0 \\ \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{n1} & \dots & a_{nn} & 0 & 0 & \dots & 1 \end{bmatrix}$$

Where I is the identity matrix,

Step 2: Use Gaussian elimination to obtain a matrix of the form

$$\begin{bmatrix} 1 & 0 & \dots & 0 & b_{11} & \dots & b_{1n} \\ 0 & 1 & \dots & 0 & b_{21} & \dots & b_{2n} \\ \vdots & \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & 1 & b_{n1} & \dots & b_{nn} \end{bmatrix}$$

Step 3: The matrix B is the inverse of matrix A

$$B \equiv \begin{bmatrix} b_{11} & \dots & b_{1n} \\ b_{21} & \dots & b_{2n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \dots & b_{nn} \end{bmatrix}$$

Write a computer program to calculate and print out the inverse of matrix A. You should call one subroutine twice in step 2. (12 Marks)

Question (4) (15 Marks)

Suppose you have the students' exam data in six courses stored in a data file "c:\test.dat". The data in the file is stored as the sample shown below (the number of student in the file is unknown)

Ac. Number	Name	S1	S2	S3	S4	S5	S6
12456	Ahmed	70	90	80	75	83	71
12701	Basem	60	50	55	61	57	70

You are asked to write a computer program to do the following tasks

- Count and print the number of students in the given file (2 marks)
- Calculate the total marks of each student (2 marks)
- Arrange the student according to their total mark (from highest to lowest) if more than one student have the same total mark then they should be sorted alphabetically and store the results in "c:\mark.dat" (4 marks)
- Create a new table for the student grades and print the results in "c:\grade.dat" use the following conditions: (Use subroutine for this task) (3 marks)

Mark	<50	50 but <65	65 but <75	65 but <75	85
Grad	Failed	Pass	Good	V. Good	Excellent

- Create a histogram for the results in each subject (this can be done by counting the number of students in each grade) (2 marks)
- Print out the highest and lowest degree in each subject (2 marks)

GOOD LUCK

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