

[2015-16]

Begum Rokeya University, Rangpur
 Department of Computer Science and Engineering
 2nd Year 1st Semester Final Examination-2018
 Course Code: CSE 2101
 Course Title: Digital Logic Design

Time: 3 Hours

Full Marks: 50

Answer any five questions

1. a) Suppose you purchase a BMW 2 series car which uses different sensors to assist drivers through generating alert signal. BMW2 generates alert when its speed is more than 140 kmh-1, road is not level plain, temperature is less than 2200F. Moreover, BMW2 generates alarm if its pressure is more than 250 psi. Now present this context using Boolean expression, logical expression, truth tables, and timing diagram. 3
- b) State DeMorgan's Theorems. Describe the implications of DeMorgan's Theorems. 3
- c) A logic circuit is needed to generate a signal x that will go HIGH whenever conditions A and B exist simultaneously or whenever conditions C and D exist simultaneously. Clearly, the logic expression for x will be $x=AB+CD$. Firstly implement this circuit using primary gate, and then implement the same circuit using either universal gate. 4
2. a) State seven major steps which are used in K-map method for simplifying any Boolean expression. 3
- b) Show how a three-input NAND gate can be constructed from three-input NOR gates. 3
- c) Design the logic circuit that will control the horn when manufacturing company needs to have a horn sound to signal quitting time. The horn should be activated when either the following condition is met:
 - a) it's after 5 O'clock and all machines are shut down.
 - b) It's Friday, the production run for the day is complete, and all machines are shutdown.
- d) Explain Don't-Care condition. 1
3. a) Illustrate parity generator and checker. 3
- b) Explain how J-K flip flop solves the ambiguity challenge of S-R flip flop. 2
- c) Briefly explain the operation of the clocked S-R flip-flop. 3
- d) How do you implement D flip-flop from J-K flip-flop? 2
4. a) Design a logic circuit which can do parallel transfer of four bit information from one circuit to another circuit. 2
- b) Illustrate Setup and Hold times. 2
- c) What is clock skew? How can it cause a problem? 3
- d) If this counter starts at 00000000, what will be its state after 520 pulses? 2

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|----|---|---|
| e) | What is meant by the term edge-triggered? | 1 |
| 5. | a) Proved that counter waveforms show frequency division by 2 for each Flip-Flop. | 2 |
| | b) What would be the MOD number of the counter if three more FFs are added? Show how to wire the 74LS293 as MOD-10, and MOD-60 counter. | 4 |
| | c) Write the prospects and problems of a synchronous counter over an asynchronous counter? | 2 |
| | d) Show how to wire a 74LS293 as a MOD-14 counter. | 2 |
| 6. | a) What is the difference between decoder and multiplexer? | 2 |
| | b) Draw the logic circuit of a 3 line to 8 line decoder and explain its circuit operations. | 5 |
| | c) How 74LS138 decoder can function as a de-multiplexer. | 3 |
| 7. | a) State merits and demerits of CMOS logic family. | 3 |
| | b) Explain with neat diagram two input CMOS and TTL NAND and NOR gates. | 7 |

Begum Rokeya University, Rangpur
 Department of Computer Science and Engineering
 2nd Year 1st Semester Final Examination-2018
 Course Code: CSE 2103
 Course Title: Data Structure

Time: 3 Hours

Full Marks: 50

Answer any five questions

1.
 - a. What is Data Structure? What is "Time-Space Trade-off" in complexity? Why do we need to consider it? 1+2
 - b. Give a brief description of (a) traversing, (b) sorting and (c) searching. 1
 - c. Consider the pattern $P = a^3ba$. Construct the table and the corresponding labeled directed graph used in the "fast" pattern matching algorithm. 4
 - d. Let W be the string ABCD. (a) Find the length of W. (b) List all substrings of W. 1+1
2.
 - a. How String type data structure store data, describe. 2
 - b. If you have given two methods called 3
 - i) INDEX (T, P): Input – T is a text String, P is a Pattern; Output: index value where P is found in S for the first time.
 - ii) LENGTH (P): Input – P is pattern; Output: length of P.

Write an algorithm that can delete every occurrence of P in T.
 - c. Consider S is story which contains multiple paragraphs. Write an algorithm which will interchange the kth and lth paragraphs in the short story S. 5
3.
 - a. What is *record* type data structure? Why do you need to use such a data structure? 1+1
 - b. Each student in a class of 30 students takes 6 tests in which scores range between 0 and 100. Suppose the test scores are stored in a 30 X 6 array TEST. Write a module which 2+2
 - (a) Finds the average score for each test
 - (b) Finds the highest score for each student
 - c. Write down the algorithm of recursive solution to tower of hanoi problem for N disks 4
4.
 - a. What is Linked List? Describe representation of Linked List in memory. 1+2
 - b. Suppose NAME1 is a Linked List in memory. Write an algorithm which copies NAME1 into a list name NAME2. 7
5.
 - a. Why Stack data-structure is considered as "Postponed Decision"-based data-structure? Describe with an example. 2
 - b. Consider the following arithmetic expression P, written in postfix notation 3+1

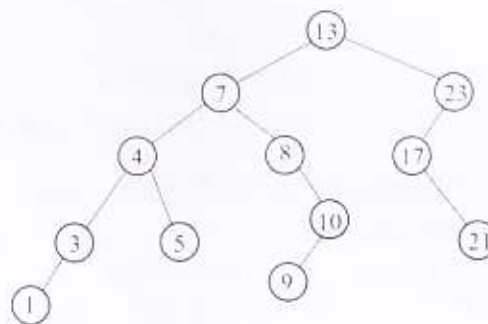
P: 22, 17, 13, -, /, 12, 11, 15, +, *, +

- (a) Translate P, by inspection and hand, into its equivalent infix expression
 (b) Evaluate the infix expression

c. Consider you have given a string S. Using Stack, write an algorithm that can reverse the string. 4

6 a. What is Extended Binary Trees? How you can convert a Binary Tree to Extended Binary Tree? 1+1

b. Consider the following Binary Search Tree 2+3



- (a) Insert a node with value 11
 (b) After performing (a), delete the node with value 7.

c. What is Heap data structure? Write pseudocode to insert a value in a Heap. 1+2

7 a. Draw tree T which corresponds to the following mathematical expression. 4

a. $(3*(1-x))/(4+(7-(y+2)))$

b. $(2*x+y)*(5*a-b)$

b. What is Graph? What are the standard ways of traversing a graph? 3

c. Write down the procedure to calculate N! and returns the value to the variable FACT. 3

Begum Rokeya University, Rangpur

Department of Computer Science and Engineering

B.Sc. (Engg.) 2nd year 1st Semester Final Examination, 2017. (Session: 2015-16)

Course Code: STA 2125

Time: 3.00 hours

Course Title: Statistics

Total Marks: 50

[N B: Answer any five (5) questions and figures in the right margin indicate full marks]

1. a) Define the following terms: Data, Quantitative variable, Frequency polygon, Median, Standard deviation. 5
 b) A variable takes values $a, ar, ar^2, \dots, ar^{n-1}$, each with frequency unity. Show that $AM \times HM = GM^2$. Also prove that $AM > GM > HM$ unless $n=1$. Where AM =Arithmetic Mean, GM = Geometric mean, HM =Harmonic mean. 5

2. Suppose that it is desired to determine the relationship between the length of sales experience (x) and the volume of sales (y) for each salesman from a group of 10 salesman of an insurance company. Years of sales and sales volume are shown below:

Sales experience (in years) x	1	2	5	7	8	9	10
Volume of sales (in Tk.100000) y	3	2	6	9	9	12	10

 a) Construct a regression line of Y on X. Interpret the result. 5
 b) Estimate the amount of sales for a salesman who has had 12 years of sales experience? 5

3. a) Find the variance of the series $a, a+d, a+2d, \dots, a+2nd$. 4
 b) Find two numbers whose arithmetic mean is 6 and variance is 16. 3
 c) Show that variance is independent of origin but dependent on scale of measurement. 3

4. a) Define the following terms: Probability, Event, Sample space, Conditional probability, Random variable. 5
 b) Seventy percent of the passengers who travel on Rangpur Express to Rangpur from Dhaka buy 'Daily Star' at the bookstall before they board the train. The train is full and each compartment holds eight passengers. 5
 i) What is the probability that all the passengers in a compartment have bought the 'Daily Star'?
 ii) What is the probability that none of the passengers in a compartment has bought the 'Daily Star'?
 iii) What is the probability that exactly three passengers in a compartment have bought the 'Daily Star'?
 iv) What is the most likely number of passengers in a compartment have bought the 'Daily Star'?

5. The random variables X and Y have the following density function

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y), & 0 < x < y, 2 < y < 4 \\ 0, & \text{Otherwise} \end{cases}$$

 a) Find $E(X)$ and $E(Y)$ and $E(XY)$ 4
 b) Verify whether $E(X+Y) = E(X)+E(Y)$ 3
 c) Are X and Y independent 3

6. a) What is expectation and variance of random variable? If x and y are two random variables, then show that (i) $\text{cov}(x,y) = 0$ and (ii) $v(x+y) = v(x)+v(y)$; if x and y are independent.

- b) Find $E(x)$ and $E(x^2)$ from the following probability distribution

X	-1	0	1	2	3
P(X)	0.2	0.1	0.3	0.3	0.1

- c) If $P(x) = a+bx$, $x = 0, 1, 2$ and $E(x) = 2$, then find the value of a .

7. a) Derive the pdf of Poisson distribution and find the mean and variance.

- b) The average number of calls received by a telephone operator during a time interval of 10 minutes from 5.00PM to 5.10PM daily is 3. What is the probability that the operator will receive

- No call
- Exactly one call
- At least two calls tomorrow during the same time interval

Begum Rokeya University, Rangpur
Department of Computer Science and Engineering
2nd Year 1st Semester B.Sc. (Engg.) Examination-2017

Course No. : MAT 2127

Course Title: Matrices and Differential Equations

Full Marks: 50

Time: 03 hours

N.B.: Answer any FIVE questions from the followings.

1. a) Define idempotent matrix. Show that $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is idempotent. 3.5
 b) Show that $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 4 & -1 \end{bmatrix}$ anti-commute and $(A + B)^2 = A^2 + B^2$. 3
 c) Show that every square matrix can be expressed as a sum of symmetric and skew-symmetric matrices. 3.5
2. a) What do you mean by rank of matrices? Find the rank of the matrix A, where $A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. 5
 b) Find the adjoint of the matrix A and then find its inverse, where $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$. 5
3. a) State and prove Cayley Hamilton Theorem. 5
 b) Show that matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 3 \\ 2 & -1 & 1 \end{bmatrix}$ satisfies Cayley Hamilton Theorem. 5
4. a) Define ordinary differential equation, Nonlinear equation, solution and complementary function. Show that $y = 4e^{2x} + 2e^{-3x}$ is a solution of the initial value problem $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$ with $y(0) = 6$ and $y'(0) = 2$. 5
 b) What do you mean by exact differential equation? Verify the following equation is exact or not. 5
 i) $(2x \sin y + y^3 e^x)dx + (x^2 \cos y + 3y^2 e^x)dy = 0$ ii) $ydx + 2xdy = 0$
5. a) Solve the equation $(6xy + 2y^2 - 5)dx + (3x^2 + 4xy - 6)dy = 0$ 3
 b) Find the solution of the equation $(x^2 - 3y^2)dx + 2xydy = 0$, separating the variables. 3
 c) Solve the differential equation $\frac{dy}{dx} + y = xy^3$. 4
6. a) Find an integrating factor and then solve the equation $(5xy + 4y^2 + 1)dx + (x^2 + 2xy)dy = 0$. 3
 b) Find the orthogonal trajectories of the curves $cx^2 + y^2 = 1$. 3.5
 c) A body of weight 8lb falls from rest towards the earth from a great height. As it falls, air resistance acts upon it and we shall assume that resistance (in pounds) is numerically equal to $2v$, where v is the velocity (in feet per seconds). Formulate the differential equation and then find the velocity. 3.5
7. a) Find the general solutions of the differential equation i) $y''' - 4y'' + y' + 6y = 0$ ii) $y'' - 6y' + 9y = 0$ 4
 b) Find the general solutions of the differential equation $y'' - 2y' - 3y = 2e^x - 10\sin x$. 6

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Department of Computer Science and Engineering

B.Sc. (Engg.) 2nd year 1st Semester Final Examination, 2017. (Session: 2015-16)

Course Code: **SOC 2223**

Time: **3.00 hours**

Course Title: **Bangladesh Studies & Sociology**

Total Marks: **50**

[N.B: Answer any five (5) questions and figures in the right margin indicate full marks]

1. Write an essay on the socio-economic history of Bangladesh. 10
2. Write an essay on the liberation war of Bangladesh. 10
3. Write an essay on the constitutional features of Bangladesh. 10
4. Define globalization. Do you think globalization can play a part for the empowerment of women in Bangladesh? Explain giving examples. 10
5. What is meant by sub-culture? Discuss. 10
6. Define Sociology. Critically discuss the sociological perspectives of social issues. 10
7. Write short note on any two of the following: 20
i) Digital Bangladesh;
ii) Cultural lag;
iii) Ethnic people;
iv) 4G; 10

Begum Rokeya University, Rangpur
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2nd Year 1st Semester B.Sc. (Engg.) Examination-2017
Course No. : CSE CHM 2124 Course Title: Chemistry

Full Marks: 50

Time: 03 hours

N.B.: Instruction for Candidates:

i) The figures in the right margin indicate full marks. ii) Answer any **FIVE** questions from the followings. iii) All questions must be answered sequentially.

1. a) Write down the postulates of Rutherford's atomic model. 4
b) Briefly describe the fundamental particles. 3
c) Classify the isotopes, isobars and isotones of the following elements $^{64}_{29}\text{Cu}$, $^{35}_{17}\text{Cl}$, $^{31}_{15}\text{P}$, $^{32}_{14}\text{Si}$, $^{64}_{30}\text{Zn}$ and $^{204}_{82}\text{Pb}$ 3
2. a) How will you prove that nucleus is positive in charge? 4
b) Define orbit and orbital. Write the physical significance of Ψ and Ψ^2 . 4
c) Calculate the total number of electrons enters into the 3rd energy level in an atom. 2
3. a) Define the following terms: 3
i) Electronegativity ii) Hund's rule and iii) Periodicity of element.
b) What is ionization potential? Explain that the 1st ionization potential of K is lower than that of Na. 3
c) What is electron affinity? Show the increasing trend of electron affinity in period and group of periodic table. 4
4. a) Define activation energy and reaction energy with energy profile diagram in a chemical reaction. 3
b) The half-period of a substance in a first order reaction is 15 minutes. Calculate the rate constant. 3
c) What are rate, rate laws and order of reaction? Write the rate law and order of the following reactions: 4
i) $\text{H}_2 + \text{I}_2 \rightarrow 2\text{HI}$
ii) $2\text{NO}_2 \rightarrow 2\text{NO} + \text{O}_2$
5. a) Define the following terms: 4
i) Colloid ii) True solution iii) Absorption iv) Adsorption.
b) What is adsorption isotherm? How adsorptions take place on metal surface? 4
c) Write down the assumptions of Langmuir Adsorption isotherm. 2
6. a) What are electrolytes and electrolysis? Show the mechanism of electrolysis of HCl. 5
b) Define the terms: i) Molar conductance and ii) Specific conductance 2
c) Define Electrochemical equivalence in light of Faraday's 1st law of electrolysis. 3
7. a) What are gel, foam and aerosol? 3
b) Describe the cleaning action of soap. 4
c) What is ampere? State the Ohm's law of electricity. 3