Bangladesh Open University
School of Science and Technology
B. Sc in Computer Science and Engineering Program
162 Term (1ˢᵗ Year 2ⁿᵈ Semester) Final Examination
Course Code & Title: MAT1231 Linear Algebra and Differential Equation

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 a differential equation with examples. Define also order and degree of a differential equation with examples. Distinguish between an ODE and a PDE. 5

   (b) Find the differential equations from the following equation: 5
   $$y = e^x(A\sin 2x + B\cos 2x).$$

   (c) Solve: $x^2(1 + y)dy + y^2(x - 1)dx = 0$. 4

2. (a) Define homogeneous and linear differential equation with examples. Solve: 2+5
   $$\frac{dy}{dx} + 2y\tan x = \sin x, \quad y\left(\frac{\pi}{3}\right) = 0.$$

   (b) Verify that the differential equation $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$ is exact and hence solve it. 7

3. (a) Solve (any two): 8
   (i) $(D^2 - 4D + 13)y = 0$;
   (ii) $(D^2 + 4)y = e^x + x^2$;
   (iii) $(D^2 + a^2)y = \cos ax$.

   (b) Find the particular solution of $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 0$ when $y(0) = 0$ and $y'(0) = 1$. 6

4. (a) Define symmetric and skew-symmetric matrices. Prove that every square matrix A can be expressed as the sum of a symmetric matrix and a skew-symmetric matrix. 1+4

   (b) If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then show that $A^2 - 4A - 5I = 0$, where I, 0 are the unit matrix and the null matrix of order 3 respectively. Use this result, also find A^{-1}. 3+2

   (c) Prove that, $A = \frac{1}{6}\begin{bmatrix} 3 & 3 & 3 & 3 \\ 3 & -5 & 1 & 1 \\ 3 & 1 & 1 & -5 \\ 3 & 1 & -5 & 1 \end{bmatrix}$ is an orthogonal matrix. 4

5. (a) Solve the following equation by using inverse of matrix method: 5
   $$2x - y + 3z = 9$$
   $$x + 3y - z = 4$$
   $$3x + 2y + z = 10$$

   (b) Find the rank of the matrix, $A = \begin{bmatrix} 1 & 2 & 0 & -1 \\ 2 & 6 & -3 & -3 \\ 3 & 10 & -6 & -5 \end{bmatrix}$. 4

   (c) Find the value of the determinate: $\begin{vmatrix} 2 & 1 & -1 & 4 \\ -2 & 3 & 2 & -5 \\ 1 & -2 & -3 & 2 \\ -4 & -3 & 2 & -2 \end{vmatrix}$. 5

6. (a) Define a vector space and subspace with example. 4

   (b) Show that $S = \{(a, b, c, d) \in R^4 : 2a - 3b + 5c - d = 0\}$ is a subspace of R^4. 5

   (c) Prove that the vector space V is the direct sum of its subspaces U and W if and only if: 5
   (i) $V = U + W$;   (ii) $U \cap W = \{0\}$.

7. (a) Define eigenvalues and eigenvectors of a square matrix. 2

   (b) Find the eigenvalues and the associated eigenvectors of the following matrix: 7
   $$A = \begin{bmatrix} 8 & 2 & -2 \\ 3 & 3 & -1 \\ 24 & 8 & -6 \end{bmatrix}$$

   (c) Find the general solution of the following system and then also find a particular solution. 5
   $$x + 2y - 3z = 6$$
 $$2x - y + 4z = 2$$
   $$4x + 3y - 2z = 14$$

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162 Term (1st Year 2nd Semester) Final Examination
Course Code & Title: EEE1233 Electronic Device and Circuit

Total Marks: 70

Time: 3 hours

[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) Explain p-n junction required for semiconductor devices. Define majority and minority carries.   5+2
   (b) Draw and explain the V-I characteristics curve of diode.   4
   (c) Prove that ripple factor of full-wave rectifier is less than half-wave rectifier.   3

2. (a) What is the difference between normal and Zener diodes? Draw the diagrams in both cases.   3+2
   (b) When does an ideal diode work as switch: ON and OFF modes.   3
   (c) Determine whether the ideal Zener diode of the Fig. is properly biased? Explain why?   6

1kΩ

10V
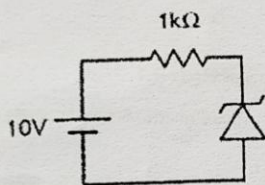
Where, $V_Z = 10v$, $I_Z(max) = 6mA$.

3. (a) Show that "Transistor can be used as an amplifier".   4
   (b) Draw and explain the input and output characteristic curve of transistor with common emitter connection.   5
   (c) Two diodes are connected parallel in the circuit. What will be the current in the circuit?   5

4Ω
12 V
D_1 D_2
3Ω 2Ω
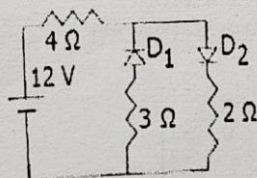
4. (a) What is the difference between a JFET and a bipolar transistor?   3
   (b) Explain the typical drain and transfer characteristics of an n-channel depletion MOSFET.   8
   (c) Explain relationship between different currents of BJT.   3

5. (a) Analysis the I_D-V_{DS} curve of a JFET and show the region which indicates Ohmic region.   6
   (b) When does a JFET behave like a resistor?   2
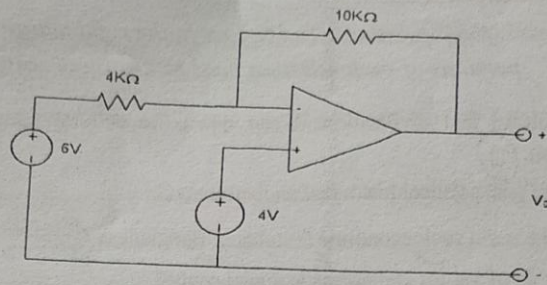   (c) Illustrate the response curve for band pass, low pass and high pass filters.   6

EEE1233

6. (a) Why op-amp is so called? For an inverting op-amp, show that $V_0 = -\dfrac{R_f}{R_i} V_i$, where symbols have their usual meaning.

(b) Design an adder and high pass filter using op-amp.   3

(c) For the op-amp circuit in Fig, calculate the output voltage V_0.   5

7. (a) What is UJT? Design UJT and explain its working principle.   1+4
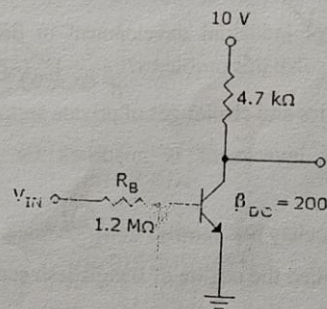
(b) Explain the UJT characteristics curve. What do you mean by negative resistance?   4+2

(c) Refer to the Fig. below, determine the minimum value of I_B that will produce saturation. Where I_B refers to the base current.   3

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162 Term (1st Year 2nd Semester) Final Examination
Course Code & Title: HUM1222 Bangladesh Studies

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 culture and civilization. Write down the cultural features of the people of Bangladesh.   2+5

   (b) Discuss the geo-political history of ancient Bengal.   7

2. (a) Mention the main socioeconomic features of Bangladesh.   6

   (b) State the role of values and norms in social control.   8

3. (a) Analyze the contribution of agricultural sector in economic development of Bangladesh.   7

   (b) Write down the existing problems of the agricultural sector of Bangladesh. What measures should be taken to these problems? Explain. → overcome   3+4

4. (a) What is industrialization? Discuss briefly the major industries of Bangladesh.   1+3

   (b) Identify the problems of industrial development in Bangladesh. Do you think Public Private Partnership can solve this problems? features   10

5. (a) What are the opportunities and challenges of private sector development in Bangladesh?   7

   (b) Do you think foreign investment is important for the economic development of Bangladesh? Why?   7

6. (a) What do you mean by society and family?   2+2

   (b) Why private sector is called the engine of Bangladesh economy?   10

7. (a) What is government? Discuss the different forms of government.   2+5

   (b) Write some features of Bangladeshi democracy.   7

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162 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) Design a logic circuit whose output is HIGH whenever A and B are both HIGH as long as C and D are either both LOW or both HIGH. 4

   (b) Find the Boolean expression for the following truth table, simplify that expression and design the logic circuit for that simplified expression. 6

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

   (c) Convert the following numbers with the indicated bases to decimal: 0.5×4=2
       (i) $(4310)_5$ (ii) $(198)_{12}$ (iii) $(2EB)_{16}$ (iv) $(2001.5)_8$

   (d) Perform subtraction on the following binary numbers using 2's complement: 2
       (i) 101101-01001   (ii) 0101010-100100

2. (a) Simplify the Boolean functions using K-map: 2×3=6
       (i) $F(w,x,y,z) = \Sigma(0,1,2,4,5,6,8,9,12,13,14)$
       (ii) $F = \bar{A}\bar{B}\bar{C} + \bar{B}C\bar{D} + \bar{A}BC\bar{D} + A\bar{B}\bar{C}$
   (iii) $F(w,x,y,z) = \Sigma(1,3,7,11,15)$

   (b) Simplify the following Boolean functions to a minimum number of literals using Boolean algebra: 1.5×4=6
       (i) $xy + \bar{x}z + yz$ (ii) $(x+y)(x+\bar{y})$
       (iii) $xy + x(wz + w\bar{z})$ (iv) $xy + \bar{x}\bar{y} + \bar{y}z$

   (c) Design a full adder circuit. 2

3. (a) Write the Boolean expression for output x in the following figure. Determine the value of x for all possible input conditions, and list the values in a truth table. 4
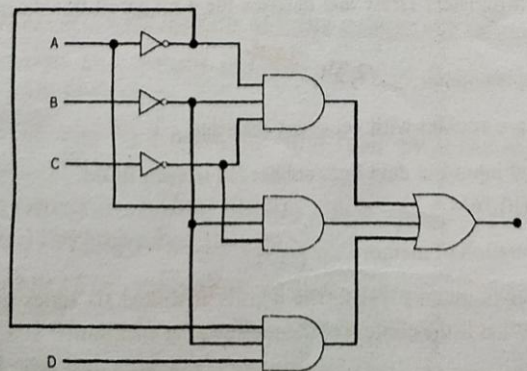
   (b) Given the following Boolean function: 10
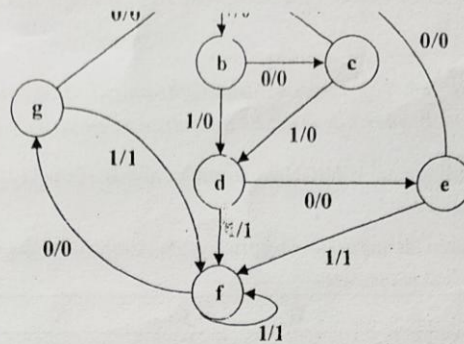
5. (a) A sequential circuit has three D flip-flops, A, B, C and one input, x. It is described by the following flip-flop input functions: 6
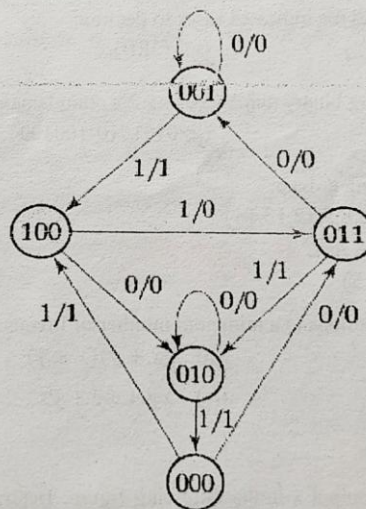
$$D_A = (B\bar{C} + \bar{B}C)x + (BC + \bar{B}\bar{C})\bar{x}$$
$$D_B = A$$
$$D_C = B$$

    i) Derive the state table for the circuit.

    ii) Draw two state diagram: one for x=0 and the other for x=1.

(b) Design the sequential circuit specified by the following state diagram using D flip-flops.   8

6. (a) What do you mean by shift register? Draw and describe the 4-bit serial transfer register circuit with an example.   1+3

    (b) Draw and explain BCD ripple counter. — 334, 339   5

    (c) Explain 4-bit up–down binary counter with necessary diagram.   5

7. (a) How many address lines and input-out data lines are needed in each ROM: 4

      (i) 2G × 8   (ii) 16M × 32   (iii) 4K × 16   (iv) 256K × 64

    (b) Explain *Read* and *Write* operation of memory.   2

    (c) The content of 4-bit register is initially 1101. The register is shifted six times to the right with the serial input being 101101. What is the content of the register after each shift?   3

    (d) Given a 32×8 ROM chip with an enable input, show the external connections necessary to construct a 128×8 ROM with four chips and a decoder.   5

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162 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) What is computer program? Discuss the steps to execute a 'C' program.   1+3
    (b) What is identifier? Write down the rules for constructing 'C' identifier?   1+3
    (c) What is keyword? What is the purpose of the keyword void?   1+1
    (d) Briefly explain *printf* and *scanf* function. Write the format specifier available in 'C' language.   4

2. (a) What is data type? Explain different data types in 'C' giving an example to each.   1+4
    (b) What is operator? Discuss logical operator. What is the difference between the = operator and the = = operator?   1+3+1
    (c) (i) What will be the output of the statement printf(" %c",'65')?
        (ii) Does 7%2 produce the same result as 4%3? Justify your answer.   2
    (d) Write a C program that prints the numbers divide by both 2 and 5 within the range 1 to 100.   2

3. (a) Differentiate between branching and looping with appropriate example.   6
    (b) What is the use of break and continue statement in C language?   1
    (c) Classify loop control structure. Write the syntax and draw the block diagram of each of them.   1+6

4. (a) What is an array? How does an array differ from an ordinary variable? Briefly explain.   1+1+4
    (b) What is a string? Discuss the use of any three (03) library functions of string manipulation.   1+3
    (c) Write a program to calculate summation of 10 integer's number using array.   4

5. (a) What is structure? Explain the syntax of structure declaration with example.   1+4
    (b) How does a structure differ from an array? Define a structure named BOUCSE which contains std_name,std_id 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.   2+4
    (c) What is pointer? State the benefits of using pointer in a program.   1+2

6. (a) What is function and list out the advantages of function? Differentiate between user defined and built in function.   3+2
    (b) Distinguish between 'call by value' and 'call by reference' techniques of arguments passing to functions.   4
    (c) Write a program to calculate the value of x to the power y (x^y) using
        (i) Function (ii) Recursive Function.   5

7. (a) What is file mode? State the purpose of various file modes to open a file.   1+3
    (b) Illustrate various file handling operations in C.   5
    (c) A file named 'dat.txt' contains a series of integer numbers. Write a C program to read these numbers and then write all positive numbers to a file named 'positive.txt'.   5