

Past Papers May/June 2015 to 2018:

9608/43/M/J/15

Q.6 A recursively defined procedure X is defined below:

```

PROCEDURE X(BYVALUE n : INTEGER)
  IF (n = 0) OR (n = 1)
  THEN
    OUTPUT n
  ELSE
    CALL X(n DIV 2)
    OUTPUT (n MOD 2)
  ENDIF
ENDPROCEDURE

```

(a) Explain what is meant by recursively defined.

.....
 [1]

(b) Explain how a stack is used during the execution of a recursive procedure.

.....

 [2]

(c) Dry run the procedure X by completing the trace table for the procedure call:
CALL X(40)

Call number	n	(n = 0) OR (n = 1)	n DIV 2	n MOD 2
1	40	FALSE	20	
2				
3				
4				
5				
6				

OUTPUT [6]



(d) State the process that is carried out by procedure X.

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..... [1]

(e) Write program code for procedure X.

Programming language

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.....
..... [5]

Answers
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6 (a) A procedure that calls itself // is defined in terms of itself [1]

(b) Before procedure call is executed current state of the registers/local variables is saved onto the stack. When returning from a procedure call the registers/local variables are re-instated [2]

(c)

Call number	n	(n=0) OR (n=1)	n DIV 2	n MOD 2
1	40	FALSE	20	0
2	20	FALSE	10	0
3	10	FALSE	5	0
4	5	FALSE	2	1
5	2	FALSE	1	0
6	1	TRUE		

1 mark 1 mark 1 mark

OUTPUT 101000 – 1 mark for each pair of bits. [6]



