

6a. At a given instant, a car travels along a circular curved road with a speed of  $22\text{ m/s}$  while decreasing its speed at the rate of  $3\text{ m/s}^2$ . If the magnitude of the car's acceleration is  $5\text{ m/s}^2$ . Determine the radius of curvature. (8marks)

b. The motor (Fig. 8) winds in the cable with a constant acceleration, such that the  $20\text{ kg}$  crate moves a distance  $S=6\text{ m}$  in  $3\text{ s}$ , starting from rest. Determine the tension developed in the cable. The coefficient of kinetic friction between the crate and the plane is  $\mu_k = 0.3$ . (12marks)

7. A flywheel rotating freely at  $1080\text{ rev/min}$  clockwise is subjected to a variable counterclockwise torque which is first applied at time  $t=0$ . The torque produces a counterclockwise angular acceleration  $\alpha = 4t\text{ rad/s}^2$ , where  $t$  is the time in seconds during which the torque is applied. Determine

(i) the time required for the flywheel to reduce its clockwise angular speed to  $800\text{ rev/min}$

(ii) the time required for the flywheel to reverse its direction of rotation and

(iii) the total number of revolution, clockwise plus counterclockwise, turned by the flywheel during the first  $12$  seconds of torque application. (20marks)



FEDERAL UNIVERSITY, OYE-EKITI  
DEPARTMENT OF MECHATRONICS ENGINEERING  
B.Eng. Degree Examination  
First Semester 2018/2019 Session  
COURSE CODE: MTE201

COURSE TITLE: COMPUTER AIDED ENGINEERING 1 UNIT: 1 Time: 2 1/2 Hours

Instructions: Answer all questions in Section 1 that contains 2 parts, then answer Two question each from section 2 and 3 respectively.

Section 1 (compulsory) answer all questions in the 2 parts: \*

Part 1. Programming In C Language

1. Describe the function of the *Integrated Development Environment* [2 marks]
2. List *Two* window in the code::Block IDE software → *Open base, main* [2 marks]
3. State *Two* Programming step → *edit base, main* [2 marks]
4. Write the *Two* ways to insert comment into a C program [2 marks]
5. Write *Two* C language keyword → *int main* [2 marks]
6. State *Two* steps involve to using a variable in C programming [2 marks]
7. State *Two* data type in C programming [2 marks]
8. Write the *do* statement syntax [2 marks]
9. Describe the advantage of *program looping* [2 marks]
10. Distinguish between the *printf* and the *puts* function in C programming [2 marks]

Part 2. Introduction to MATLAB

11. State *TWO* plotting step in MATLAB [2 marks]
12. Write *TWO* MATLAB file extension [2 marks]
13. Write the MATLAB *command* for evaluating matrix *inverse* and *determinant* [2 marks]
14. Differentiate between *who* and *whos* commands associated with variables in MATLAB [2 marks]
15. Write the MATLAB command for 2D and 3D plot [2 marks]
16. Distinguish between the *format short e* and *format rat* commands in MATLAB [2 marks]
17. State the function of the *command window* and *workspace window* in MATLAB [2 marks]
18. Write the *linspace command* and *length command* syntax in MATLAB [2 marks]
19. What is the output of the command *eye (3)* and *eye (3, 4)* in MATLAB [2 marks]
20. State *TWO* axis type in MATLAB [2 marks]

9. Which of the following is the correct syntax for declaring an array in a program? Choose one. (1 mark)

- (a) data-type Array-Name[Array-Size];
- (c) data-type Array-Name(Array-Size);

- (b) data-type Array-Name{Array-Size};
- (d) data-type Array-Name<Array-Size>;

4 10. Explain the following with one example each: (i) Argument (ii) Statement block (2 marks)

### Part 3 Introduction to MATLAB

1. State the MATLAB files.
2. How can operator precedence be altered in MATLAB?
3. State the default axis type in MATLAB.
4. Write the format assignment statement.
5. State *TWO* commands associated with variables.
6. State the format function that prints 2 decimal places in MATLAB.
7. In what window are the created variable name and value stored in the current command window?
8. Write the syntax that Generates vectors with uniformly spaced elements.
9. What command would create a 4 X 4 matrix with ones on the diagonal and zero everywhere else?
10. List *TWO* plot functions.
11. Write the syntax to dot and cross vectors A and B.
12. Write the command for a 3D pie and bar charts.
13. List *TWO* surface plot commands.
14. How can output be suppressed in MATLAB?
15. Write the command to determine the length of a row vector.

### Section 2

Instruction: Answer only one question from this section

#### Question 1

- a. List the phases of development environment of a C program in sequential order. (5 marks)
- b. List 5 engineering applications of C programming Language. (5 marks)
- c. The well-known formula for calculating the volume of a cylinder is given as the expression

$$V = \pi r^2 h$$

Where  $r$  is the radius of the circular surface,  $h$  is the height of the cylinder and  $\pi$  has the constant value of 3.142.

Write a C program to find the value of  $V$ . The program should include the code to allow the user to key in the values of the variables  $r$  and  $h$  respectively. (10 marks)

#### Question 2

- a. Given a conditional operator code:  $(X \geq 3) ? \text{"Bake Cake"} : \text{"Bake Bread"}$  Explain the code. (2 marks)
- b. Explain briefly what happens in 'linking' and 'compiling' stage of a C program. (5 marks)
- c. What does the continue statement do inside a loop? (2 marks)

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COURSE TITLE: COMPUTER AIDED ENGINEERING 1 UNITS: 1 Time: 2½ Hours

Instructions: Answer all questions in Section 1 that contains 3 parts, then answer one question each from section 2, 3 and 4 respectively.

Section 1 (compulsory) answer all questions in all the 3 parts:

Part 1. Computer Aided Engineering Linux (CAELinux)

- 1a. List any 3 software applications embedded in CAELINUX 2013 CD (3 marks)
- 1b. In your own words, what do you understand by finite element analysis? (2marks)
- 1c. List 3 key features of SALOME MECA (3marks)
- 1d. List 2 file formats in which you can import CAD models. (2marks)

Part 2. Programming In C Language

1. An advantage of high level language is 'Portability'. What do you understand by this? (1mark)
2. Write a line of code that prints "WELCOME TO MTE201 EXAM" on a console screen. (1mark)
3. Which of the following are valid function names? (a) 2PrintCopy() (b) total\_number (c) total-number() (d) \_quick\_add() (e) printCopy() (f) account\*97() (g) +getchar() (1.5marks)
4. Answer true or false: In  $Y=X++$ ; Y is assigned the value of X, the one after X is incremented by 1. (1mark)
5. List out the possible iterations from the 'for' statement:  $\text{for}(i=0, j=4; i \leq 3, j > 0; i++, j--)$  (1 mark)
6. Write appropriate comments for each of these line of codes, the first one has been done for you: (4marks)
  1. `#include <stdio.h> /* place stdio.h where the directive is located*/`
  2. `main () /* */`
  3. `{ /* */`
  4. `int w, x, y, z, result; /* */`
  5. `w = x = y = z = 1; /* */`
7. Consider this 'if' statement:  $\text{if}(a > b \ \&\& \ a > c)$ . which of the following options best explains the statement? Choose one: (1 mark)
  - (a). if a is greater than a and c
  - (b). if a is greater than both b and c
  - (c). if both b and c are greater than a
  - (d). if a is greater than b or c
  - (e). if a is greater than b but not c
8. A linker is used to link together -----, ----- and ----- to produce an executable file (1.5 marks)

$$C = (F - 32) / 1.8$$

$$F = 72$$

$$A = (F - 32)$$

**Section 2**

**Instruction: Answer only two question from this section**

**Question One**

- (a) Using the for statement write the source code to evaluate the 1000th term in a sequence with initial value of 1. Note your program must contain appropriate comment for readability and message at the output terminal. [5 marks]
  - ii Explain every statement you have used in (a) above. [5 marks]
- (b) Using the puts function write a program that prints the text I love Federal University Oye Ekiti. [5 marks]
  - ii Explain every statement you have used in (a) above. [3 marks]
- (c) State the function of the modulus operator. [2 marks]

**Question Two**

- (a) Using the scanf function write a program that tells the user to input temperature value from the keyboard in degrees Fahrenheit (F) and convert this value to degrees Celsius (C) using the following formula:

$$C = \frac{(F - 32)}{1.8}$$

Note your program must contain appropriate comment for readability and message at the output terminal. [5 marks]

- ii Explain every statement you have used in (a) above. [3 marks]
- (b) Write the output of the following program

```

#include <stdio.h>

int main(void)
{
    printf("MTE201 Exam\nOngoing at the ELT\nToday Monday 10th June, 2019");
    printf("\n");
    return 0;
}
    
```

- (c) Write the while loop syntax. [2 marks]

**Question Three**

- (a) Write a program that tells the user to input the radius of a sphere from the keyboard and evaluate the volume (V) using the following formula:

$$V = \frac{4}{3} \pi r^3$$

Note your program must contain appropriate comment for readability and message at the output terminal. [5 marks]

- ii Explain every statement you have used in (a) above. [5 marks]
- (b) Write a program to evaluate the equation shown here  $3x + 6$  for  $x = 2.55$ . [3 marks]
- (c) Write the expected output of the following program. [2 marks]

```

#include <stdio.h>
int main()
{
    
```

7.65  
 1.33, 22.2

### Question Five

- (a) Using axis square command, write the *code* to plot the function below within time interval of -2 to 2 with an increment of 0.01. [6 marks].

$$f = e^{-t}$$

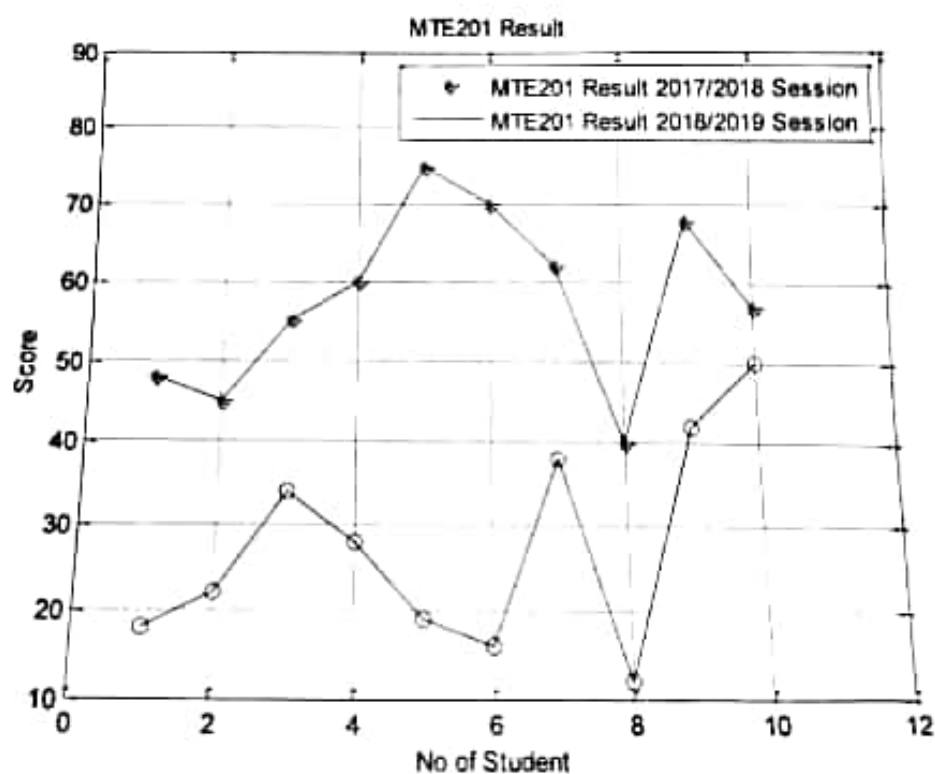
$$v = \cos(t)$$

- ii. The code should include the *grid command* and *legend command* [4 marks].
- (b) Given the matrix `>> A = [1, 2, 5; 2, 8, 9; 5, 9, 4]`; Write the command to obtain the *rank* of matrix A and *delete the third row* of A respectively. [4 marks].
- (c) Consider the row vector [8, 3, 9, 10, 5, 4, 12, 20]. Write the MATLAB *code* to obtain the minimum element of this row vector and as components of a *row vector* [1 mark].

### Question Six

- (a) The table below presents the MTE201 result for two successive session. Write the MATLAB code to present this information as shown in the figure [10 marks].

No. of Student	1	2	3	4	5	6	7	8	9	10
MTE201_Result_2017/2018_Session	48	45	55	60	75	70	62	40	68	57
MTE201_Result_2018/2019_Session	18	22	34	28	19	16	38	12	42	50



- (b) Given the base and height of a triangle to be 8 mm and 3 mm respectively, write the MATLAB code to calculate its Area [4 marks].
- (c) Write the MATLAB code to evaluate the square root of 256 and return the value for H [1 mark].



```

int answer, result;
answer = 100;
result = answer -10;
printf("The result is %i\n", result +5);
return 0;

```

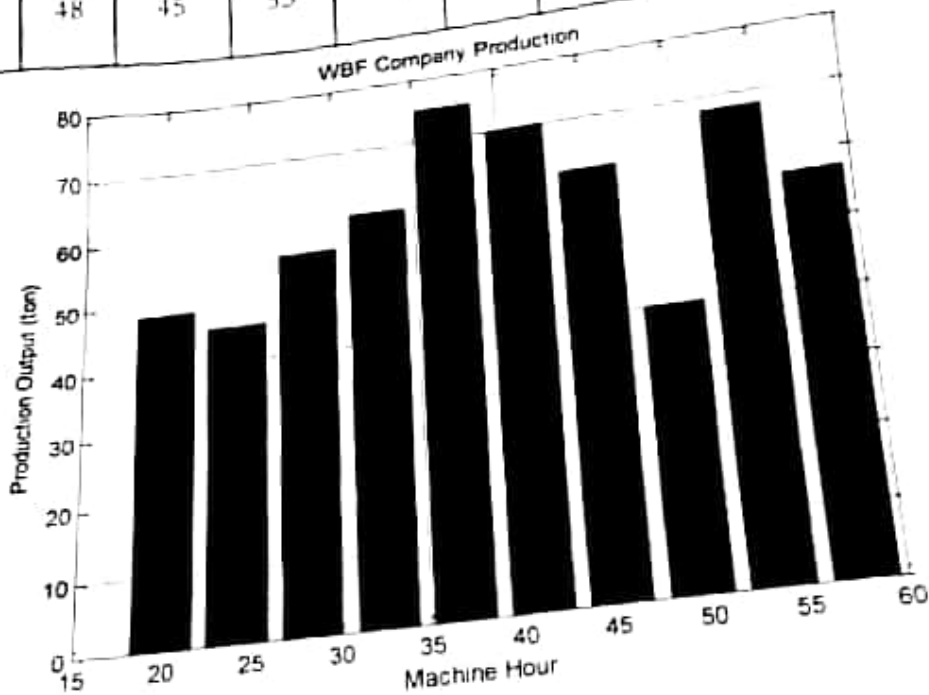
**Section 3**

**Instruction: Answer only two question from this section**

**Question Four**

(a) The table below presents the production output of **WBF Company**. Write the MATLAB code to present this information as shown in the figure [10 marks]

Machine Hours	20.00	24.22	28.44	32.67	36.89	41.11	45.33	49.56	53.78	58.00
Production Output (tons)	48	45	55	60	75	70	62	40	68	57



[1 mark].

(b) Write the *code* to *transpose* vectors A = [9; 4; 8];

(c) Write the *code* to pass in the augmented matrix of the linear system of equation below in MATLAB [4 marks].

$$\begin{aligned}
 2x_1 + x_2 - 2x_3 + 2x_4 &= 3 \\
 5x_1 - 3x_2 + x_3 - x_4 &= 6 \\
 3x_1 + 4x_2 - 3x_3 + x_4 &= 6 \\
 3x_1 - x_2 + 2x_3 - x_4 &= 3
 \end{aligned}$$