

Hajee Mohammad Danesh Science and Technology University, Dinajpur

Department of Computer Science and Engineering

B.Sc. (Engineering) in CSE

Semester Final Examination 2020 (Jul-Dec)

Level I Semester II, Course Code: CSE 151, Credit: 3.0

Course Title: Structured Programming Language

Marks: 90

Time: 3 Hours

Section A

Answer any Three

- a) State the features of Structured Programming Language. Draw the execution process of a C program. 3+3
- b) Write the name and category of each of the operators used in the following expression. 4  
`if (x>20 || x==10)  
 result=(y%4==1)?x++:x--;`
- c) Compare between if else and switch statements with example. 5
- d) Mention the name of the parts each loop contains. Write two while loop statements as an example of sentinel and counter controlled loops. 2+4
- e) Explain, with an example, the statements in which the break statement is used. 4
- f) Write a program to print the following series: 5  
1, 3, 3, 9, 27, 243, ....
- g) Give an example of compile time and run time array initialization. What would be the third value in the following statement? `int x[4]={3, 0};` 4+2
- h) Read the following statements and find if the following statements are valid/invalid (with reason, if invalid).  
i. `float get[3]={5, 10, 15};` valid  
ii. `char simple[5]; simple[5]={"good"};` invalid  
iii. `char a1[3] {"go"}; char a2[3] {"no"}; a1[1]=a1[2];` invalid  
iv. `int a=5; char b= 'x'; a=a+b;` valid.
- i) Write a program that takes a string as input and counts the number of vowels in it. 5
4. a) Write benefits of using the user defined functions in a program. What are formal and actual parameters of a function? 3+3
- b) Describe static variable in brief. 4
- c) Write a program that takes five numbers as input and determine whether each number is odd or even using a user defined function that has arguments and returns no value. 5

## Section B

### Answer any Three

1. a) Write the general format of a structure definition and declaration. Explain an approach to pass a structure as a function argument. 3+3  
b) State the rules to initialize a structure. 4  
c) Write a program to calculate the average marks of three subjects using structure. 5

2. a) How do a pointer point to another pointer variable? Define pass by value and pass by reference. 2+4  
b) Determine the value of the following expressions. 4

int a=5, b=10, c;

int \*p= &a, \*q=&b;

i.  $a+=*p--;$  10

ii.  $p++;$

iii.  $p=p+10;$  15

iv.  $c=&p;$

- c) Write a program using a pointer to access the elements of an array. 5

3. a) Why is dynamic memory allocation more efficient than static memory allocation? What does `free()` do? 4+2  
b) What is the difference between the preprocessor directives `#include"filename"` and `#include <filename>`? 4  
c) Write a statement to allocate 80 times memory space of type integer. Then reallocate the allocated space by 100 times. 5

4. Write short note (any two) 7.5x2

i. C token

ii. Formatted output

iii. File management

Time: 3 hours

Total Marks: 90

[N.B. The figure in the right margin indicates the marks allocated for the respective question.  
 The split answer of any question is not allowed.]

### Section-A

(Answer any 03(three) from the following questions)

1. (a) Define digital system. Briefly explain the characteristics of the digital system. 2+3
- (b) Convert  $(47BAC)_{16} = (\ )_2 = (\ )_6 = (\ )_8 = (\ )_{\text{gray}} = (\ )_{\text{Ex-3}}$  5×1=5
- (c) Simplify the boolean expressions to the minimum number of literals: 1+2+2
- (i)  $(A+B)(A+\bar{C})(\bar{B}+\bar{C})$
- (ii)  $AB + \bar{A}\bar{C} + \bar{B}C A (AB+C) 1$
- (iii)  $\bar{A}C + AB + BC + A\bar{B}$
2. (a) Write the differences between latches and flip flops. Design a logic circuit with four inputs as A, B, C, and D and whose output will be HIGH when most of the inputs are high. 2+3
- (b) What is the significance of a Karnaugh map (K-map) for solving combinational circuits? Solve  $F(a,b,c,d) = \sum m(1, 2, 3, 8, 9, 10, 11, 14) + d(7, 15)$  in SOP form using a K-map. 2+3
- (c) Briefly describe the characteristics of logic families of digital ICs. 5
3. (a) Design the combinational circuit of a 4 bit BCD adder. 5
- (b) Briefly discuss the conversion procedure of the D flip flop to the T flip flop. 5
- (c) What is multiplexer? Using 8:1 multiplexer, realize the boolean function  $F(A, B, C, D) = \Sigma(0,1,2,5,7,8,9,14,15)$  5
4. (a) Design a circuit that compares two 4-bit numbers, A and B, to check if they are equal. The circuit has one output x, so that  $x = 1$  if  $A = B$ , and  $x = 0$  if  $A \neq B$ . 5
- (b) Briefly explain the full binary subtractor. 5
- (c) Design a right shift register (serial input and parallel output) with its timing diagram. 5

## Section-B

(Answer any 03(three) from the following questions)

(a) What are minterm and maxterm? What is an essential prime implicant? State and prove Demorgan's theorem. 2+1+2

(b) Determine the transmitted CRC for the following byte of data (D) and generator code (G). Verify that the remainder is 0. 5.

D: 10110010

G: 1010

(c) Explain even and odd parity checks with an example. Describe the drawback of parity check and how it can be overcome. 2+2+1

(d) Identify the term 'carry propagation.' Why is look-ahead carry essential? Design an odd parity generator. 1+2+2

(b) Reduce the SOP expression using the Quine-McCluskey method. 5

$$F(P, Q, R, S) = \sum m(0, 1, 2, 8, 10, 11, 14, 15)$$

(e) Implement a full-subtractor using only half-subtractor. 5

3. (a) What is the excitation table? Explain SR flip flop with its characteristic table. 1+4

(b) Design a 4 bit binary synchronous counter with a D-flip flop. 5

(c) Explain the functionality of a demultiplexer. 5

(a) Simplify the following Boolean function in (i) sum of products and (ii) product of sums.  $F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10)$  5

(b) Explain the race around condition and also explain how to eliminate it. Implement a full-adder circuit with a decoder and two OR gates. 2+3

(e) Reduce the number of the state in the following state table and tabulate the reduced state table. Also, draw the original and reduced state diagram. 5

Present State	Next State		Output	
	$x=0$	$x=1$	$x=0$	$x=1$
a	b	f	0	0
b	c	d	0	0
c	e	f	0	0
d	a	g	0	1
e	e	d	0	0
f	b	f	1	1
g	<del>h</del>	g	1	0
h	a	g	0	1

N.B:

- i) Answer any SIX questions taking any three from each section.
- ii) Figures in the right margin indicate full marks.
- iii) Use separate answer script for each section.
- iv) Assume a realistic value for any missing data.

### Section- A

- Q1. a) Define the following terms: i) bilateral circuit ii) voltage iii) energy iv) passive element. 04  
 b) State Ohm's law. What are the limitations of ohm's law? 03  
 c) For the following figure (1): i) Calculate  $R_T$  ii) Determine  $I_S$ ,  $I_5$  and  $V_T$  iii) Find the total power  $P_E$ . 08

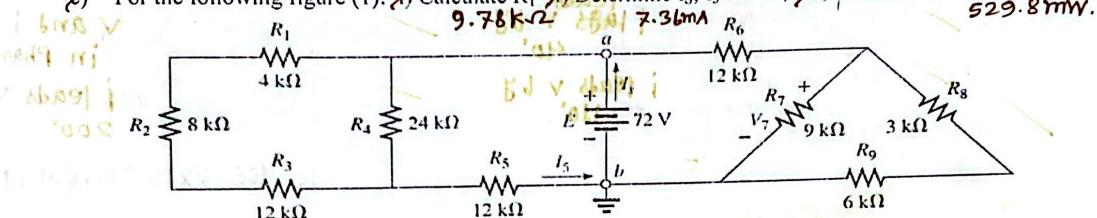


Figure (1)

- Q2. a) Mention the characteristics of series and parallel circuit. 05  
 b) State and explain Kirchhoff's Voltage Law. 04  
 c) By using KCL, determine the unknown currents for the following figure (2A) and figure (2B). 06

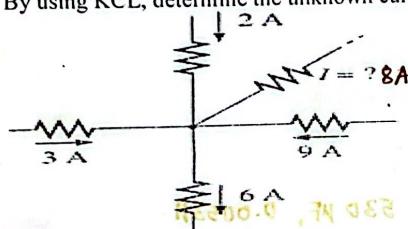


Figure (2A)

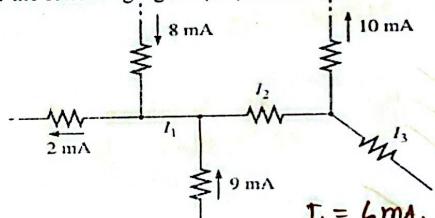


Figure (2B)

- Q3. a) Explain the concept of voltage division and current division in electric circuit with an example. 05  
 b) By using nodal analysis, determine the potential across the  $4\Omega$  resistor for the following figure (3A). 04  
 c) Find the total resistance for the following figure (3B). 03

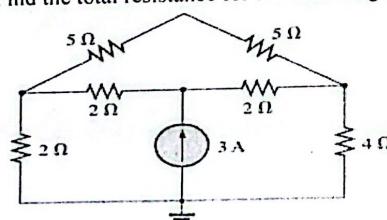


Figure (3A)

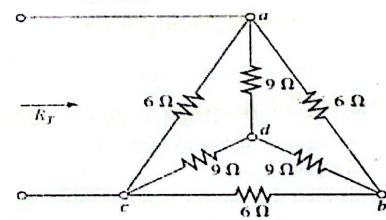


Figure (3B)

4. a) State maximum power transfer theorem. Mathematically explain about this theorem 07  
 b) Find the Norton equivalent circuit for the portion of the network to the left of a-b in figure (4): 08

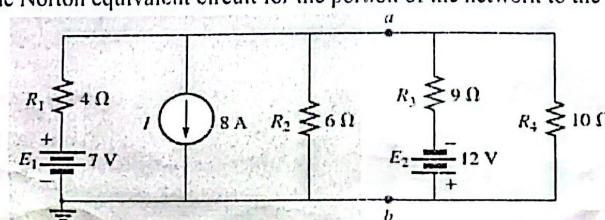


Figure (4)

## Section -B

- (1) a)** Define the following terms: i) peak value ii) average value iii) instantaneous value iv) cycle  
**b)** Find the average and r.m.s value of the following periodic waveform in figure(5) over one full cycle. 04  
 06

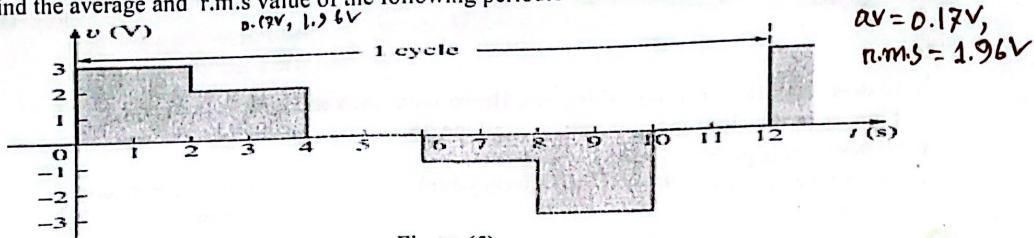


Figure (5)

- The voltage across a 0.8 H coil is  $v = 100 \sin 20t$ . What is the sinusoidal expression for the current? 05  
 Sketch the v and i curves.  $v = 100 \sin 20t$ ,  $i = 6.25 \sin(20t - 90^\circ)$

- (2) a)** Sketch and find out the phase relationship between sinusoidal waveforms of each of the following sets: 10

<i>i</i> ) $v = 10 \sin(\omega t + 40^\circ)$	<i>i</i> leads $v$ by $60^\circ$	<i>ii</i> ) $v = 3 \sin(\omega t - 150^\circ)$	$v$ and $i$ are in phase.
<i>iii</i> ) $i = 5 \sin(\omega t + 80^\circ)$	$40^\circ$	$i = -2 \cos(\omega t - 60^\circ)$	
<i>iv</i> ) $v = 3 \sin(\omega t - 10^\circ)$	<i>i</i> leads $v$ by $110^\circ$	<i>iv</i> ) $v = 2 \sin(\omega t + 20^\circ)$	$i$ leads $v$ by $200^\circ$ .
<i>v</i> ) $i = 2 \cos(\omega t + 10^\circ)$	$110^\circ$	$i = -\sin(\omega t + 40^\circ)$	

- b)** Determine the current  $i_2$  in the time domain of the following figure (6): 05

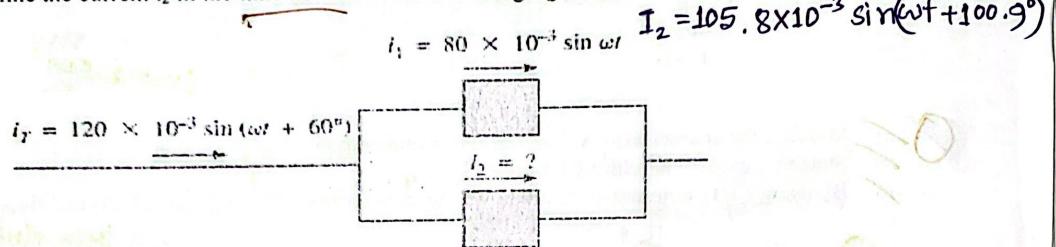


Figure (6)

- (3) a)** What do you mean by complex number and complex conjugate? 04  
**b)** Define power factor. Prove that  $P = V I \cos \theta$ , Where the symbols represent its usual meanings. 05

- c)** For the following parallel RLC circuit which shown in figure (7):  
 i) Calculate the total admittance and impedance.  
 ii) Find the value of C in microfarads and L in henries 530 μF, 0.0053H.

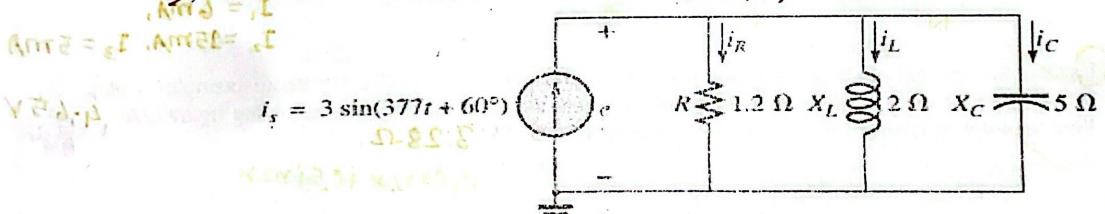


Figure (7)

4. An ac voltage of  $e = 28.28 \sin 377t$  is applied to a series RLC circuit shown in the following figure (8): 15  
 i) Calculate the total impedance.  
 ii) Draw the impedance diagram.  
 iii) Find the current I and voltages  $V_R$ ,  $V_L$ ,  $V_C$   
 iv) Find the total power and power factor.

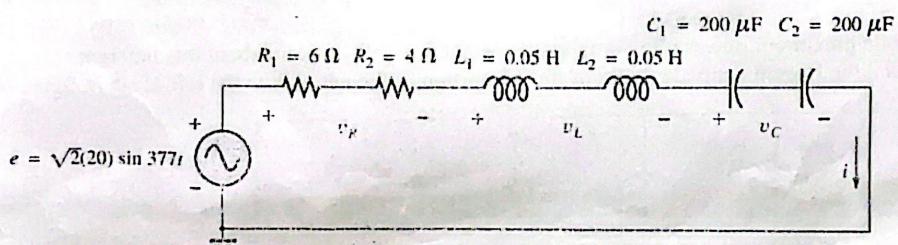


Figure (8)

Hajee Mohammad Danesh Science and Technology University, Dinajpur

B. Sc. in CSE

Level 1, Semester II (July-December), Examination 2020

Course Title: Mathematics II, Course code: MAT 105

Full Marks: 90 (45 for Section A & 45 for Section B)

Time: 3 hours

The figures in the right margin indicate the full marks for respective question.  
USE SEPERATE SCRIPT FOR ANSWERING EACH SECTION.

**Section A**

Answer any 3 (three) questions.

1. (a) Define ordinary and partial differential equations with examples 5

(b) Find the differential equation of the system of curves  $y = A \cos x + B \sin x$ ; 5  
where  $A$  and  $B$  are arbitrary constants.  $\frac{d^2y}{dx^2} + y = 0$

(c) Find the order and degree of the following differential equation: 5

$$\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = \frac{d^2y}{dx^2}. \quad 2, 2$$

2. Solve the following differential equations:

$$(a) \sin x \frac{dy}{dx} + 2y = \tan^3\left(\frac{x}{2}\right). \quad \text{Ans: } y = \frac{1}{2} \log \frac{\cos x}{3}$$

$$(b) (x + 2y)(dx - dy) = dx + dy, \quad \text{Ans: } y = \frac{1}{2}x + C$$

$$(c) \frac{dy}{dx} = \frac{y}{x} + x \sin \frac{y}{x}, \quad \text{Ans: } y = x \ln x + Cx$$

3. (a) Discuss the method for solving an exact differential equation.  $\int M dx + \int N dy (\text{not contain } x) = C$

(b) Is the equation  $\{2xy(\cos x)^2 - 2xy + 1\}dx + \{(\sin x)^2 - x^2 + 3\}dy = 0$  exact? 5  
Hence solve the differential equation.  $\frac{\partial M}{\partial y} = 2x \cos x - 2x \quad \therefore \frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

(c) Derive the integrating factor of the following differential equation: 5

$$(2x \log x - xy)dy + 2y dx = 0. \quad \text{Ans: } M$$

4. (a) Define complementary function, particular integral and complete solution of a 5  
differential equation.

(b) Find the complementary function (CF) of the following differential equation: 5  
 $(D^2 + 4)y = \cos 2x. \quad C_1 \cos 2x + C_2 \sin 2x$

(c) Derive the particular integral and complete solution to the differential equation 5  
 $(D^2 + 4)y = \cos 2x. \quad \frac{x \sin 2x}{4} \quad \frac{D \sin 2x}{4}, \quad y = C_1 \cos 2x + C_2 \sin 2x + \frac{x \sin 2x}{4}$

[Please turn over.]

### Section B

Answer any 3 (three) questions.

1. Solve the following differential equations:

(a)  $(2x^2 + 3y^2 - 7)x dx - (3x^2 + 2y^2 - 8)y dy = 0,$  5

(b)  $(x^2 - y^2)dx + 2xydy = 0,$  5

(c)  $\cos(x+y) dy = dx.$  5

2. (a) Define order and degree of a differential equation. 3

(b) Show that the differential equation  $M(x, y)dx + N(x, y)dy = 0$  is exact if and only if  $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}.$  6

(c) Convert the differential equation,  $x \frac{dy}{dx} + y \log y = xy e^x$  to standard linear (Leibnitz's) form and then solve it. 6

3. (a) Form a partial differential equation by eliminating constants from the equation: 5  
$$z = axy + b.$$

(b) Write the working rule for solving the Lagrange's partial differential equation 5  
$$Pp + Qq = R. \quad \frac{\frac{\partial z}{\partial x}}{P} = \frac{\frac{\partial z}{\partial y}}{Q} = \frac{\partial z}{R}$$

4. Find the general solution to the partial differential equation: 5  
$$y^2 zp - x^2 zq = x^2 y.$$

(a) Define a matrix with an example. Null matrix 3

(b) Find the inverse of the matrix 7  
$$\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}. \quad \begin{bmatrix} 1 & -1 & 0 \\ -2 & 3 & -4 \\ -2 & 3 & -3 \end{bmatrix}$$

(c) Calculate the rank of the matrix 5  
$$\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}.$$

**HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR**

**B.Sc. (Engineering) in CSE**

**Semester Final Examination Level 1 Semester II 2020 (July-Dec)**

**Course Title: Society and Technology**

**Course Code: SOC 103 Credits: 02**

**Full Marks: 60**

**Duration: 02 hours**

**Section A: Marks 30**

**Answer any three (03) of the following**

- |  |  |
|--|--|
| <p>1. 'Sociology of Technology provides the knowledge to make a bridge between society and technology'. Explain the statement from the perspective of sociological imagination.</p> <p>2. How do broadcast media influence our daily life? Briefly discuss your lived experience.</p> <p>3. Define postindustrial society. Discuss the feature of this society elaborately.</p> <p>4. How social inequality is created between the 'Adivasi' and 'Bangalee' communities in terms of the mobile banking system in Bangladesh?</p> | <p><b>10</b></p> <p><b>10</b></p> <p><b>3+7</b></p> <p><b>10</b></p> |
|--|--|

**Section B: Marks 30**

**Answer any three (03) of the following**

- |  |   |
|--|---|
| <p>1. Illustrate the prominent features of "E-Governance".</p> <p>2. Discuss the law of cybercrime in Bangladesh.</p> <p>3. Explicit the present status of the recycling system of "E-Waste" in Bangladesh.</p> <p>4. What will be your contribution in the future as a CSE student to make a sustainable 'Digital Bangladesh?</p> | <p><b>10</b></p> <p><b>10</b></p> <p><b>10</b></p> <p><b>10</b></p> |
|--|---|