Internals 1: Introduction to Programming

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Duration: 60 minutes **Total Marks:** 16

Instructions:

- Answer all questions and write code only using allowed arithmetic operations *,/,-,+ and allowed functions: mod, floor, sum, prod, max, min, mean, length, zeros, size, rand, randn. You may also use for, while, if, else, end and function commands.
- Anyone possessing a mobile phone/smartwatch or any networking device will instantly get a zero.
- No calculators or external MATLAB references are allowed.

1 One line codes (2 marks)

Write the output of the following commands in MATLAB and justify your answer:

1. `sum([1:10] > mean(1:5))`

2. `max(prod([1,1;3,1].*[1,1;2,3], 2))`

2 Writing a code (3 Marks)

Given a time series of GDP growth rates, compute a rolling moving average using a for loop.

3 Debugging a code (3 Marks)

A palindrome is a sequence of symbols that reads the same backwards as forwards. For example, 17571 is a palindrome, but 234 is not.

The following code was written to check if the `num` variable is a palindrome by extracting the symbols starting from unit place and constructing the number `rev` with symbols in reverse order. If `num` is a palindrome, the `flag` variable should be set to 1; otherwise, it should be 0. But there is a logical error in precisely ONE of the lines. Please write down the line with the error and fix it.

```
function flag = isPalindrome(num)
orig = num;
rev = 0;
while num > 0
    d = mod(num, 10);
    rev = rev * 10 + d;
    num = floor(num * 10);
end
flag = (orig == rev);
end
```

4 Stacks (4 Marks)

Write down the value of the variable Y once you run the script. Don't explain your reasoning. Instead draw the stack S at the end of every iteration for the two "loops". (There should be six stack drawings.)

```
S = Stack(3);
Y=[];
S.Push(2);
S.Push(4);
S.Push(6);
for i = 1:3
    t = S.Pop;
    S.Push(t - 1);
end
while S.IsEmpty == 0
    Y =[Y, S.Pop];
end
```

5 Descriptive (4 Marks)

What are iterations and recursions? In this context, contrast the use of loops and functions.