NOTE:
You must answer all questions in this test.
No calculators or smart watches are permitted.
Answer in the space provided in this booklet.
There is space at the back for answers which overflow the allotted space.

<table>
<thead>
<tr>
<th>Surname</th>
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<tbody>
<tr>
<td>Forenames</td>
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<td>Preferred Name</td>
<td>(if different to forenames)</td>
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<td>Monday/Tuesday</td>
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<td>Lab Times</td>
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<tr>
<th>Q1</th>
<th>Q4</th>
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<th>Q2</th>
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<th>Q3</th>
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Question 1 (20 marks)

a) Complete the output produced by the following code.

```python
result = 3 * 2 / 6 % 4 - 5 // 2 * 3 % 2
print("Result:", result)
```

```
Result: 1.0
```

(2 marks)

b) Complete the output produced by the following code.

```python
print("Result1:", 17 % 7, "Result2:", 6 % 8, "Result3:", 9 % 3)
```

```
Result1: 3 Result2: 6 Result3: 0
```

(2 marks)

c) Complete the code below which assigns an even number between 50 and 100 (both inclusive) to the variable, `even_random`. You can assume that the `random` module has been imported.

```python
even_random = random.randrange(50, 101, 2)
```

(2 marks)

d) Complete the output produced by the following code.

```python
phrase = "I am serious; it was a joke"
index1 = phrase.find("a")
index2 = phrase.rfind("suo")
print("1.", index1,"2.", index2,"3.", phrase[6],"4.",phrase[-2])
```

```
1. 2 2. -1 3. e 4. k
```

(2 marks)

e) Complete the output produced by the following code.

```python
phrase = "Rain is saved up in cloud banks"
print("1.", phrase[:3],"2.", phrase[-3:],"3.", phrase[5:14:3])
```
1. Rai  2. nks  3. ise

f) Complete the output produced by the following code.

```python
result = False or True and not True
print("Result: ", result)
```

Result: False

(2 marks)

g) In the code below, initialise the two variables, `value1` and `word`, so that the output of the code is: Yes.

```python
value1 = 8
word = "cat"
if "a" in word and value1 % 2 == 0 and value1 > 7:
    print("Yes")
else:
    print("No")
```

(4 marks)

h) Given the following code, what is the type of each of the three Python objects: `object1`, `object2` and `object3`?

```python
a_string = "567821"
number = 56.8
a_list = [7, "4.5", True]
object1 = a_list[0] + number / 3
object2 = a_string[2] * 4
object3 = a_list[2] == False
```

- type of `object1`: float
- type of `object2`: string
- type of `object3`: boolean

(3 marks)
**Question 2 (24 marks)**

a) Complete the following program. The program first prompts the user for their username (3 or 4 letters followed by exactly 3 digits) using the prompt "Enter username: ". Two example user names are afer023, sli009.

The program prints the first initial of the username in upper case, followed by ". " followed by the second letter of the username in upper case, followed by ". - " and finally the integer number from the username ignoring any initial zeroes (the number may be one digit, two digits or three digits). For example, the following screenshots show three different executions of the completed program:

```
Enter username: afer023
A.F. - 23

Enter username: sli009
S.L. - 9

Enter username: bset976
B.S. - 976
```

```python
user_name = input(prompt)
first_initial = user_name[0]
second_initial = user_name[1]
number = int(user_name[-3:])
to_print = (first_initial.upper() + "." +
             second_initial.upper() + "." + "-" +
             str(number))
print(to_print)
```

b) Give the output produced by the following code.

```python
number = 23
while number < 39:
    print(number, end = " ")
    number = number + 4
```

```
23 27 31 35
```
c) Complete the `for ... in range()` loop so that the output of the following code is:

```
21 26 31 36 41 46 51 56 61 66 71.
```

```
for number in range(21, 72, 5):
    print(number, end = " ")
```

(4 marks)

d) Give the output produced by the following code.

```
number = 5
while number < 15:
    number = number + 3
    if number % 2 == 0:
        print(number, end = " ")
    number = number + 2
print(number, end = " ")
```

```
8 10 13 16 18
```

(4 marks)

e) Complete the output produced by the following code.

```
count_a = 0
count_b = 0

for number in range(16, 1, -3):
    count_a = count_a + 1
    if count_a % 2 == 0:
        count_b = count_b + count_a
    count_b = count_b + 1
print("count_a:", count_a, "count_b:", count_b)
```

```
count_a: 5  count_b: 7
```

(4 marks)
Question 3 (16 marks)

a) The first line of the `get_random_word()` function defines the variable, words, which is a string made up of words where each word is followed by spaces so that each word takes up exactly ten spaces, e.g., the second word "sad       " starts at index 10 and ends at index 19, the fourth word "fantastic " starts at index 30 and ends at index 39, and so on. Note: after obtaining the random word from the words string, you will need to remove blank spaces from end of the random word. Complete the `get_random_word()` function which returns a random word (with no blank spaces) taken from the variable, words. For example, the textbox below shows a possible output produced when the `main()` function is executed.

```python
import random

def main():
    print("1.", get_random_word())
    print("2.", get_random_word())
    print("3.", get_random_word())

def get_random_word():
    #Only part of the string, words, is shown here
    words = "happy     sad       so-so     fantastic   dreamy   ...
    index = random.randrange(0, len(words), 10)
    word = word_strings[index: index + 10]
    return word.strip()

1. so-so
2. dreamy
3. happy
```

(8 marks)

b) The following program works out car rental costs. The program executes as follows:

- Firstly the program prompts the user for the distance travelled (in kilometres),
- then the program prompts the user for the number of rental days, and
- finally the program displays a summary including the distance travelled, the number of rental days, the discount amount (if any) and the total cost.

All the functions for this program have already been defined. You are required to complete the `main()` function of the program by adding FOUR lines of code, with each line making a call to one of the defined functions.

On the next page are two example outputs produced using the completed program (the user input in the examples is shown in a larger bold font).
def main():
    distance_prompt = "Enter distance travelled"
    days_prompt = "Enter number of days"
    cost_per_k = 0.15
    cost_per_day = 20

    distance = get_number(distance_prompt)
    days = get_number(days_prompt)
    total_cost = get_cost(distance, days, cost_per_k, cost_per_day)
    display_summary(distance, days, total_cost)

def get_number(prompt):
    return int(input(prompt + "": "))

def get_cost(distance, days, cost_per_k, cost_per_day):
    discount = get_discount(distance, days)
    cost = distance * cost_per_k + days * cost_per_day - discount
    return round(cost)

def get_discount(distance, days):
    if days > 10 or distance > 5000:
        return 100
    return 0

def display_summary(num_k, num_days, total_cost):
    discount = get_discount(num_k, num_days)
    print("Distance": num_k, "kilometres")
    print("Days": num_days, "days")
    if discount > 0:
        print("Discount: ", discount, sep="")
    print("Total: ", total_cost, sep="")

Enter distance travelled: 6050
Enter number of days: 7
Distance: 6050 kilometres
Days: 7 days
Discount: $100
Total: $948

Enter distance travelled: 100
Enter number of days: 2
Distance: 100 kilometres
Days: 2 days
Total: $55
Question 4 (20 marks)

a) In the boxes below, show the elements of list2 after the following code has been executed. Use as many of the boxes as you need.

```python
list1 = [True, False, False, True, True]
number = 5
list2 = []
for element in list1:
    if element:
        list2 = list2 + [number]
        number = number + 1
    else:
        number = number - 2
```

```
list2
```
```
  0  1  2  3  4  5
  5  2  3
```

(6 marks)

b) In the boxes below, show the elements of the list, result_list, after the following code has been executed. Use as many of the boxes as you need.

```python
list1 = [1, 2, 3]
list2 = [9, 8, 7]
result_list = [1, 2, 3]
for i in range(0, len(list1)):
    index1 = (i + 1) % 3
    index2 = (i + 2) % 3
    result_list[i] = (list1[index1] * list2[index2] - list1[index2] * list2[index1])
```

```
result_list
```
```
  0  1  2  3  4  5
-10 20 -10
```

(6 marks)
c) Complete the `display_elements()` function which is passed two lists of numbers as parameters. The function displays a list of all the elements from the first parameter list which are also present in the second parameter list and, on the next line, displays a list of all the elements of the first parameter list which are NOT present in the second parameter list. For example, when the following `main()` function is executed using the completed function the output is:

```
List 1 elements which are in List 2: [2, 3]
List 1 elements which are NOT in List 2: [1, 1]
```

```python
def main():
    a_list1 = [1, 1, 2, 3]
    a_list2 = [2, 2, 3, 4]
    display_elements(a_list1, a_list2)

def display_elements(list1, list2):
    elements_in = []
    elements_not_in = []
    for element in list1:
        if element in list2:
            elements_in = elements_in + [element]
        else:
            elements_not_in = elements_not_in + [element]
    message1 = "List 1 elements which are in List 2:"
    message2 = "List 1 elements which are NOT in List 2:"
    print(message1, elements_in_list2)
    print(message2, elements_not_in_list2)
```

(8 marks)
Question 5 (20 marks)

a) Give the output produced by the following program.

```python
def main():
    print("A", end = ")
    do1()

def do1():
    do2()
    print("B", end = ")

def do2():
    print("C", end = ")
    do3()

def do3():
    print("D", end = ")

main()
```

ACDB

(6 marks)
b) Using the code trace technique taught in lectures, perform a code trace on the program on the next page and show the output.

```python
def main():
    result = first("DRABBLE")
    print(result)

def first(word):
    part1 = second(word[:2])
    part2 = second(word[2:])
    return part1 + part2

def second(word):
    letters = "ABCDE"
    digits = "35739"

    print(word)

    number = 1
    if word[0] in letters:
        index = letters.find(word[0])
        number = number * int(digits[index])

    if word[1] in letters:
        index = letters.find(word[1])
        number = number * int(digits[index])

    return number

main()

Show the output:

DR
ABBLE
18
```

Show the output:

```
DR
ABBLE
18
```
OVERFLOW PAGE
(If you have used this page, please indicate clearly under the relevant question that you have overflowed to this page)