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COMPUTER SCIENCE **9608/41**

Paper 4 Written Paper **October/November 2017**

MARK SCHEME

Maximum Mark: 75

Published

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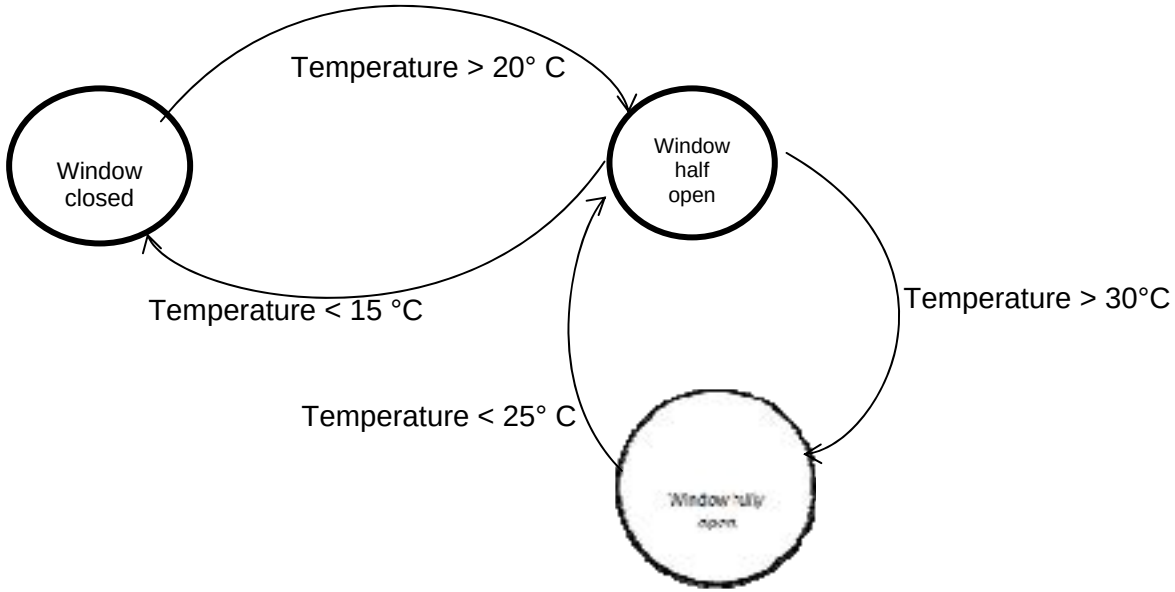
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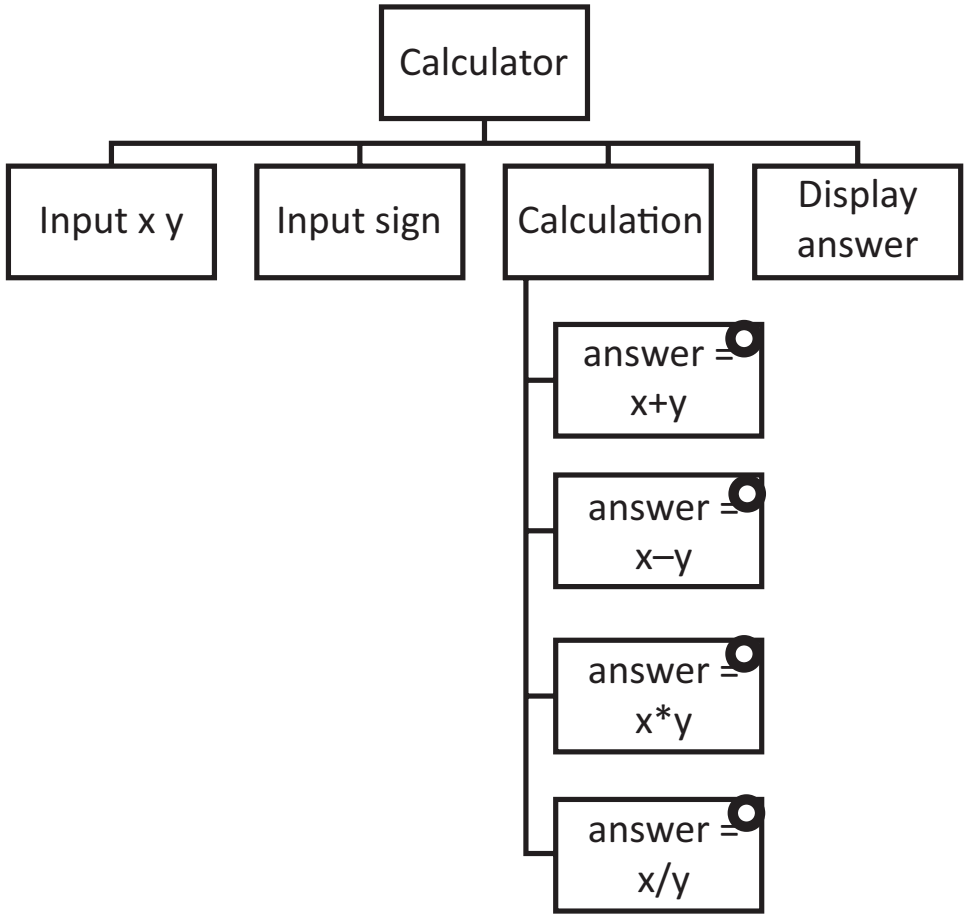
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Question	Answer	Marks
1	1 mark for each completed statement 	**7**

Question	Answer	Marks
2(a)(i)	• Asterisk (*) in the corner/top of the box(es)	**1**
2(a)(ii)	• Circle (o) in the corner/top of box(es)	**1**

Question	Answer	Marks
2(b)	1 mark per bullet • Inputting 2 numbers, stored in x and y • Inputting sign Selection used for all four calculations • .. underneath an appropriate box at level 1 • Displaying the answer For example:  	**5**

Question	Answer	Marks
3(a)	1 mark per clause • `person(mimi).` • `food(lettuce).` • `likes(mimi, chocolate).` • `dislikes(mimi, sushi).` • `dislikes(mimi, lettuce).`	**5**
3(b)	1 mark per answer `chocolate, pizza`	**2**

3(c)	1 mark per bullet
	• `might_like(`**`B,A`**`)`
	• `Person(B)`
	• `Food(A)`
	• `AND`
	• `AND NOT`
	• `Dislikes` predicate
	
	For example:
	
	`might_like(B, A).`
	
	`IF person(B) AND food(A)`
	
	`AND NOT(dislikes(B, A)).`
		6

Question	Answer	Marks
4(a)		**11**

Label	Op code	Operand	Comment	Marks
START:	LDM	#63	// load ASCII value for '?'	
	OUT		// OUTPUT '?'	1
	IN		// input GUESS	1
	CMP	LETTERTOGUESS	// compare with stored letter	1
	JPE	GUESSED	// if correct guess, go to GUESSED	1
	LDD	ATTEMPTS	// increment ATTEMPTS	1
	INC	ACC		1
	STO	ATTEMPTS		1
	CMP	#9	// is ATTEMPTS = 9 ?	1
	JPE	ENDP	// if out of guesses, go to ENDP	1
	JMP	START	// go back to beginning of loop	1
GUESSED:	LDM	#42	// load ASCII for '*'	
	OUT		// OUTPUT '*'	1
ENDP:	END		// end program	
ATTEMPTS:	0			
LETTERTOGUESS:	'a'			

Question	Answer	Marks
4(b)		**10**

Label	Opcode	Operand	Comment	Mark
START:	LDR	#0	// initialise the Index Register	1
LOOP:	LDX	NUMBERS	// load the value from NUMBERS	1 (LOOP) + 1(LDX NUMBERS)
	LSL	#2	// multiply by 4	1 (LSL) + 1 (#2)
	STX	NUMBERS	// store the new value in NUMBERS	1
	INC	IX	// increment the Index Register	1
	LDD	COUNT	// increment COUNT	1
	INC	ACC		
	STO	COUNT		
	CMP	#5	// is COUNT = 5 ?	1
	JPN	LOOP	// repeat for next number	1
ENDP:	END			
COUNT:	0			
NUMBERS:	22			
	13			
	5			
	46			
	12			

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Question	Answer	Marks
5(a)(i)	PERT / GANTT	**1**
5(a)(ii)	1 mark per bullet to max 3 For example: • Calculate total minimum time required for project • Identify milestones • Task dependencies • Provides the critical path analysis • Identify which tasks need to be prioritised • Determine when to begin specific tasks/stages • Identify slack time • Identify when resources need allocating • Identify tasks that can be completed in parallel	**3**
5(b)(i)	Integration	**1**
5(b)(ii)	Beta / acceptance	**1**

Question	Answer	Marks
6(a)	1 mark per bullet to max 6 • Declaring a class with the name animal • Declaring variables for across, down and score (all Integers) • …as private/protected • Correct constructor header and ending • Randomly generating an across between 0–39 inc. in constructor • Randomly generating a down between 0–39 inc. in constructor • Initialising Score to zero in constructor • Correct get for `Across` • Correct set for `Across`	**6**

Question	Answer	Marks
6(a)	Example: VB Class Animal Private Across As Integer Private Down As Integer Private Score As Integer Function GetAcross() Return Across End Function Sub SetAcross(Value As Integer) Across = Value End Sub Sub New() Randomize() Across = randomnumber.Next(0, 40) Down = randomnumber.Next(0, 40) Score = 0 End Sub End Class	

Question	Answer	Marks

6(a)	or
	
	`Class Animal`
	`  Private Across As Integer`
	`  Property _Across As Integer`
	`  Get`
	`  Return _Across`
	`  End Get`
	`  Set(Value As Integer)`
	`  Across = Value`
	`  End Set`
	`  End Property`
	`  Private Down As Integer`
	`  Private _Score As Integer`
	`  Sub New()`
	`  Randomize()`
	`  Across = randomnumber.Next(0, 40)`
	`  Down = randomnumber.Next(0, 40)`
	`  _Score = 0`
	`  End Sub`
	`End Class`
	
	`Example: Python`
	`class Animal :`
	`  def __init__ (self) :`
	`  x = random.randint(0,39)`
	`  y = random.randint(0,39)`
	`  self.Across = x`
	`  self.Down = y`
	`  self.Score = 0`
	
	`  def SetAcross(A) :`
	`  self.Across = A`
	
	`  def GetAcross() :`
	`  return self.Across`	

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Question	Answer	Marks

6(a)	Example: Pascal
	type
	Animal = class
	private
	Across: integer;
	Down: integer;
	score: integer;
	public
	constructor init;
	
	procedure SetAcross(AcrossV: integer);
	function GetAcross(): integer;
	end;
	
	constructor Animal.init();
	SetAcross(random(40));
	SetDown (random(40));
	SetScore (0);
	end;
	
	procedure Animal.SetAcross(AcrossV: integer);
	begin
	Across := AcrossV;
	end;
	
	function Animal.GetAcross(): integer;
	begin
	GetAcross := Across;
	end;	

Question	Answer	Marks

6(b)	1 mark per bullet to max 5
	• constructor method heading and ending
	• Initialise all 40 by 40 elements of Grid as '' or equivalent
	• Loop 5 times…
	• …Creates a new instance of animal inside loop...
	• ...and adds it to array `AnimalList`
	
	• Call generate food **and** initialise `StepCounter` to 0
	
	Example Python
	
	`def __init__ (self) :`
	`  self.grid = [[' ' for i in range(40)] for j in range(40)]`
	`  self.AnimalList = []`
	`  self.StepCounter = 0`
	`  for i in range(5) :`
	`  newAnimal = Animal ()`
	`  self.AnimalList.append(newAnimal)`
	`  self.GenerateFood()`
	
	Example VB
	
	`Sub New()`
	`  For x = 0 To 39`
	`  For y = 0 To 39`
	`  grid(x, y) = ""`
	`  Next`
	`  Next`
	
	`  For z = 0 To 4`
	`  AnimalList(z) = New Animal`
	`  Next`
	
	`  Call GenerateFood()`
	`End Sub`
		5

Question	Answer	Marks

6(b)	Example Pascal
	
	`constructor Desert.init();`
	`  for x := 0 to 39 do`
	`  begin`
	`  for y := 0 to 39 do`
	`  begin`
	`  grid(x,y) = "";`
	`  end`
	`  end`
	
	`  for x := 0 to 4 do`
	`  begin`
	`  AnimalList(x) = object (Animal);`
	`  end`
	
	`  GenerateFood();`
	`end;`	

6(c)(i)	1 mark per bullet: • Function header and ending taking one value as parameter • Check if coordinate = 0 (on lower bound) • …generate random number (0 or 1) • Check if coordinate = 39 (on upper bound) • …generate random number (–1 or 0) • Generate random number (e.g. –1, 0, 1) • Return the generated value	**max 4**

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Question	Answer	Marks

6(c)(i)	Example VB
	
	`Function GenerateDirection(ByRef coord As Integer)`
	`  Dim lowerbound As Integer = -1`
	`  Dim upperbound As Integer = 1`
	
	`  If coord = 0 Then`
	`  lowerbound = 0`
	`  ElseIf coord = 39 Then`
	`  upperbound = 0`
	`  End If`
	
	`  GenerateDirection = randomnumber.Next(lowerbound, upperbound)`
	
	`End Function`
	
	Example Python
	
	`def GenerateDirection(Coord) :`
	`  lowerBound = -1`
	`  upperBound = 1`
	`  if Coord == 0 :`
	`  lowerBound = 0`
	`  elif Coord == 39 :`
	`  upperBound = 0`
	`  return random.randint(lowerBound, upperBound)`	

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Question	Answer	Marks

6(c)(i)	Example Pascal
	
	`function GenerateDirection(coord : Integer): Integer;`
	`begin`
	`  lowerbound = -1;`
	`  upperbound = 1;`
	`  if coord = 0 then`
	`  lowerbound = 0;`
	`  else if coord = 39 then`
	`  upperbound = 0;`
	`  GenerateDirection = random(39);`
	`end;`	

6(c)(ii)	1 mark per bullet to max 4
	• Procedure move header, no parameters
	• Calling GenerateDirection **twice** sending across and down as separate parameters
	• Add return value to Across
	• Add return value to Down
	• Check if the grid, at the (new) coordinates == “F”
	• ..if true, Call EatFood
	
	Example python
	
	`def Move(self) :`
	`  self.Across +=  GenerateChangeInCoordinate(self.Across)`
	`  self.Down +=  GenerateChangeInCoordinate(self.Down)`
	`  if grid[self.Across][self.Down] == 'F' :`
	`  self.EatFood()`
	`  return`
		4

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Question	Answer	Marks

6(c)(ii)	Example VB
	
	`Sub Move(ByRef thisAnimal As Animal)`
	`  thisAnimal.across += GenerateChangeInCoordinate (thisAnimal.across)`
	`  thisAnimal.down += GenerateChangeInCoordinate (thisAnimal.down)`
	`  If thegrid._grid(thisAnimal.across, thisAnimal.down) = "F"`
	`  Then`
	`  Call EatFood()`
	`  End If`
	`End Sub`
	
	Example Pascal
	
	`procedure Move(thisAnimal : Animal);`
	`begin`
	`  thisAnimal.across = this.Animal.across + GenerateChangeInCoordinate (thisAnimal.across);`
	`  thisAnimal.down = thisAnimal.down + GenerateChangeInCoordinate (thisAnimal.down);`
	`  if (thisgrid.grid(thisAnimal.across, thisAnimal.down) = "F") then`
	`  EatFood();`
	`End;`	

6(d)	1 mark per bullet to max 3 • Pre-compiled • Collection of Code/modules/routines • Each module performs a specific purpose/task • Each module can be linked/imported into the program	**2**

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