Bangladesh Open University

School of Science and Technology

B. Sc in Computer Science and Engineering Program

172 Term (1st Year 2nd Semester) Final Examination

Course Code & Title: MAT1231 Linear Algebra and Differential Equation

Time: 3 hours **Total Marks (5×14): 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) Define differential equation with examples. Define also order and degree of a differential equation with examples. 2+3

   (b) Find the differential equation whose solution is $y = a + b\ln x + c(\ln x)^2 + 3x^2$, where a, b and c are arbitrary constants. 5

   (c) Solve: $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$. 4

2. (a) Define homogeneous differential equation with example. Solve the equation 1+4
   $(6x - 4y + 1)dy = (3x - 2y + 1)dx$.

   (b) Determine whether the equation $ylogy\,dx + (x - logy)dy = 0$ is exact. If it is then solve. 4

   (c) Define Bernoulli's equation and hence solve : $\frac{dy}{dx} + \frac{2y}{x} = \frac{y^3}{x^3}$. 5

3. (a) Find the general solution of the following differential equations: 8
   (i) $(D^2 - 3D + 4)y = \cos(4x + 5)$;
   (ii) $(D^2 - 6D + 9)y = 1 + x + x^2$.
   where $D = \frac{d}{dx}$

   (b) Find the particular solution of $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 8e^{2x} - 5e^{3x}$, when $y(0) = 3$ and $y'(0) = 5$. 6

4. (a) Define upper triangular & lower triangular matrix. Show that $(AB)^{-1}=B^{-1}A^{-1}$, where A and B are non singular matrix. 2+3

   (b) Find the adjoint and inverse of the matrix $A = \begin{bmatrix} 2 & -1 & -1 \\ 1 & -2 & 1 \\ 1 & -1 & 2 \end{bmatrix}$. 4

   (c) Solve the following linear equations with the help of matrices: 5
   $x + 2y + 3z + 4 = 0$
   $2x + 4y + 5z + 7 = 0$
   $3x + 5y + 6z + 10 = 0$.

5. (a) Define rank of a matrix. Find the rank of matrix A=$\begin{bmatrix} 3 & -2 & 0 & -1 \\ 0 & 2 & 2 & 1 \\ 1 & -2 & -3 & 2 \\ 0 & 1 & 2 & 1 \end{bmatrix}$. 5

   (b) Prove that, $\begin{vmatrix} a^2 - bc & b^2 - ca & c^2 - ab \\ c^2 - ab & a^2 - bc & b^2 - ca \\ b^2 - ca & c^2 - ab & a^2 - bc \end{vmatrix} = (a^3 + b^3 + c^3 - 3abc)^2$. 5

   (c) Using Cramer's rule solve the followings: 4
   $x - y + z = 1$
   $x + y - 2z = 0$
   $2x - y - z = 0$.

6. (a) State and proof second fundamental theorem of subspace. 5

(b) Show that the set of vectors {(3, 0, 1, -1), (2, -1, 0, 1), (1, 1, 1, -2)} is linearly dependent. 4

(c) State Cayley Hamilton theorem. Use Cayley Hamilton theorem find A^{-1} of the matrix 5

$$A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}.$$

7+3

7. (a) Find the eigenvalues and eigenvectors of the matrix

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}.$$

Also find the matrix P that diagonalizes A and determine $P^{-1}AP$. 4

(b) Test whether the Transformation defined as follows is linear or not.

$$T : R^4 \to R^3 : T(x, y, z, t) = (x - y + z, x + y, y - t).$$

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172 Term (1st Year 2nd Semester) Final Examination

Course Code & Title: CSE1235 Digital Logic Design

Time: 3 hours **Total Marks: 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) Name the universal gates. Why they are called so? Explain with example using one of the universal gates. 4

   (b) Write the truth table, minimum Boolean expression of a full adder and draw the circuit diagram. Draw the block diagram of a full adder using half adder. 6

   (c) Apply DeMorgan's theorem (i) ((A+B+C)'D')' ; (ii) (AB'+C'D+EF)'. 4

2. (a) How multiplexers work? Draw the circuit diagram with waveforms for a 4-input multiplexer 4

   (b) Simplify the Boolean function in (a) sum of products and (b) product of sums using K-mapping technique. 4

   $$F(w,x,y,z) = \sum(0,1,2,4,5,6,8,9,12,13,14)$$

   (c) Simplify the below functions to a minimum number of literals: 6

   (i) $xy + x'z + yz$

   (ii) $(xy' + w'z)(wx' + yz')$

3. (a) Minimize the following expression using Karnaugh map and Draw the circuit diagram after minimization. 3

   Y= A'B'C'D+A'B'CD+A'BCD+AB'C'D'+ABC'D'+ABCD'+ABCD.

   (b) Map the following SOP expression on a Karnaugh map and find the equivalent SPOS and minimum form of POS expressions. 5

   A'BC+AB'+AB'C+AB'C'D+ABC'D'+A'BC'D.

   (c) Implement the below function with NAND gates: 6

   (i) $F(x,y,z) = \sum(1,2,3,4,5,7)$

   (ii) $(AB' + CD')E + BC(A + B)$

4. (a) Water is used for manufacturing process in a factory. The water is stored in four different tanks. A level sensor in each tank produces a HIGH signal when the level of water in the tank drops below a specified point. Design a circuit that monitors the water level in each tank and indicates when the level in any three of the tanks drops below the specified point. 5

   (b) Design a decimal-to-BCD encoder. 3

   (c) Implement the following Boolean expression using multiplexer. 4

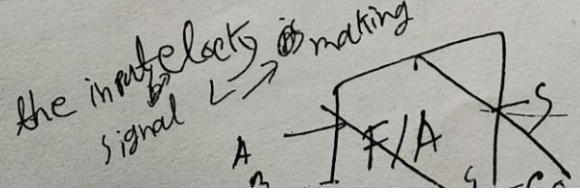
   A'BC+ A'B'C+ AB'C'+ ABC'+ ABC.

   (d) Draw a 2 by 4 de-multiplexer. 2

5. (a) What is a flip-flop? Define S-R and D flip-flops using block, circuit and timing diagrams. 5

   (b) "J-K flip-flops are used as frequency divider"- Justify with an example of divide by four with timing diagram. 4

   (c) How asynchronous counters work? Draw a circuit diagram of a MOD-10 asynchronous counter with truth table and timing diagram. 5



6. (a) Define sequential circuit with its basic block diagram. 1

(b) Draw a 2-bit up-down binary counter which is designed using T-flip-flops. 4

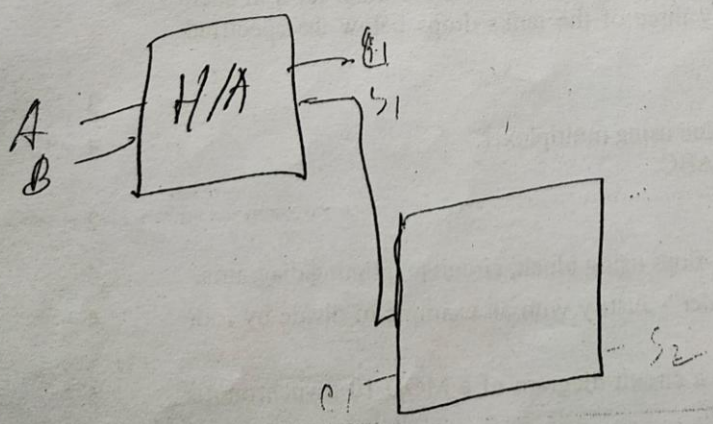
(c) Design a sequential circuit from the following state table: 9

Present State			Input	Next State			Output
A	B	C	x	A	B	C	y
0	0	1	0	0	0	1	0
0	0	1	1	0	1	0	0
0	1	0	0	0	1	1	0
0	1	0	1	1	0	0	0
0	1	1	0	0	0	1	0
0	1	1	1	1	0	0	0
1	0	0	0	1	0	1	0
1	0	0	1	1	0	0	1
1	0	1	0	0	0	1	0
1	0	1	1	1	0	0	1

7. (a) Consider the below 8-bit data word: 4
11000100
Generate parity bits and check bits for the above data.

(b) Design and draw the logic diagram of carry look-ahead generator. 5

(c) Design 64K DRAM using address multiplexing. 5



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B. Sc in Computer Science and Engineering Program

172 Term (1st Year 2nd Semester) Final Examination

Course Code & Title: EEE1233 Electronic Device and Circuits

Time: 3 hours **Total Marks (5×14): 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) State and explain Norton's theorem. 3

   (b) Determine the current flowing through the resistor 30Ω in the Fig-1(b). 6

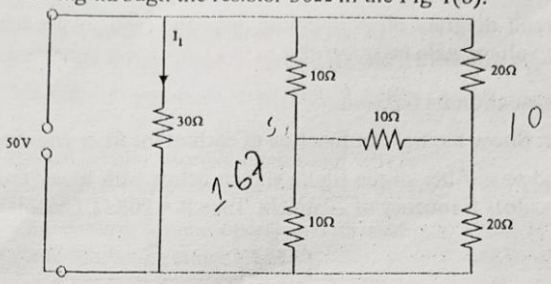


Fig-1(b)

   (c) Replace the Y-configuration of the following circuit shown in fig-1(c) with a Delta-configuration and solve the source current I_{S1}. 5

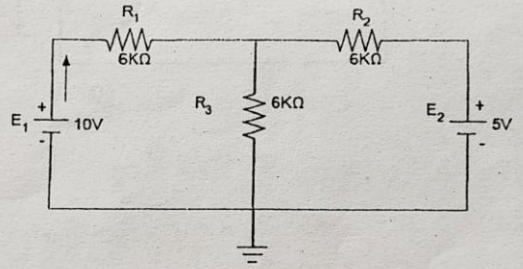


Fig-1(c)

2. (a) Define doping. How hole is formed in P-type semiconductor? 2+3

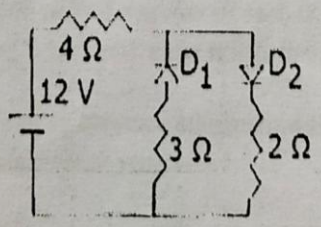
   (b) What are the conditions for forward and reverse biasing of PN diode? When does diode works as logic gate? 3+2

   (c) What do you mean by drift current and diffusion current in p-n junction diode. 4

3. (a) Explain full wave bridge rectifier with necessary diagram. What are the advantages of it over half and full wave rectifiers? 4+2

   (b) How a zener diode can be used for supplying constant voltage? 4

   (c) Two diodes are connected parallel in the circuit shown below, so what will be the current in circuit? 4



4. (a) "FET is a voltage controlled and uni-polar device." Explain the statement briefly. 4

(b) Explain construction and working principle of JFET with necessary diagram. 6

(c) Explain why the region upto V_P is called the ohmic region of JFET. 4

5. (a) Explain the construction and operation of UJT with appropriate block diagrams. 7

(b) Explain the reasons behind the existence of the negative resistance region in UJT. 4

(c) Compare between BJT and UJT. 3

6. (a) Write down the characteristics of an ideal Op-Amp? 3

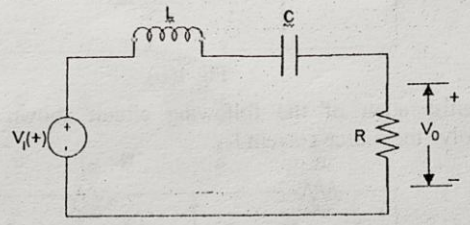
(b) Derive the output voltage equation on a closed loop non-inverting op-amp? 5

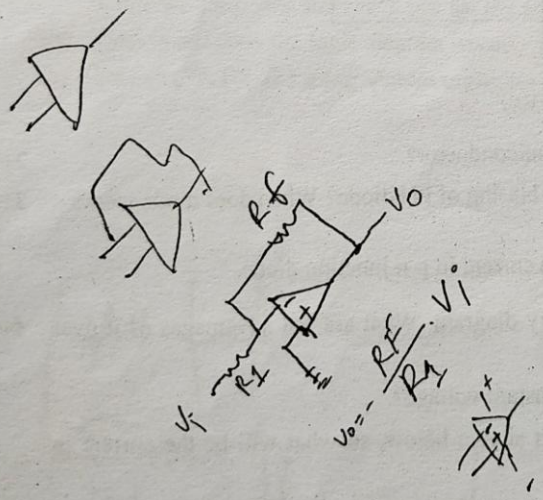
(c) Draw the circuit diagram of an inverting amplifier (without feedback) with appropriate label and write the voltage gain equation of it. 6

7. (a) Define filter. Mention its function. 2+2

(b) Classify filter. Show the transfer function of each of the filter with necessary diagram. 2+4

(c) Design a band-pass filter of the figure shown below with lower cutoff frequency of 20.1KHz and an upper cutoff frequency of 20.3KHz. Take R = 20KΩ. Calculate L and C. 4





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B. Sc in Computer Science and Engineering Program

172 Term (1st Year 2nd Semester) Final Examination

Course Code & Title: CSE1237 Structured Programming Language

Time: 3 hours **Total Marks: 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) Define Programming Language. Why C is called structured programming language? 1+1

   (b) (i) What is token in C programming? Write a simple program and identify what are the tokens are available there. 2+2+2

   (ii) What is key word? Give some examples of C keyword.

   (iii) What is flow chart? Draw a flow chart to test ODD and EVEN number.

   (c) What is an include file? Why do you need to include STDIO.H when use printf(), puts(), or scanf()? 1+2

   (d) Which of the followings are invalid variable names and why? 3
   Minimum, First.name, n1+n2, &name, doubles, 3rd_row, n$, float, Sum Total

2. (a) What is operator? Briefly discuss logical operator with example. What is the difference between the = operator and the = = operator? 1+4+1

   (b) Write a program to read the price of an item in decimal form (like 15.95) and print the output. 2

   (c) (i) how many times "C" is get printed and mention the reasons? 2+2+2

```
#include<stdio.h>
main()
{
int x;
for(x=1;x<=10;x++)
{
if(x<5)
printf("C");
}
}
```

   (ii) What will be the output of the following program?

```
main()
{ float a, b, c, x, y, z;
 a=9; b=12; c=3;
x=a-b/3+c*2-1;
y=a-b/(3+c)*(2-1);
printf("x=%f \n", x);
printf("y=%f \n", y);
}
```

   (iii) What is the value of x from the following code and why?

```
int x, a=10, b=5;
x=(a>b)? b:a
```

3. (a) Classify loop control structure and write the syntax of each of them. 4

   (b) If two loops are nested together, which one must finish first, the inner loop or the outer loop? Briefly explain. 4

   (c) Write down the general structure of switch-case statement with example. 4

   (d) What is the purpose of continue and break statement? 2

4. (a) What is an array? How does an array differ from an ordinary variable? Briefly explain. 2+3

(b) What is a string? Briefly discuss the use of any three (03) library functions of string manipulation. 2+3

(c) Suppose an array contains 10 integers. Write a C program to calculate the sum of these 10 integers. 4

5. (a) What is function and list out the advantages of function? C offers two types of functions. What are they, and how are they different? 2+4

(b) When passing arguments to a function, what's the difference between passing by value and passing by reference? 4

(c) What is Recursion? Write a Program using recursion to determine the factorial of N numbers? 1+3

6. (a) What is structure? How does a structure differ from an array? Write the syntax of structure declaration with example. 1+1+4

(b) Define a structure type data named student which contains stdudent_id stdudent_name, department and std_cgpa. Using this structure write a program to read this information for two students from the keyboard prints the same on the screen. 4

(c) What is a pointer? State the benefits of pointer. Show the memory representation of the following declarations: 1+3

```
int m=0, n=20;
int *ptr=&m;
n=*ptr
```

7. (a) What is file? Write the purpose of the following file handling functions: 1+4
(i) fopen() (ii) getc() (iii) fscanf() (iv) fseek()

(b) What is file mode? State the purpose of various file modes to open a file. 1+4

(c) Write a C program to read name and marks of n number of student from user and store them in a file named 'student.txt'. 4

① User defined function.
② Built in function

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Bangladesh Open University

School of Science and Technology

B. Sc in Computer Science and Engineering Program

172 Term (1st Year 2nd Semester) Final Examination

Course Code & Title: HUM1222 Bangladesh Studies

Time: 3 hours **Total Marks (5×14): 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) What is Two Nation Theory? 2
   (b) Write in brief about the Language Movement, 1952. 4
   (c) Discuss the political context of liberation war of Bangladesh. 8

2. (a) Discuss the contribution of agriculture in the economy of Bangladesh. 6
   (b) Mention the existing drawbacks of Bangladesh agriculture. 4
   (c) What measures need to be taken for developing the agriculture of Bangladesh? Explain. 4

3. (a) Show the classification of modern's government. 3
   (b) Write down the merits and demerits of democracy. 5
   (c) How political parties can play role in sustaining modern democracy in Bangladesh? Explain. 6

4. (a) "Family is the first educational institution in any body's life" –explain the statement. 6
   (b) Write the advantages and disadvantages of joint family and single family. 8

5. (a) What do you mean by the word "Social Control"? 4
   (b) Explain the types of social control with example. 10

6. (a) What do you mean by society? 4
   (b) Distinguish between culture and civilization. 10

7. (a) What is industrialization? 5
   (b) Write some benefits of Private-Public Partnership (PPP). 9