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COMPUTER SCIENCE **9608/42**

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

MARK SCHEME

Maximum Mark: 75

Published

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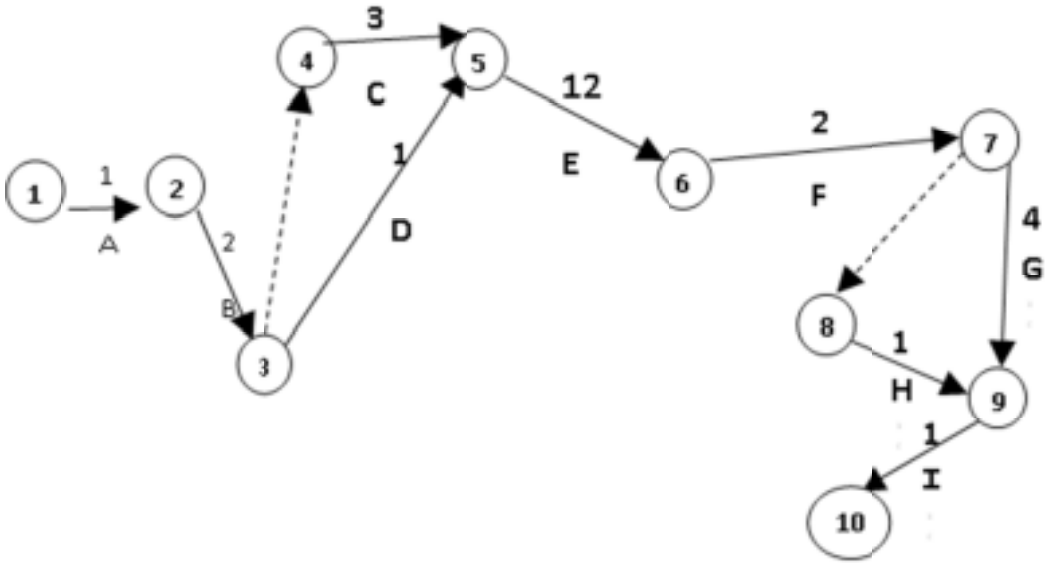
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Question	Answer	Marks
1(a)	1 mark per shaded group	**4**

		Column							
		1	2	3	4	5	6	7	8
Conditions	Grade C in Computer Science	Y	Y	Y	Y	N	N	N	N
	Grade C in Maths	Y	Y	N	N	Y	Y	N	N
	Grade C in Science	Y	N	Y	N	Y	N	Y	N
Actions	Take Computer Science	Y	Y	Y	Y	Y	Y		
	Take Maths	Y	Y			Y	Y		
	Take Physics	Y				Y			

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(b)</td><td>1 mark per column
<table>
<tr><td></td><td></td><td colspan="8">Column</td></tr>
<tr><td></td><td></td><td>S</td><td>T</td><td>U</td><td>V</td><td>W</td><td>X</td><td>Y</td><td>Z</td></tr>
<tr><td rowspan="3">Conditions</td><td>Grade C in Computer Science</td><td>Y</td><td>–</td><td>–</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grade C in Maths</td><td>–</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grade C in Science</td><td>–</td><td>–</td><td>Y</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Actions</td><td>Take Computer Science</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Take Maths</td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Take Physics</td><td></td><td></td><td>Y</td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td><td>3</td></tr>
<tr><td>1(c)</td><td>For example:
• (Column S) combining 1,2,3,4…
• … because they only need CS to take CS // Maths and Science do not matter
• (Column T) combining 1,2,5,6…
• … because CS does not matter if it is Y/N
• (Column U) combining 1,5…
• …because CS does not matter if it is Y/N</td><td>3</td></tr>
</table>

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Question	Answer	Marks
2(a)	1 mark for each correct line, duration and activity.  	**7**
2(b)	• Dummy activity	**1**

Question	Answer	Marks
3(a)	1 mark per clause • `room(corridor).` • `furniture(table).` • `furniture(lamp).` • `located(table, corridor).` • `located(lamp, corridor).`	**5**
3(b)	• `master_bedroom` • `spare_bedroom`	**2**
3(c)(i)	1 mark per bullet to max 2 • The first clause only says the nursery is next to the master bedroom • … but not that the master bedroom is next to the nursery • The second clause only says the master bedroom is next to the nursery • … but not that the nursery is next to the master bedroom • Goal to find rooms adjacent to master bedroom would not return nursery • … Example. `FindNextTo(X, master_bedroom)` • It is a two-way relationship	**2**
3(c)(ii)	1 mark per bullet • `room(main_bathroom).` • `nextTo(corridor, main_bathroom).` • `nextTo(main_bathroom, corridor).`	**3**

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Question	Answer	Marks

3(d)	1 mark per bullet
	• `canBeMovedTo(B,A)`
	• `Furniture(B)`
	• `Room(A)`
	• `AND / ,`
	• `AND NOT / , NOT`
	• `Located(B,A)`
	
	Example:
	
	`canBeMovedTo(B,A)`
	
	`IF furniture(B) AND room(A)`
	
	`AND NOT(located(B,A)).`
		6

Question	Answer	Marks

4(a)	1 mark per item in bold
	
	`FOR Pointer ← 1 TO (Max – 1)`
	
	`  ItemToInsert ← Numbers[Pointer]`
	
	`  CurrentItem ← Pointer`
	
	`  WHILE (CurrentItem > 0) AND (Numbers[CurrentItem – 1] > ItemToInsert)`
	
	`  Numbers[CurrentItem] ← Numbers[CurrentItem – 1]`
	
	`  CurrentItem ← CurrentItem – 1`
	
	`  ENDWHILE`
	
	`  Numbers[CurrentItem] ← ItemToInsert`
	
	`ENDFOR`
		4

4(b)	• The size of the array // value of Max • How ordered the items already are	**2**

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Question	Answer	Marks
5(a)	Max 10	**10**

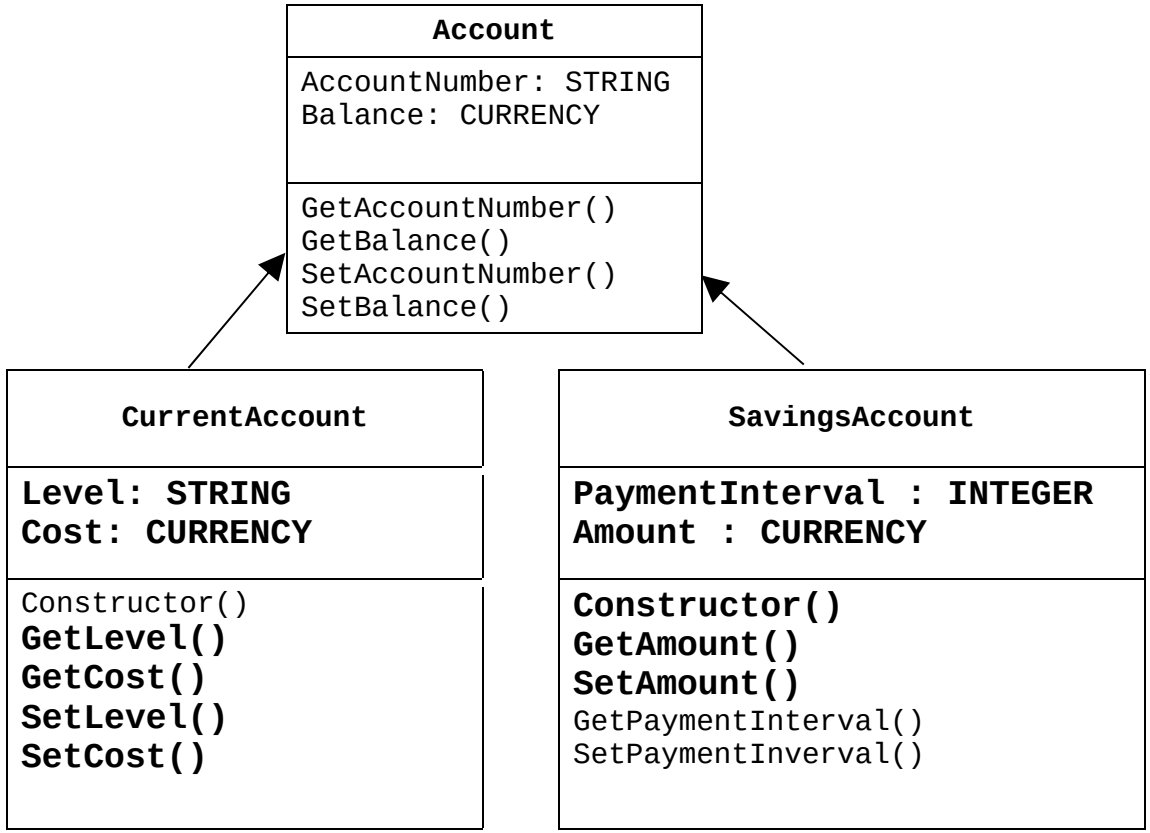
Label	Op code	Operand	Comment	Marks
START:	LDR	#0	// initialise Index Register	
LOOP:	**LDX**	**LETTERS**	// load LETTERS	1
	CMP	**LETTERTOFIND**	// is LETTERS = LETTERTOFIND ?	1
	JPN	**NOTFOUND**	// if not, go to NOTFOUND	1
	LDD	**FOUND**	// increment FOUND	1
	INC	**ACC**		1
	STO	**FOUND**		1
NOTFOUND:	**LDD**	**COUNT**	//increment COUNT	1
	INC	**ACC**		
	STO	**COUNT**		
	CMP	**#6**	// is COUNT = 6 ?	1
	JPE	**ENDP**	// if yes, end	1
	INC	**IX**	// increment Index Register	1
	JMP	**LOOP**	// go back to beginning of loop	1
ENDP:	END		// end program	
LETTERTOFIND:	'x'			
LETTERS:	'd'			
	'u'			
	'p'			
	'l'			
	'e'			
	'x'			
COUNT:	0			
FOUND:	0			

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

Label	Op Code	Operand		Comment
START:	**LDR**	**#0**	// initialise the Index Register	1
LOOP:	**LDX**	**VALUES**	// load the value from VALUES	1(loop) + 1(LDX Values)
	LSR	**#3**	// divide by 8	1 (LSR) + 1 (#3)
	STX	**VALUES**	// store the new value in VALUES	1
	INC	**IX**	// increment the Index Register	1
	LDD	**REPS**	// increment REPS	1
	INC	**ACC**		
	STO	**REPS**		
	CMP	**#6**	// is REPS = 6 ?	1
	JPN	**LOOP**	// repeat for next value	1
	END			
REPS:	0			
VALUES:	22			
	13			
	5			
	46			
	12			
	33			

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Question	Answer	Marks
6(a)	1 mark per bullet • Inheritance correctly shown from `CurrentAccount` and `SavingsAccount` to `Account` • Level and cost methods, get and set functions in `CurrentAccount` • Get and set Amount and constructor in `SavingsAccount` 	**3**

Question	Answer	Marks

6(b)	1 mark per bullet to max 5
	• Class heading and ending
	• Identifying inheritance
	• Declaring `AccountNumber`, `Balance`
	• Use of private/protected for `AccountNumber` and `Balance`
	• One Correct `Get` Method
	• One Correct `Set` Method
	• Second correct `Get` and `Set` Methods
	
	Example VB
	`MustInherit Class Account`
	`  Private AccountNumber As String`
	`  Private Balance As Decimal`
	
	`  Sub SetAccountNumber(AccNumP As String)`
	`  AccountNumber = AccNumP`
	`  End Sub`
	
	`  Function GetAccountNumber() As String`
	`  return AccountNumber`
	`  End Function`
	
	`  Sub SetBalance (BalanceP As Decimal)`
	`  Balance = BalanceP`
	`  End Sub`
	
	`  Function GetBalance() As Decimal`
	`  return Balance`
	`  End Function`
	`End Class`
	
	or
	
	`MustInherit Class Account`
	`  Private AccountNumber As String`
		5

Question	Answer	Marks
6(b)		

```
    Protected AccountNumber As String
       Get
         return _AccountNumber
       End Get
       Set (ByValue AccountNumberV As String)
          _AccountNumber = AccountNumberV
       End Set

    Private _Balance As Decimal
    Protected Balance As Decimal
       Get
         return _Balance
       End Get
       Set (ByValue BalanceV As Integer)
          _Balance = BalanceV
       End Set

 End Class
```

Example Python

```
class Account:
    def__init__(self, accountNumber, balance):
          self.__accountNumber = accountNumber
          self.__balance = balance

    def getAccountNumber(self):
          return self.__accountNumber:
    def setAccountNumber(self, AccountNumber):
        self.___AccountNumber = AcountNumber

    def getBalance(self):
         return self._balance:
    def setBalance(self, Balance):
         self.___Balance = Balance
```

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Question	Answer	Marks

6(b)	Example Pascal
	
	`type`
	`  Account := class`
	`  private`
	`  AccountNumber, Balance,;`
	`  public`
	`  constructor Create(AccountNumber, Balance);`
	`  procedure setAccountNumber(AccountN: String);`
	`  function getAccountNumber() : String;`
	`  procedure setBalance(BalanceV: Real);`
	`  function getBalance() : Real;`
	
	`constructor Account.init(Account, Bal);`
	`begin`
	`  AccountNumber := Account;`
	`  Balance := Bal;`
	`end;`
	
	`procedure SetAccountNumber(AccountN: String);`
	`begin`
	`  AccountNumber := AccountN;`
	`end;`
	
	`procedure GetAccountNumber() : String;`
	`begin`
	`  GetAccountNumber := AccountNumber`
	`end;`
	
	`procedure SetBalance(Bal: String);`
	`begin`
	`  Balance := Bal;`
	`end;`
	
	`procedure GetBalance() : String;`
	`begin`	

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Question	Answer	Marks

6(b)	`      GetBalance := Balance`
	`  end;`
	`end;`	

6(c)	1 mark per bullet to max 5
	• Class declaration and end
	• Declaration of inheritance
	• `Amount` and `PaymentInterval` as Private/protected with appropriate data types
	
	Constructor:
	• Override / Overriding in constructor
	• Constructor heading and end
	• …taking values as parameters
	• Constructor setting all values using base class
	• Initialisations of new attributes in the constructor
	• … all set to the parameters
	
	Example VB
	`Class SavingsAccount`
	`    Inherits Account`
	`    Private Amount As Decimal`
	`    Private PaymentInterval As Integer`
	
	`    Public Overrides Sub New(ByVal AccountNumberValue As`
	`                  String, ByVal BalanceValue As Decimal, ByVal AmountValue As Decimal,`
	`ByVal PaymentValue As Integer)`
	`        Amount = PaymentValue`
	`        PaymentInterval = PaymentValue`
	`    End Sub`
	
	`End Class`
		5

Question	Answer	Marks

6(c)	or
	
	`Class SavingsAccount`
	`    Inherits Account`
	`    Private Amount As Decimal`
	`    Private PaymentInterval As Integer`
	`    Public Sub New(AccountNumberValue As String, BalanceValue As Decimal, PayInterval As Integer, payAmount As Decimal)`
	`        MyBase.New(AccountNumberValue, BalanceValue)`
	`        AccountNumber = AccountNumberValue`
	`        Balance = BalanceValue`
	`        Amount = payAmount`
	`        PaymentInterval = PayInterval`
	`    End Sub`
	etc.
	
	Example Python
	`class SavingsAccount(Account):`
	
	`    def_init_(self, AccountNumber, Balance, PayInt, AmountP):`
	`        super().__init__(AccountNumber, Balance)`
	`        self.__PaymentInterval = PayInt`
	`        self.__Amount = AmountP`
	
	Example Pascal
	`type`
	`  SavingsAccount = class(Account);`
	`    private`
	`       PaymentInterval : integer;`
	`       Amount : currency;`
	`    public`
	`       constructor Create(AcountNum : String, Bal : Currency, PayInt : Integer, AmountP : Currency);`
	`end;`
	
	`constructor SavingsAccount.Create(); override;`	

Question	Answer	Marks

6(c)	`begin`
	`  inherited Create(AccountNum, Bal)`
	`  PaymentInterval := PayInt;`
	`  Amount := AmountP;`
	`end;`	

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