Section III

20 marks
Attempt either Question 24 or Question 25
Allow about 35 minutes for this section

Answer the question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

Marks

Question 24 — Evolution of Programming Languages (20 marks)

(a) For each of the code fragments, identify the programming paradigm used. Justify your response by describing the features of the paradigm evident in each example. **3**

FRAGMENT 1

```
hair(sally,red).
hair(john,brown).
hair(sue,black).

?–hair(sally,X)
```

FRAGMENT 2

```
(setq friends '((sally red) (john brown) (sue black)))

(defun hair (y)
        (loop for x in '(0 1 2)
                when (member y (nth x friends)) do
                (print (cdr (nth x friends)))))

(hair 'sally)
```

(b) Discuss the reasons for the emergence of the object-orientated programming paradigm. **5**

Question 24 continues on page 19

Marks

Question 24 (continued)

(c) This small program was written to calculate the area of rectangles. The program should stop when the user enters 0 as the height of the rectangle.

```
1  program test;
2  uses
3          Objects;
4  type
5          PRectangle =^TRectangle;
6          TRectangle = object (TObject)
7          private
8                  height, width : integer;
9          public
10                 function area:integer;
11         end;
12 function TRectangle.area:integer;
13 begin
14         area :=(height*width);
15 end;
16 var
17         InstRectangle : TRectangle;
18 {Code section ***************************}
19 begin
20         while InstRectangle.height <> 0 do
21         begin
22                 write('Enter height');
23                 readln(InstRectangle.height);
24                 write('Enter width');
25                 readln(InstRectangle.width);
26                 writeln('The area is ', InstRectangle.area);
27         end;
28 end.
```

(i) When this program is run, nothing happens. Describe the logic error located between lines 18 and 28, and describe TWO methods of correcting this error. **3**

(ii) The user would also like the program to be able to calculate the area of a triangle, using the formula: area $= \frac{1}{2} \times$ base $\times$ height. Write a definition for a triangle, to be added to this program. **3**

Question 24 continues on page 20

Marks

Question 24 (continued)

(d) Justify the programming paradigm you would choose to develop the system described below. **6**

A new international airport will be installing a computer-controlled baggage sorting system. Each piece of baggage will have a bar-coded label attached to it that indicates the destination and class of the passenger. The baggage will move along a conveyor belt until it reaches the chute assigned to its category, into which it will be automatically tipped. At the bottom of the chute, unloaders will pick up the baggage and load it onto trolleys to be transported to the aircraft.

At the beginning of each day, the day's flight schedule will be loaded into the system, and the number of chutes required for each flight determined using the default of one chute per destination and class. The system will determine where bottlenecks may occur, or where the number of chutes required can be compressed. Automatic 'Compression Rules' are to be used. Chutes will then be assigned to each destination and class. Chute assignments will be automatically changed by the system as the number of people booked on any flight varies throughout the day.

End of Question 24

OR