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Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
2nd Year 1st Semester B.Sc. Engineering Final Examination-2018

Course Title: Digital Logic Design **Course Code: CSE 203**
Total Marks: 60 **Time: 3 (three) Hours**

N.B.
i) Answer **SIX** questions taking any **THREE** from each Section, ii) All questions are of equal values.
iii) Use separate answer script for each section

Section: A

1. a) Perform the subtraction with the following decimal numbers using 9's complement and 10's complement. i) 72532-3250, ii) 3250-72532 — 4
   b) Let X= 01100 and Y= 00110, draw the input-output signals for AND, OR and NOT gates. — 3
   c) Draw the odd-parity generation table and its figure. — 3

2. a) Prove that i) x+xy = x, ii) x+1 = 1 using postulates and theorems of Boolean algebra. — 3
   b) Design a combinational circuit that accepts a three-bit number and generates an output binary number equal to the square of the input number. — 5
   c) Express the Boolean function F = A+B′C in a sum of minterms. — 2

3. a) Simplify the Boolean function F= ∑(0,1,2,4,5,6,8,9,12,13,14) using K-map and draw the logic diagram after simplified. — 3
   b) State the design procedure of a combinational circuit. Differentiate between combinational circuit and sequential circuit with sketching block diagram of each. — 3
   c) What is decoder? Explain a 3-to-8 line decoder. — 4

4. a) Design a combinational circuit whose input is a four-bit number and whose output is the 2's complement of the input number. — 5
   b) What is parity bit? Design a circuit to check for even parity of four bits. — 3
   c) Find the complement of the functions F = x′yz′ + x′y′z — 2

Section: B

5. a) What is code conversion? Design a BCD-to-Access-3 code converter. — 6
   b) Implement the Boolean function F (A,B,C,D) = ∑(0,1,3,4,8,9,15) with a multiplexer. — 4

6. a) Design the octal-to-binary encoder. — 4
   b) Implement the Boolean functions F_1 = AB′ + AC and F_2 = AC+BC using PLA. — 4
   c) Draw the switching circuits for the following expression: i) F= (A+B+C).(D+E), ii) (AB+CD).(E.F) — 2

7. a) Draw the block diagram of a sequential circuit. Define the following terms: — 5
      i. Asynchronous sequential circuit
      ii. Synchronous sequential circuit.
      iii. Clocked sequential circuit.
   b) What is meant by a clock? Write the difference between edge and level in a clock with appropriate figure of a clock. — 2
   c) Draw the T flip-flop with graphic symbol. Also obtain the truth table and simplified expression by using map method. — 3

8. a) Draw the logic diagram of a master slave flip flop. 2

b) A sequential circuit has one input variable **x**, one output variable **y**, and two clocked RS flip-flop **A** and **B**. Draw the state diagram for the following state table: 3

	Next State		Output	
Present State	**x = 0**	**x = 1**	**x = 0**	**x = 1**
AB	**AB**	**AB**	**y**	**y**
00	00	01	0	0
01	11	01	0	0
10	10	00	0	1
11	10	11	0	0

c) First you have to write the truth table of JK clocked flip flop and find the excitation table. 3

d) Write down the steps for designing a clocked sequential circuit. 2

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2nd Year 1st Semester B.Sc. Engineering Examination – 2018
Course Code: STA205 Course Name: Applied Statistics and Queuing Theory
Full Marks: 60 **Time: 3 Hours**

N.B.
i. Answer **SIX** questions, taking any **THREE** from each section.
ii. All questions are of equal values.
iii. Use separate answer script for each section.

Section A (30 Marks)

1. a) Distinguish between Binomial distribution and Poisson distribution? 2
   b) Show that mean and variance of Poisson distribution are equal. 4
   c) The probability that a man aged 50 years will die within a years is .01125. What is the probability that of 12 such men at least 11 will reach their fifty-first birthday? 4

2. a) You are given two sets of data with equal means and told to compare the datasets. How will you compare them? Discuss with real-life example. 5
   b) The daily wages in Taka of seven workers of two factories are given in below table. Which of the distributions of wages has the larger dispersion? 5

Wages of factory I	142	143	150	150	153	153	155	157
Wages of factory II	122	140	150	150	150	154	159	175

3. a) Which measure is called standard measure of dispersion? 1
   b) The time (in seconds) that a random sample of employees in a pharmaceutical firm took to complete a task is : 33,35,34,38,28,45,32,40,27,23,26,25,37,28,39 4

   Calculate mean, variance and standard deviation.
   c) Let us that, measurements made with one micrometer of the diameter of a ball bearing have a mean of 7.92mm and standard deviation of 0.0652mm, whereas measurement made with another micrometer of the unscratched length of a spring have a mean of 7.54 inches and a standard deviation of 0.096 inch. Which of these two measuring instruments is relatively less precise? 5

4. a) What is regression analysis? What are the assumptions of regression analysis? 3
   b) The data given below are the amount of export (x in 00 million taka) of fish and amount of total export (y in 00 million taka) in different years. 7

x:	7	10	13	12	14	16	15
y:	17	22	24	25	28	37	40

   i. Fit a regression line of y on x and test the significance of regression.
   ii. Estimate the total amount of export if amount of export of fish is 20 hundred million takas.

   Hint: You have to first calculate the coefficients (both slop coefficient and regression coefficient) and then substitute it in the regression line.

Section B (30 Marks)

5. a) Define followings terms: Mutually exclusive events, Equally likely events, Exhaustive events, Conditional probability, independent events. 5

   b) Among employees of a certain firm, 70% know C/C++, 60% know Python, and 50% know both languages. What portion of programmers 5
   i. does not know Python?
   ii. does not know Python and does not know C/C++?
   iii. knows C/C++ but not Python?
   iv. knows Python but not C/C++?
   v. If someone knows Python, what is the probability that he/she knows C/C++ too?
   vi. If someone knows C/C++, what is the probability that he/she knows Python too?

6. a) Define Queuing theory with a practical example. A Queuing model is specified based on some characteristics which are they? 3

   b) Describe the (M/M/1):(FIFO) Queuing model with specification of all notations and solution procedure 7

7. a) A researcher claims that the average wind speed in a certain city is μ_0 miles per hour. A sample of n days has an average wind speed of $\bar{x}$ miles per hour. The known standard deviation of the population is σ_0 mile per hour. At α% level of significance, is there enough evidence to reject the claim? Write the steps of the test. 5

   b) A car magazine is comparing the total repair costs incurred during the first three years on two sports cars, the T-999 and the XPY. Random samples of 7 T-999s and 11 XPYs are taken. All 18 cars are 3 years old and have similar mileages. The repair costs for the both type of cars for the first 3 years are given below table in thousands USD. 5

T-999:	18	16	15	20	18	15	12				
XPY:	20	14	12	22	16	14	15	10	12	18	10

   Assume that the standard deviations for the two populations are \$800 and \$1000, respectively. Using a 5% significance level, can you conclude that mean repair costs are different for these two types of cars?

8. a) What is contingency table? What is the importance of this table in hypothesis testing? Explain with example. 5

   b) A researcher wanted to study the relationship between gender and owning cell phones. She took a sample of 2000 adults and obtained the information given in the following table. 5

	Own Cell Phones	Do Not Own Cell Phones
Men	640	450
Women	440	470

   At a 5% level of significance, can you conclude that gender and owning a cell phone are related for all adults?

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Course Title: Data Structure **Course Code: CSE 201**
Total Marks: 60 **Time: 3 (three) Hours**

N.B. : i) Answer **SIX** questions taking any **THREE** from each Section, ii) All questions are of equal values. iii) Use separate answer script for each section

Section: A

1. a) How the study of data structure plays important roles in the field of Computer Science? **3**

b) Let Array A: 53, 66, 51, 27, 85, 23, 10. Apply bubble sort algorithm to sort the array. **3**

c) What do you mean by the complexity of an algorithm? Discuss briefly the time-space tradeoff of algorithms. **4**

2. a) What are the advantages of linked list over array? **2**

b) Distinguish between the linear search and the binary search algorithm. **3**

c) Consider data be the following sorted 13-element array: 25, 30, 37, 45, 57, 69, 72, 79, 82, 89, 91, 96, 98. Apply the binary search algorithm to find 96 value. **5**

3. a) Can you use binary search in link list? If yes, explain how? If no, explain why? **3**

b) How an item can be deleted from the linked list? Explain with necessary figure. **3**

c) Construct an expression tree for the expression: $E = (x + y - z) / (5a * 3b / 6c)$. **4**

4. a) What is stack? Write algorithms for PUSH and POP operations of stack using array. **4**

b) What do you mean by garbage collection? Define Overflow and Underflow. **2**

c) Consider the following arithmetic infix expression Q: A + (B * C - (D / E ^ F) * G) * H). Transform Q into its equivalent postfix expression P. **4**

Section: B

5. a) Write the procedure to delete an ITEM from a QUEUE. **3**

b) Write about the Preorder, Inorder and Postorder traversal of trees. **3**

c) Consider the following list of 11 numbers: 33 11 77 45 23 17 6 0 25 71 31 85 Use the Quick sort algorithm to find the final position of 33. **4**

6. a) Construct a binary search tree for the following numbers: 40, 60, 55, 22, 66, 11, 50. **4**

b) Build a heap from the following list of numbers: 40, 30, 70, 23, 54, 50, 21, 44, 55, 77. **4**

c) Differentiate between complete binary tree and extended binary tree. **2**

7. a) What is adjacency matrix of a graph? Explain the shortest path algorithm with example. **3**

b) Write down the differences between Breadth-First Search (BFS) and Depth-First-Search (DFS) with a suitable example. **3**

c) Consider the following data set: 77, 33, 44, 11, 88, 22, 66, 55. Illustrate the selection sort algorithm using this data set. **4**

8. a) What is connected graph? Describe the linked representation of graph. **3**

b) Suppose 9 cards are punched as follows: 348, 143, 361, 423, 538, 128, 321, 543, 366. Sort the numbers using Radix sort. **4**

c) Explain merge sort using an example. **3**

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2nd Year 1st Semester B.Sc. (Engg.) Examination- 2018

Course No.: MAT205 Course Title: Vector,Matrixs and Fourier Analysis
Full Marks: 60 Time: 03 Hours

N.B.
1) Answer SIX questions, taking any THREE from each section.
2) All questions are of equal values.
3) Use separate answer script for each section.

SECTION-A (30 Marks)

1. (a) Define with example: (i) Matrix (ii) Rectangular matrix (iii) Transposed matrix (iv) Diagonal matrix (v) Singular matrix. 5
   (b) Define order of a minor. Find the matrix X from the equations $AX = B$ where $A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 1 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 1 \\ 7 \end{bmatrix}$. 5

2. (a) What is rank of a matrix? 2
   (b) Reduce the following matrix to its echelon form and find its rank. 4
   $$A = \begin{pmatrix} 1 & 2 & -2 & 3 \\ -1 & 1 & 3 & 2 \\ 2 & 4 & -4 & 6 \\ 1 & 0 & -1 & 2 \end{pmatrix}$$
   (c) Find the inverse of the matrix 4
   $$A = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 1 & -1 \\ -2 & 1 & 3 \end{pmatrix}$$

3. (a) Define a Fourier series and derive the Euler's formula. 5
   (b) State dirichlets condition. Find the Fourier series representing $f(x) = x \;\; 0 \langle x \langle 2\pi$. 5

4. (a) Define Fourier transformation, Fourier sine transformation and Fourier cosine transformation. 3
   (b) State any two properties of Fourier transformation. 2
   (c) What do you mean by convolution? State and prove the convolution theorem on Fourier transformation. 5

SECTION-B (30 Marks)

5. (a) Define a unit vector. Find a unit vector parallel to the resultant of vectors $\boldsymbol{r_1} = 2\boldsymbol{i} + 4\boldsymbol{j} - 5\boldsymbol{k}, \boldsymbol{r_2} = \boldsymbol{i} + 2\boldsymbol{j} + 3\boldsymbol{k}$. 4
   (b) State and prove Frenet-Serret formula. 6

6. (a) Find the unit tangent vector to any point on the curve 5
   $$x = t^2 + 1, \quad y = 4t - 3, \quad z = 2t^2 - 6t.$$
   (b) Find the directional derivatives of $U = 2xy - z^2$ at $(2, -1, 1)$ in a direction towards $(3, 1, -1)$. 5

7. (a) Define gradient, divergence and curl. Prove that $\nabla.(\phi \mathbf{A}) = (\nabla\phi).\mathbf{A} + \phi(\nabla.\mathbf{A})$. 4
   (b) Define irrotational vector. Prove that, irrotatioal vector is conservative. 6

8. (a) State and prove Green's theorem in the plane. 5
   (b) Define line integral. Find the total work done in moving a particle in a force field given by $\boldsymbol{F} = 3xy\boldsymbol{i} - 5z\boldsymbol{j} + 10x\boldsymbol{k}$ along the curve $x = t^2 + 1; y = 2t^2; z = t^3$ from $t=1$ to $t=2$. 5