Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
2nd Year 2nd Semester B.Sc. Final Examination-2020
Course Title: Algorithm Design and Analysis **Course Code: CSE 251**
Full Marks: 60 Time: 3 Hour

N.B. i) Answer **6 (SIX)** questions, taking any **3(THREEE)** from questions.
ii) Answer all subparts of each question sequentially.

SECTION - A

Q.1 (a) How does radix sort work? Describe step by step with an example. 5

(b) Build matrix of LCS for the following input and write the Pseudo of LCS algorithm - (i) ABCWEDEUY (ii) ZXBWDUYL. 5

Q.2 (a) Write down the comparison between ~~counting~~ quick and merge sort. 2

(b) Write down the Huffman codes algorithm and apply for the following example 4
A (80) B (25) C (120) D (115) E (50) F (55) G (45) H (75).

(c) What is merge sort? Write down the merge algorithm in merge sort. Apply merge sort for the following array. Compute the run time of merge sort. 4
[10 30 80 15 20 12 25]

Q.3 (a) Describe the process building min-priority queue using heapify. Build a priority queue using heapify for the following inputs: 22, 12, 41, 25, 11, 15, 35, 45. 5

(b) Suppose a student wants to go from home to school in the shortest possible way. He knows some roads are heavily congested and difficult to use. Find the shortest path from home to school in the following graph Fig: 3(c): 5

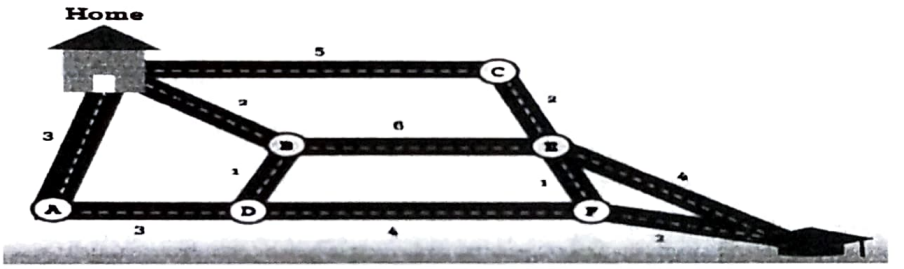


Fig: 3(c)

Q.4 (a) Compute worst case running time of quick sort. What are the drawbacks of quick sort and how can we resolve those? 3

(b) What are back edge, forward edge, cross edge and tree edge? Explain with examples 3

(c) What is connected component? Write down the algorithm for finding connected components. 4

SECTION - B

Q.5 (a) Imagine that you have 5 friends: Billy, Jenna, Cassie, Alyssa, and Harry. You know a few roads that connect some of their houses, and you know the length of those roads. But, Floyd-Warshall can take what you know and give you the optimal route given that information. For example, look at the graph below, it shows paths from one friend to another with corresponding distances. 5

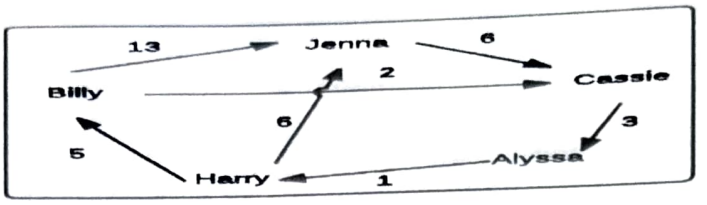


Fig: 5(c)

(b) What is the problem with Dijkstra algorithm and how bellman ford algorithm overcomes the problem? 2.5

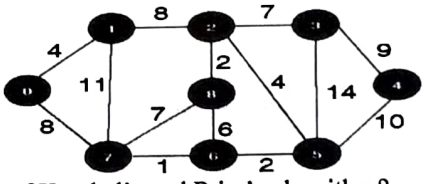
(c) Solve the recurrence $T(n) = 3T(\sqrt{n}) + \log n$. 2.5

Q.6 (a) Write down the Pseudo code of Insertion sort and calculate the running of the algorithm. 5

(b) Write short note on (i) average bound (ii) upper bound and (iii) ~~average~~ lower bound run time. 2

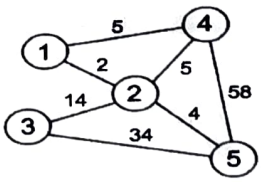
(c) What is tree? What are the properties of a tree? 3

Q.7 (a) What is minimum spanning tree? Compute minimum spanning tree applying Prim's algorithm for the following graph. 4



(b) What are the comparisons of Kruskal's and Prim's algorithm? 2

(c) What is graph? How graph are implemented in computer? Show implementation of the following graph using two method of implementation. 4



Q.8 (a) Prove correctness of Huffman codes algorithm. 2

(b) Faruk the great scientist once claimed that he had discovered the blood of very ancient people to justify his claim, he sent the DNA sequence of blood into the research lab.in lab, if the subsequence of DNA matches maximum with the reserved DNA sequence, then they will approve faruk's claim. Now your job is to help the researcher by providing an algorithm that matches these two sequences find the length of the maximum matched subsequence. Your algorithm will also provide the matched subsequence. 4

(c) Sort out maximum non-overlapped activities from following schedule using activity selection algorithm. 4

A1 (5-9) A2 (1-2)

A3 (3-4) A4 (0-6)

A5 (5-7) A6 (8-9)

Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science and Engineering
2nd Year 2nd Semester B.Sc. Engineering Examination- 2020
Course No.: MAT255, Course Title: Complex variable and Laplace transformation
Full Marks: 60 Time: 03 Hours

N.B. Answer **SIX** questions taking three of each section.

Section-A

1. (a) Explain complex analysis. What do you know about the graphical representation of a complex number? 5
   (b) What do you mean by order pair form of a complex number? Find out modulus and argument of the following complex number: $z = (-3+5i)^2$. 5

2. (a) Define single and multiple valued function. State and prove De Moiver's theorem in the complex variable. 5
   (b) Show that $u = xe^x \cos y - ye^x \sin y$ is harmonic. Then find the conjugate harmonic function v such that $f(z) = u + iv$ is analytic. 5

3. (a) Define Line integral. Evaluate $\int_{(0,1)}^{(2,5)} (3x+y)dx + (2y-x)dy$ along (a) the curve $y = x^2 + 1$ (b) The straight lines from (0,1) to (2,1) and then from (2,1) to(2,5) 5
   (b) State and prove Cauchy's integral formula. 5

4. (a) State and prove residue theorem. 3
   (b) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a Laurent series valid for $1 < |z| < 3$ 4
   (c) Evaluate $\oint_C \frac{dz}{z-a}$ where C is any simple closed curve and $z = a$ (i) outside C (ii) inside C 3

Section-B

5. (a) Define Laplace Transform. Find the Laplace Transform of the function $F(t)$ Where $F(t) = \begin{cases} t, & 0<t<2 \\ 3, & t>2 \end{cases}$ 6
   (b) State and prove first shifting property of Laplace Transform. 4

6. A mass m =1 is attached to a spring with constant k =5 and damping constant c = 2. At the instant t=π the mass is struck with a hammer, providing an impulse p = 10. Also, x(0)=0 and x'(0)=0. 10
   a) Write the differential equation governing the motion of the mass.
   b) Find the Laplace transform of the solution x(t).
   c) Apply the inverse Laplace transform to find the solution.

7. (a) Solve the differential equation $Y''(t) + Y(t) = t$ when $Y(0) = 1, Y'(0) = -2$. 5
   (b) Solve the differential equation $tY''(t) + Y'(t) + 4tY(t) = 0$ when $Y(0) = 3$, ~~$(0) = 0$.~~ $Y'(0) = 0$ 5

8. (a) Evaluate $L^{-1}\left\{\frac{5s+3}{(s-1)(s^2+2s+5)}\right\}$. 5
   (b) State convolution theorem. Evaluate $L^{-1}\left\{\frac{3}{s^2(s+2)}\right\}$, using convolution theorem. 5

Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science & Engineering
2nd Year 2nd Semester B.Sc. (Engg.) Final Examination-2020

Course No.: LAW255 **Course Title: Cyber and Intellectual Property Law**

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.

SECTION-A

1.	a)	What is meant by intellectual property?	2
	b)	Discuss different forms of intellectual property.	8
2.	a)	Explain compulsory licensing under the copyright law?	5
	b)	Sabrina, reincarnated as a neoclassical existensialist poet, gave a poetry recital at the Central Auditorium in Bangabandhu Sheikh Mujibur Rahman Science & Technology University for Kinetic Studies. On this occasion, she extemporized her poetry, a fancy way of saying she made it up on the spot. Jenny, a student with an exceptional memory, returned home afterwards and wrote down from memory one of Sabrina's extemporized poems. She published it under the name "Conversations." Does Sabrina have a claim for copyright infringement against Jenny?	5
3.	a)	What is industrial design?	2
	b)	Discuss the criteria's of registration of industrial design.	8
4.	a)	Rewrite patent.	2
	b)	What are the criteria's of patentability? Describe.	8

SECTION-B

5.	a)	Write down the procedure of registration of trademark.	7
	b)	Define and distinguish between passing off and infringement.	3
6.	a)	Define cybercrime.	2
	b)	Write down different kinds of cybercrime.	8
7.		Enumerate the constitution and jurisdictions of Cyber Tribunal and Cyber Appellate Tribunal.	10
8.		State different grounds of revocation of patent.	10

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

2nd Year 2nd Semester B.Sc. Engineering Examination-2020

Course Code: CSE253 **Course Title: Introduction to Digital Systems**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.

i. Answer **SIX** questions taking any **THREE** from each section.

ii. All parts of a question must be answered sequentially.

Section-A

1.	a)	Explain OR and AND logic gates made with diodes and transistors.	**5**
	b)	Describe Current and Voltage Parameters $V_{IH}(min)$, $V_{IL}(max)$, $V_{OH}(min)$, $V_{OL}(max)$, I_{IH}, I_{IL} and I_{OH} of digital IC with figure.	**3**
	c)	What do you mean by Fan-Out and Fan-In? Give examples.	**2**
2.	a)	What is propagation delay? Explain propagation delay with figure.	**3**
	b)	What is transistor? Discuss different kinds of BJT transistors.	**4**
	c)	What is clock in a digital system? Explain PGT and NGT with figures.	**3**
3.	a)	Explain setup time and hold time with examples.	**3**
	b)	Why clocked S-R flip-flop is better than S-R latch?	**3**
	c)	Design and explain J-K flip-flop.	**4**
4.	a)	Design a D flip-flop from clocked S-R flip-flop. Write the uses of D flip-flop.	**4**
	b)	Discuss the operation of CMOS NAND and CMOS NOR gates with appropriate figure.	**3**
	c)	Design a shift register using D flip-flop.	**3**

Section-B

5.	a)	What is counter? Design synchronous counter using J-K flip-flop.	**4**
	b)	Design a counter that circularly count last four unique digit.	**4**
	c)	Explain MOD counter.	**2**
6.	a)	Design a MOD-10 counter that will count from 0000(zero) through 1001(decimal 9).	**4**
	b)	Design and explain the working principle of NOR gate using a transistor.	**4**
	c)	Write the applications of TTL circuits.	**2**
7.	a)	Design and explain working principle of DAC.	**3**
	b)	Design and explain working principle of ADC.	**4**
	c)	Why R2R DAC is better than others?	**3**
8.	a)	Design a clipper circuit that will clip 2v from -5 to 5 sin wave.	**3**
	b)	Design and describe clamper circuit.	**3**
	c)	Explain working principle of astable multivibrator.	**4**

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

2nd Year 2nd Semester B.Sc. Engineering Examination-2020

Course Code: ACC255 **Course Title: Industrial Management and Accountancy**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.

i. Answer **SIX** questions taking any **THREE** from each section.

ii. All parts of a question must be answered sequentially.

Section-A

1. a) What is cash and accrual basis of Accounting? **4**

b) Write down about the Accounting equation. **2**

c) What are the features of business transaction? **4**

2. Mr. Berney is a tax lawyer and started his own law firm, Fare Consulting, on June 1, 2010. The following transactions occurred during the month of June.

June 1: Mr. Berney invested $75,000 cash in the business.

2: The company borrowed $10, 000 cash from the bank on a note.

7: Purchased computer equipment for 50,500 on cash.

11: Received a cash payment of $4,000 for service performed.

14: Performed $3,000 of services on account.

15: Employee service received in operating the business to date were paid in cash $3,200.

19: The firm paid $4,500 on the note to the bank.

19: The firm paid $50 as interest expense.

31: Client of June 14 paid $1,000 of the amount they owe the company.

Instructions:

a) Prepare a tabular analysis of the transactions, using the following column Headings: Cash, Accounts Receivable, Office Equipment, Notes Payable, Berney' Capital; Berney' Drawings; Revenues; and Expenses. **6**

b) Prepare the Income Statement. **2**

c) Prepare the Balance Sheet. **2**

3. a) Define Adjusting Entries. **2**

b) What are the types of Adjusting Entries? **4**

c) Okabe Company accumulates the following adjustment data at October 31. **4**

1. Services provided but not recorded total $750.
2. Store supplies of $300 have been used.
3. Okabe Company signed a $20,000; 3-month note payable on October 1.The note requires Okabe to pay interest at an annual rate of 12%.
4. Utility expenses of $225 are unpaid.
5. Unearned revenue of $260 has been earned.
6. Salaries of $900 are unpaid.
7. Prepaid insurance totaling $350 has expired.

Instruction:

Prepare the adjusting entries at the date of October 31.

4. The following transactions were experienced by Shafiq's Car Washing during October, 2014:

Oct. 1: Shafiq invested tk. 1,20,000; consisting cash tk. 40,000 and building 80,000, to start the new business. (Make a compound entry.)

4: The business borrowed Tk. 40,000 from a bank and a note was signed for that.

6: Car wash equipment costing Tk. 20,000 was purchased for Tk. 50% cash and remaining on Notes Payable.

8: Supplies costing Tk. 10,000 were purchased on account.

10: Payment of Tk. 10,000 was made on Notes payable.

15: Cash revenue of Tk. 6,000 was collected.

17: Purchased gasoline for Tk.1000 on account.

20: Revenue of Tk. 5,000 was earned but not yet collected.

25: Utility expense of Tk.2,500 was paid for cash.

25: Wages Tk. 1,000 and salaries Tk. 5,000 were paid for cash.

Instruction:

a) Journalize the transactions. **5**

b) Post to the ledger accounts. Prepare the following account – Cash, Service Revenue, Accounts Payable, Notes Payable

Section-B

5. Brook Hanson began operations as a private investigator on January 1, 2010. The Trial balance columns of the worksheet for Brook Hanson, P.I. at March 31 are as follows. **10**

Brook Hanson, P.I.
Worksheet
For the Quarter Ended March 31, 2010

Accounts Titles	Dr.	Cr.
Cash	12,400	
Accounts Receivable	5,620	
Supplies	1,050	
Prepaid Insurance	2,400	
Equipment	30,000	
Notes Payable		10,000
Accounts Payable		12,350
B. Hanson, Capital		20,000
B. Hanson, Drawing	600	
Service Revenue		13,620
Salaries Expense	1,200	
Travel Expense	1,300	
Rent Expense	1,200	
Miscellaneous Expense	200	
	55,970	55,970

Other data:

1. Supplies on hand total $750.
2. Depreciation is $400 per quarter.
3. Interest accrued on 6-month note payable, issued January 1, $300.
4. Insurance expires at the rate of $150 per month.
5. Services provided but unbilled at March 31 total $750.

Instruction:
Enter the trial balance on a worksheet and complete the worksheet.

6. a) What do you mean by Sole Proprietorship Business? State its features. **5**
   b) What are the advantages and disadvantages of Sole Proprietorship Business? **5**
7. a) What is business? What are the essential elements of a business? **4**
   b) What do you mean by industry? **2**
   c) Write about the social objectives of business. **4**
8. a) Classify partners in the perspective of Partnership Business? **5**
   b) What are the advantages and disadvantages of Partnership business? **5**

Bangabandhu Sheikh Mujibur Rahman Science & Technology University

Department of Computer Science & Engineering

2nd Year 2nd Semester B.Sc. (Engg.) Final Examination-2020

Course No.: CSE255 **Course Title: Theory of Computing**

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.

SECTION-A

1. a) What do you mean by abstract computing devices? Write the applications of theory of computing. 4
   b) Define languages and grammars with proper examples. 4
   c) Illustrate string and power of a string. 2

2. a) What are differences between DFA and NFA? 2
   b) Write a DFA and a regular expression for a binary string that contains 101 as a substring. 5
   c) What are the conditions of a language to become its regular? 2

3. a) Construct an NFA that recognizes language (01 U 001 U010)*. 3
   b) Draw DFA and NFA for recognizing a word "Great". 6
   c) What did mean by ε-transitions? 1

4. a) Explain the use of union, concatenation and kneene closure operations over a language L. 3
   b) Assume an alphabet Σ that is {0, 1}. 7
      i) Draw the simplest possible DFA (in terms of number of states and arcs) that describes the language of all strings that end in "00".
      ii) Draw the NFA that recognizes the language where w contains the substring 0101. Do this using 5 states.

SECTION-B

5. a) What do you mean by decidable, Turing recognizable, and undecidable languages? 3
   b) Write a regular expression for a binary string which does not contain two consecutive 0's or two consecutive 1's anywhere. 3
   c) Prove that every NFA has an equivalent DFA. 4

6. a) Define context free grammar. Write some applications of CFG. 4
   b) Design the following CFG – 6
      i) Can accept only the palindromic binary string.
      ii) Starts and ends with same symbols.

7. a) Prove that, 0^n1^{2n} is context-free, where $n \geq 1$. 5
   b) Construct context free grammars to accept the following languages over $\sum=\{0, 1\}$: 5
      (i) {w | w starts and ends with the same symbol}.
      (ii) {w | |w| is odd and its middle symbol is 0}.

8. a) Answer the following True/False for those short answer questions – 5
      i) A DFA is not equivalent in expressive power to an NFA
      ii) The language 0^n0^n is not regular
      iii) You can convert an NFA with n states to a DFA with 2^n states
      iv) a* is a regular expression
      v) A=> aA| ε is a CFG
   b) What do you mean by parse tree? Explain with an example. 3
   c) Define turing machine and push down automata. 2