Index Number: _____ Programme: _____

UNIVERSITY OF ENERGY AND NATURAL RESOURCES, SUNYANI, GHANA
DEPARTMENT OF COMPUTER AND ELECTRICAL ENGINEERING
CENG 205: Computer Programming for Engineers

Mid-Semester Examination | **Total marks: 25** | **Time: 1 hour**

Instructions: Programme should be created in a single source file.
The format of the source file name should be *IndexNumber_CLASS.cpp*

The scores of some students obtained in MATH 101 for a semester are shown below. Assignments were marked out of 20 and carries 10% of the final score, mid-sem exams also were marked over 30 and contributes 30% of the final score and the final exam with a weight of 60% was marked over 100 all in total giving 100%.

Table 1: Raw scores of MATH 101

ID	ASSIGNMENT	MID-SEM	FINAL EXAM
UE12345616	15	25	87
UE01234516	18	18	69
UE98564316	18	20	91
UE45365316	18	16	66
UE65678516	20	13	72
UE74847416	0	10	65
UE58734616	12	20	84
UE12345616	17	15	50
UE12345616	18	17	78
UE12345616	19	21	80

1. a) Implement a function to compute the average of the raw scores and display it to the user.
   b) A total mark of 90 % or above is an **A**, 80 % or above is a **B**, 70 % or above is a **C**, 60 % or above is a **D**, and anything lower is an **F**. Write a loop in a function to print out each student's letter grade.

   [*Hint: Grades are obtained from the sum of ASSIGNMENT, MID-SEM and FINAL EXAM totaling 100 %*]

   c) The Pythagorean theorem states that the sum of the squares of the sides of a right triangle is equal to the square of the hypotenuse. For example, if the two sides *s1* and *s2* have a length of 3 and 4, then the hypotenuse h must have a length of 5. *h* can be generated by the following formula: $h = \sqrt{s_1^2 + s_2^2}$

   Write a program that asks the user to enter the values *s1* and *s2* and displays the value of the hypotenuse squared.

2. a) A movie in a local theater is in great demand. To help a local charity, the theater owner has decided to donate to the charity a portion of the gross amount generated from the movie. Designs and implements a program making use of user defined function that prompts the user to input the *movie name*, *adult ticket price*, *child ticket price*, *number of adult tickets sold*, *number of child tickets sold*, and *percentage of the gross amount* to be donated to the charity.

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Sample output of the program is as follows.

```
*****************************************
Movie Name: ..... Kejetia vs. Makola
Number of Tickets Sold: ..... 2650
Gross Amount: ..... ₵ 9150.00
Percentage of Gross Amount Donated: ..... 10.00%
Amount Donated: ..... ₵ 915.00
Net Sale: ..... ₵ 8235.00
```

b) A parking garage charges a ₵ 5.00 minimum fee to park for up to three hours. The garage charges an additional ₵ 1.50 per hour for each hour or part thereof in excess of three hours. The maximum charge for any given 24-hour period is ₵ 15.00. Assume that no car parks for longer than 24 hours at a time. Write a program that calculates and prints the parking charges for each of three customers who parked their cars in this garage yesterday. You should enter the hours parked for each customer. Your program should print the results in a neat tabular format and should calculate and print the total of yesterday's receipts. The program should use the function *calculateCharges* to determine the charge for each customer.

Your program output should appear in the following format:

```
Car       Hours      Charge
1           1.5        5.00
2           4.0        6.50
3          24.0       15.00
TOTAL      29.5       26.50
```

c) An integer is said to be a perfect number if the sum of its factors, including 1 (but not the number itself), is equal to the number. For example, 6 is a perfect number, because 6 = 1 + 2 + 3. Write a function perfect that determines whether parameter number is a perfect number. Use this function in a program that determines and prints all the perfect numbers between 1 and 1000. Print the factors of each perfect number to confirm that the number is indeed perfect.

9150
8235
915

5

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31. What Matlab command will return the size of matrix **w**?

A sizeof(w)
B length(w)
C rowcol(w)
D size(w)

32. Which of the following correctly declares an array in C?

A myArray {10};
B int myArray;
C int myArray [10];
D array myArray [10];

33. What is the value of **D** after the following Matlab commands are executed?

```
A = [1 2; 3 4]; B = [ 0 1; 2 1]; C = A * B; D = B * C
```

A
6 4
8 8

B
0 2
12 4

C
4 2
8 10

D
8 7
16 13

34. Convert the following statement to C statement.
If the number ***n,*** is even, add it to **evenSum**, otherwise add it to **oddSum**.

A
```
if (n is even) evenSum += n;
else oddSum += n;
```

B
```
if (n == 0) evenSum += n;
else oddSum += n;
```

C
```
if (n%2 == 0) evenSum += n;
else oddSum += n;
```

D
```
if (!n is odd) evenSum += n;
else oddSum += n;
```

35. Consider matrix `A = [0 2 1.5; 5 3 -6; -7 1.5 10]` and `B = A(2:3, :)`.
What is the value of **B** in Matlab?

A
0 2.0
5.0 3.0
-7.0 1.5

B
5.0 3.0 -6.0
-7.0 1.5 10.0

C
0.0 2.0 1.5
5.0 3.0 -6.0

D
5.0 3.0
-7.0 1.5

36. What will be printed if the following code is executed?

```
Line 5:   ...
Line 6:   float a = 0.3;
Line 7:   if(0.3 > a)
Line 8:        printf("True\n");
Line 9:   else
Line 10:       printf("False\n");
Line 11:  ...
```

A True False
B True
C False
D None of the above

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Section B - Answer question 37 [***15 marks***] and any other question [***10 marks each***].

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37. a) Write a C program that uses function with three integer inputs. The function displays **success** if the first number raised to the power of the second number equals the third number. Otherwise ***game over.***

b) Compare the following pairs of C keywords with respect to their syntax and function:
   i. **break** and **continue**.
   ii. **goto** and **break**.
   Write simple C code with each keyword to illustrate their usage.

38. You have been contacted by a reputable company in Ghana to develop a computer software using C programming language to read employee's ID (**employeeID**) as integer value, overtime hours worked (**OVERTIME**), hours absent (**ABSENT**) and determine the bonus payable (**PAYMENT**) to the worker. Use the chart below to estimate bonuses.

Bonus Schedule

OVERTIME – (2/3) × ABSENT	Bonus Paid (GH ¢)
> 40 hours	65
> 30 hours but ≤ 40 hours	50
> 20 hours but ≤ 30 hours	45
> 10 hours but ≤ 20 hours	30
≤ 10 hours	15

39. A wireless company offers customers the following cellular plan:

- 700 weekday minutes ¢39.99
- Nights (9pm - 6am) and weekends Free
- Unlimited texting ¢ 20.00
- Data Plan up to 2 GB, ¢30.00, ¢10.00 per additional GB or fraction thereof
- Additional weekday minutes ¢0.40
- Taxes and surcharges 6.25%

Write a program that prompts (or request for) the user to enter the number of weekday minutes, night minutes, weekend minutes and GB used and calculates

a) The pre-tax monthly bill,

b) The tax amount,

c) The total bill.