

8 (a) Outline the purpose of lexical analysis during the compilation of a program.

[2]

(b) Write the Reverse Polish Notation (RPN) for the given infix expression:

$(2 - 6) * (13 + 7) / 5$

[2]

(c) The RPN expression:

$d \ a \ b \ + \ * \ c \ a \ - \ /$

is to be evaluated, where:

$a = 6, \ b = 12, \ c = 15 \text{ and } d = 5.$

Show the changing contents of the stack as the RPN expression is evaluated.

[4]

8 (a) State the purpose of the optimisation stage in the compilation of a program.

[1]

(b) Convert this Reverse Polish Notation (RPN) back to its original infix form:

a b - c + c a - * d /

[3]

(c) The RPN expression:

c a / b d - * b +

is to be evaluated, where:

a = 3, b = 16, c = 9 and d = 6.

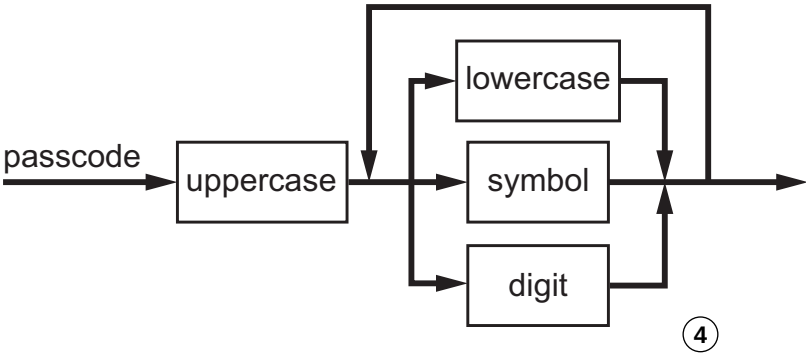
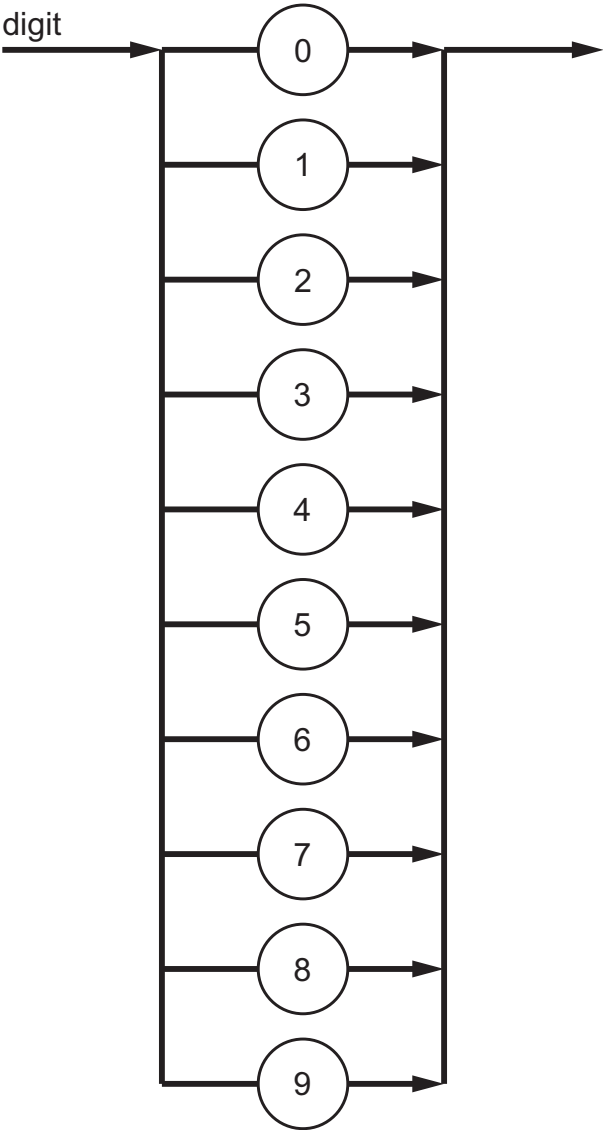
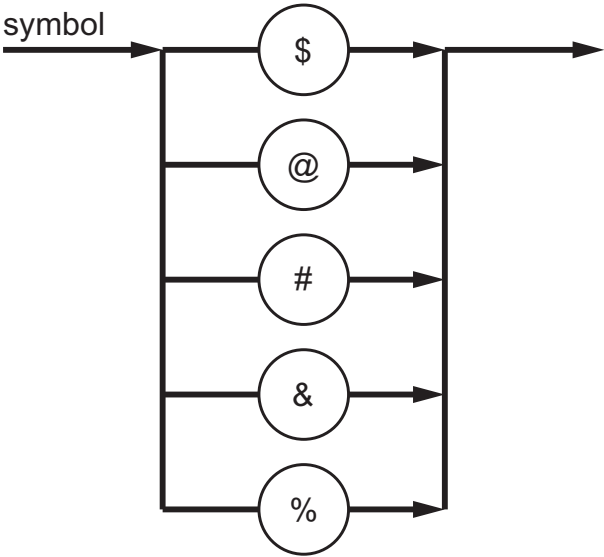
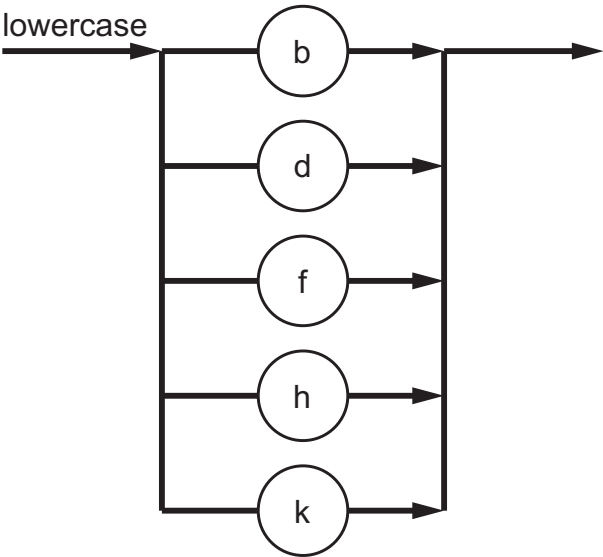
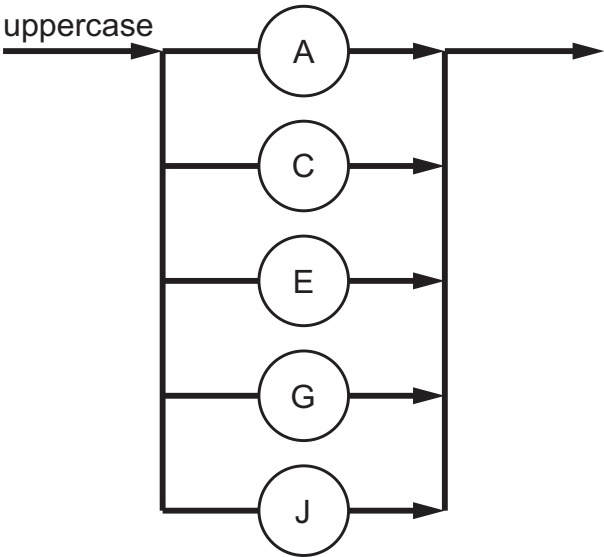
Show the changing contents of the stack as the RPN expression is evaluated.

[4]

6 Describe the process of executing a program using an interpreter.

[4]

7 Several syntax diagrams are shown.



(a) State why each **passcode** is invalid for the given syntax diagrams.

#Jd7

Reason
.....

C%6A

Reason
.....

[2]

(b) Complete the Backus-Naur Form (BNF) for <uppercase> and <passcode>.

<uppercase> ::=
.....

<passcode> ::=
.....
.....
.....
.....
.....
.....

[4]

8 Explain what is meant by **lexical analysis** during program compilation.

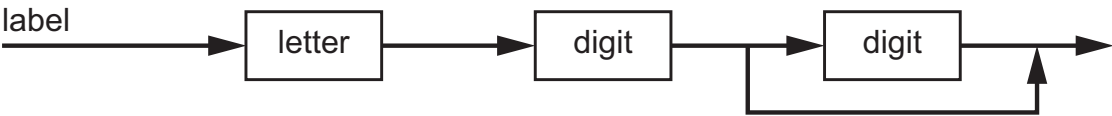
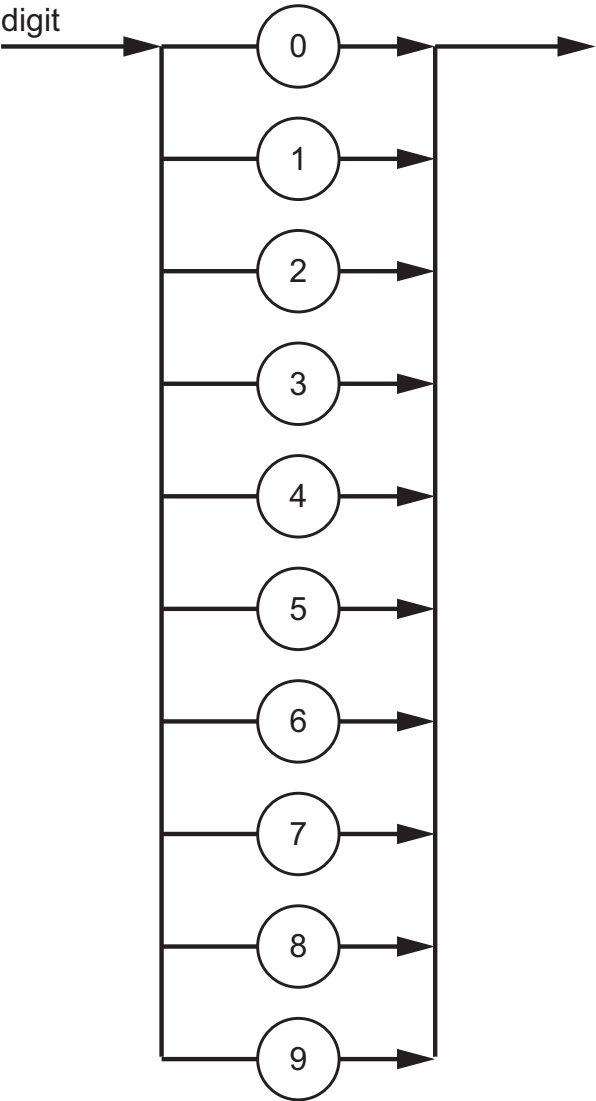
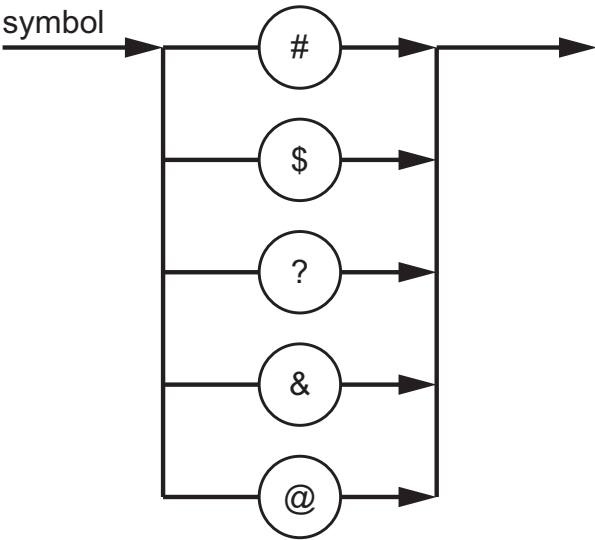
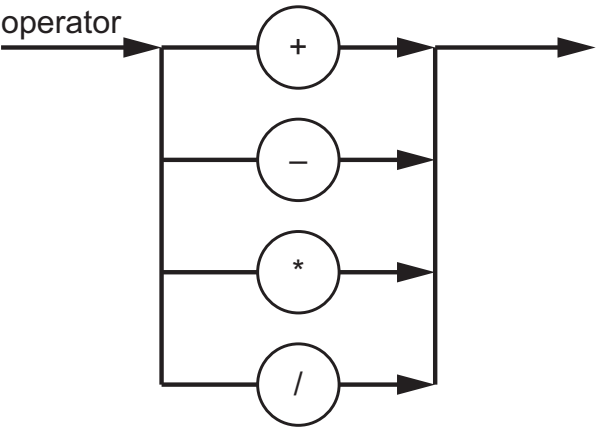
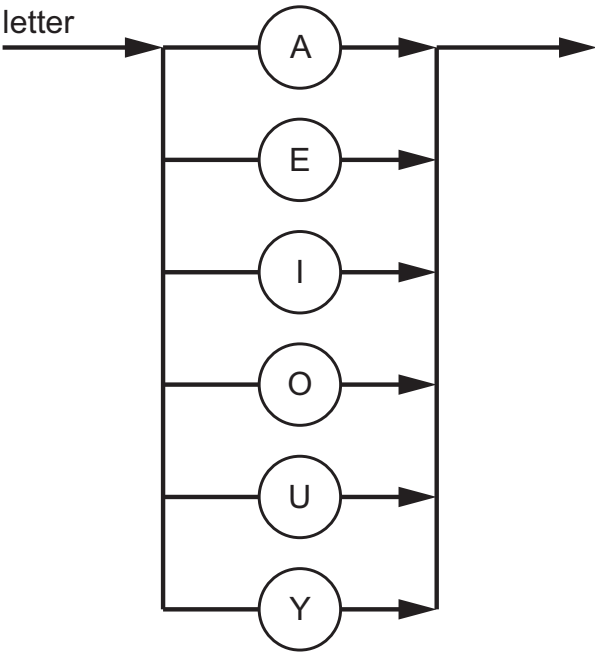
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[4]

8 Explain the process of **syntax analysis** during program compilation.

[4]

10 Several syntax diagrams are shown.



(a) Complete the Backus-Naur Form (BNF) for the given syntax diagrams.

<operator> ::=

.....

<label> ::=

.....

<equation> ::=

.....

[4]

(b) A new syntax rule, **password**, is required. It must begin with a letter or a symbol, followed by a digit and end with one or two symbols.

(i) Draw a syntax diagram for **password**.

[3]

(ii) Write the BNF for **password**.

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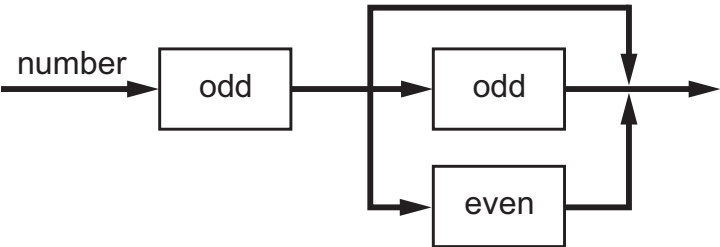
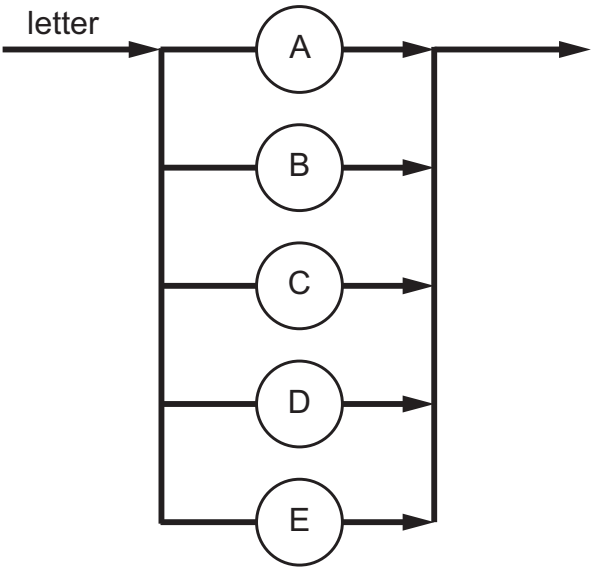
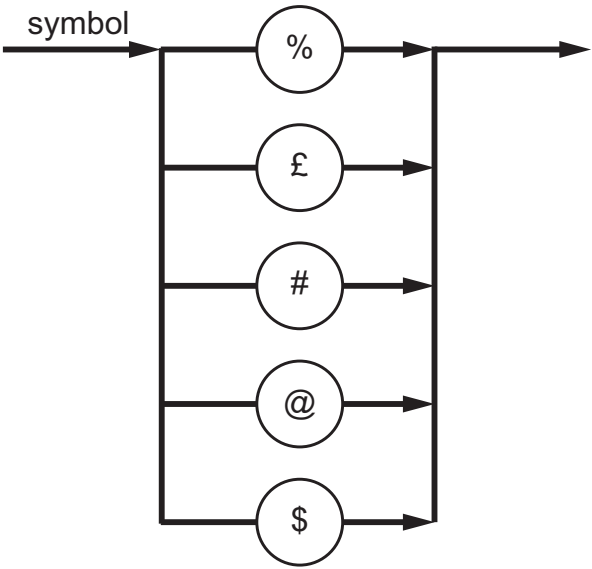
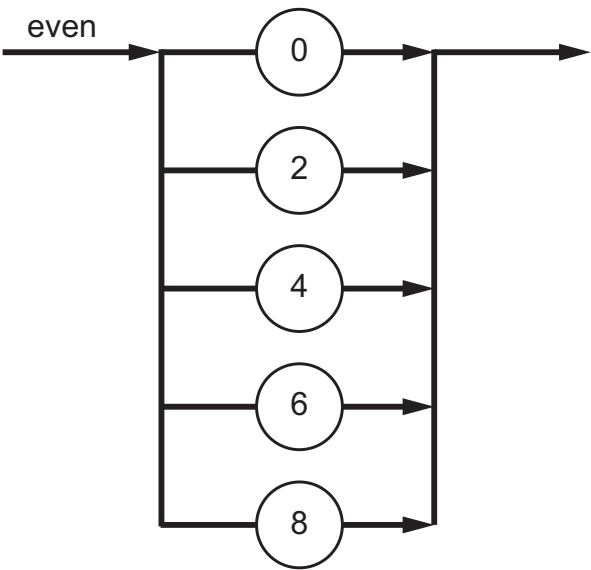
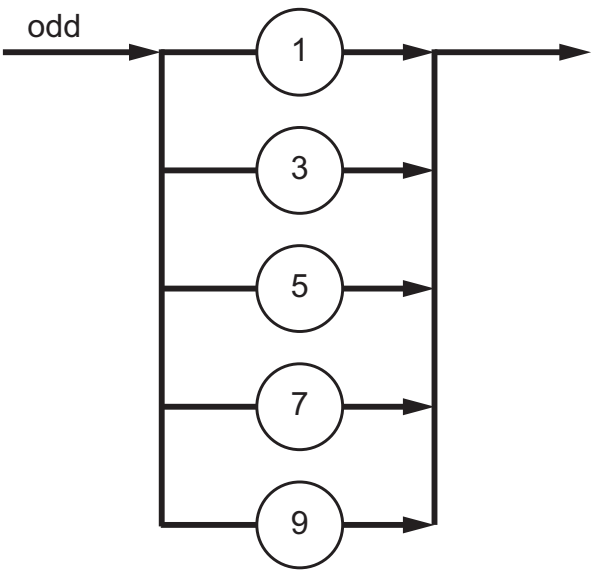
.....

.....

.....

[2]

7 Several syntax diagrams are shown.



(a) State why each number is invalid for the given syntax diagrams.

21

Reason
.....

123

Reason
.....

[2]

(b) Complete the Backus-Naur Form (BNF) for the given syntax diagrams.

<symbol> ::=
.....

<number> ::=
.....

[2]

(c) A new syntax rule, **code**, is required. It must begin with a letter, followed by one or two numbers, and end with a symbol.

(i) Draw a syntax diagram for **code**.

[3]

(ii) Write the BNF for **code**.

.....
.....
.....
..... [2]