

International Islamic University Chittagong

Morality Development Program (MDP)

Semester End Examination Autumn-2022

Course Title: Concepts on Moral Development Part-1

Course Code: MDP -2404

Full Marks: 50

Time: 2 hours

Answer any five. All questions are of equal value.

1. "Enjoining good and forbidding evils are the basis for a welfare state"- Give reasoning for or against your answer.
2. Describe the Islamic dress code for both male and female in the light of Quran and Sunnah.
3. "Unlawful use of drugs is the root cause of various social evils"- Evaluate.
4. Define Islamic brotherhood. 'Victory of Islam over other religions has been possible by Islamic brotherhood'-Elucidate.
5. What do you mean by co-existence in society? What is the foundation of peaceful coexistence in Islam? – Elaborate.
6. "A family as well as a society may be ruined by gambling"- Give reasons for or against your answer.
7. Recommend a Health Policy acceptable in Islam.

International Islamic University Chittagong
Center for General Education (CGED)
Final Examination Autumn Semester- 2022
Course Code: URBL-2401
Course Title: Functional Bengali Language and Literature
Full marks: 50 Time: 3.00 Hours

ক-বিভাগ

ভাষা ও নিমিতি: ৩০

যেকোনো তিনটি প্রশ্নের উত্তর দাও।

১০×৩=৩০

০১. ক.বাংলায় অনুবাদ কর:

৫

It was the most brutal genocide ever known in the history of mankind. History has never seen such a large number of people wiped out in such a short period of the nine months of the Bangladesh liberation war. Between March 25, 1971 and December 16, 1971, Pakistani occupation army and their local collaborators killed 3 million innocent, unarmed people, violated more than a quarter million women; destroyed most of the factories, roads, bridges and culverts, burned houses, engaged in indiscriminate arson and plundering and created such an unbearable situation that 10 million people were forced to leave their country.

খ. পাঁচটি বাংলা যতিচিহ্নের ব্যবহার লেখ।

৫

০২. আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রামে প্রভাষক পদে নিয়োগের জন্য একটি আবেদনপত্র লেখ।

০৩. বাংলা বানানের উল্লেখযোগ্য নিয়মগুলো আলোচনা কর।

০৪. সংক্ষিপ্ত আলোচনা কর:

ক. বাংলা উৎসব। খ. আধুনিক তথ্য-প্রযুক্তি।

খ-বিভাগ

সাহিত্য : ২০

যেকোনো দুইটি প্রশ্নের উত্তর দাও।

১০×২=২০

০১. সনেট কাকে বলে? মাইকেল মধুসূদন দত্তের "বঙ্গভাষা" কবিতার আলোকে সনেটের বৈশিষ্ট্য নিরূপণ কর।

০২. 'মানুষের প্রতি বিশ্বাস হারানো পাপ'- "সভ্যতার সংকট" প্রবন্ধের আলোকে উক্তিটি বিশ্লেষণ কর।

০৩. মুনীর চৌধুরীর "কবর" নাটকের প্রেক্ষাপট ও বিষয়বস্তু আলোকপাত কর।

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. Engineering in CSE
Final Exam, Autumn 2022

Course Code: ACC 2401

Time: 2 hours 30 minutes

Course Title: Financial and Managerial Accounting

Full Marks: 50

[The figures in the right-hand margin indicate full marks, Answer the questions from the followings]

Part A

1. a)

Smart Touch Learning Company
Adjusted Trial Balance
as at 31 December 2019

CO2 U 10

	Dr (£)	Cr (£)
Cash	19130	
Accounts receivable	5440	
Supplies	1520	
Insurance Prepayment	4600	
Land	20000	
Office equipment	3600	
Accounts payable		1800
Unearned interest revenue		480
Notes payable		15000
Capital		30000
Drawings	8000	
Interest revenue		33680
Salary expense	9050	
Rental expense	3200	
Utility expense	1970	
Supplies expense	4080	
Sundry expense	910	
Insurance expense	200	
Rental revenue		240
Salary payable		500
Total	81,700	81,700

Required: Financial statements of Smart Touch Learning Company for the year ended 31 December 2019.

OR

Agape Counseling Center
Trial Balance
May 31, 2018

1. a)

CO2 An 10

Sl. No.	Name of Accounts	Debit	Credit
	Cash	Tk.1,670	-
	Notes Receivable	10,340	-
	Supplies	560	-
	Prepaid Insurance	1,790	-
	Furniture	27,410	-
	Accumulated Depreciation- Furniture	-	Tk.1,480
	Building	55,900	-
	Accumulated Depreciation-Building	-	33,560
	Land	13,700	-

	Accounts Payable	-	14,730
	Unearned service revenue	-	6,800
	N/P-Long Term	-	18,700
	R. J. Capital	-	34,290
	R. J. Withdrawal	3,800	-
	Service revenue	-	9,970
	Salary expense	2,170	-
	Utilities expense	490	-
	Property Tax expense	640	-
	Advertisement expense	1,060	-
	Total	1,19,530	1,19,530

Additional data at May 31, 2018:

- Accrued salary expense Tk.600.
- Supplies on hand Tk.410.
- Prepaid insurance expired during May Tk.390
- Accrued interest expense Tk.220.
- Unearned service revenue earned during May Tk.4,400.
- Accrued advertising expense Tk.60.
- Accrued interest revenue Tk.170.
- Depreciation: Furniture Tk.380; Building Tk.160.

Required: Complete a ten-column worksheet for May.

2. a) The trial balance of **Cloud Break Consulting Company** at June 30, 2021, the end of the company's fiscal year and adjustment data as follows:

CO3 U 10

Adjustment data:

- Supplies on hand as at 30 June 2021 totaled £1000.
- Nine months rent £27000 were paid in advance on April 01, 2021.
- Depreciation expense on the building of £12000 has not been recorded.
- Employees work Monday through Friday. The weekly payroll is £5,000 and is paid every Friday. June 30, 2021, is a Monday.
- Service revenue accrued £15,000.
- Unearned service revenue as at 30 June totaled £30050.

Cloud Break Consulting Company Trial balance June 30, 2021		
	Dr (£)	Cr (£)
Cash	131000	
Accounts receivable	104000	
Supplies	4000	
Prepaid rent	27000	
Land	45000	
Building	300000	
Accumulated depreciation - building		155000
Accounts payable		159000
Unearned service revenue		40000
Common stock		102000
Drawings	7000	
Service revenue		450000
Salary expense	255000	
Rental expense	25000	
Miscellaneous expense	8000	
Total	<u>906000</u>	<u>906000</u>

Required: Complete Cloud Break Consulting Company worksheet for the year ended June 30, 2021.

Part B

3. a) Prepare a Cost of Goods Sold Statement for Hisham & Sons Company based on the following information: CO2 An 10

Sales discount	\$ 1800
Purchase discounts	350
Sales	2,80,000
Purchase returns and allowances	2,150
Depreciation:	
--Machinery (90% factory related)	25,000
--Building (40% factory related)	18,000
Factory insurance	5,140
Freight out	2800
Other factory expenses	1,600
production supervisor salary	5,000
land	50,000
Bond interest expense	5,000
Indirect Materials	2,350
Sales salaries	10,480
Rental Income	2,500
Freight in	1,500
Direct factory labor	85,500
Materials purchases	42,350
Supplies expense	2,000
Utility expense	3,040
Office salaries	10,600
Advertising expenses	1,200

Indirect Labor	4,350
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Inventories:	January 1, 2018	December 31, 2018
Finished goods.....	\$6,000	\$4,000
Work-in-process.....	5,000	2,000
Raw Materials.....	10,000	8,000

4. a) Super Sales Company is the exclusive distributor for a revolutionary booking. The product sells for \$60 per units and variable expenses per unit \$36. The company's fixed expenses are \$360,000 per year.

CO3 An 10

Required:

1. What are the Super Sales Company CM ratio?
2. Using the equation method:
 - a. What is the break-even point in units and in sales dollars?
 - b. What sales level in unit and in sales dollars in required to earn an annual profit of \$90,000?
 - c. Assume that through negotiation with the manufacturer the Super Sales Company is able to reduce its variable expenses by \$3 per unit. What is the company's new break-even point in units and in sales dollars?
3. What are the Super Sales Company MOS and OL?

OR

4. a) Convoy Manufacturing Company sells a single product. The company's sales & expenses for a recent month as follows:

CO3 An 10

Particular	Total	Per Unit
Sales	\$ 600,000	\$ 40
Less: Variable expenses	\$ 420,000	\$ 28
Contribution margin	\$ 180,000	\$ 12
Less : fixed expense	\$ 150,000	
Net operating income	\$ 30,000	

Required:

- a) What is the monthly break -event point in units sold & in sales dollars?
- b) Without resorting to computation, what is the total contribution margin at the break-even point?
- c) How many units would have to be sold each month to earn a minimum target profit of \$18,000 & \$19,500?
- d) Refer to the original data. Compute the companies margin of safety in both Dollar & percentage terms.

5. a) The production department of Zan Corporation has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year:

CO3 An 10

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	5,000	8,000	7,000	6,000

In addition, the beginning raw materials inventory for the 1st Quarter is budgeted to be 7,000 grams and the beginning accounts payable for the 1st Quarter is budgeted to be \$2,500. Each unit requires 8 grams of raw material that costs \$1.50 per gram. Management desires to end each quarter with an inventory of raw materials equal to 35% of the following quarter's production needs. The desired ending inventory for the 4th Quarter is 8,000 grams. Management plans to pay for 70% of raw material purchases in the quarter acquired and 30% in the following quarter.

Required:

Prepare the company's direct materials budget and schedule of expected cash disbursements for purchases of materials for the upcoming fiscal year.

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE Final Examination, Autumn 2022
Course Code: CSE 2421 Course Title: Computer Algorithms
Total marks: 50 Time: 2 hours 30 minutes
 [The figures in the right hand margin indicate full marks.
 Course Outcomes and Bloom's Taxonomy Levels are mentioned in
 additional columns]

Group A

CO DL

1.

a) Greedy strategy does not give the optimal solution for 0/1 knapsack. Do you agree with this statement? Justify your answer with example.

5 CO2 An

b) You have been asked to encode a paragraph with Huffman coding scheme. This paragraph contains the following symbols along with their associate frequency in the paragraph.

5 CO5 Ap
p

			A	B	C	D	E	F	G	H	I	J	
			3	3	26	5	3	8	13	2	16	9	

Draw the corresponding Huffman tree and utilizing that tree tell the binary encoding for each letter.

OR

Suppose we have a knapsack that has a weight limit w . There are items i_1, i_2, \dots , in each having weight w_1, w_2, \dots, w_n and some benefit associated with it v_1, v_2, \dots, v_n . We need to maximize the benefit such that the total weight inside the knapsack is at most w . Demonstrate an algorithm to solve this problem

2.

a) Draw the following undirected graph

3 CO1 A

$G = \{a, b, c, d, e, f, g, h, i\}$

$E = \{(a,b), (a,d), (b,c), (c,d), (c,e), (d,e), (d,g), (f,e), (g,f), (g,i), (h,d), (h,g), (i,f)\}$

Traverse the graph using Breadth First Search starting from vertex **h**. Visit the nodes in lexicographic order (a, b, c ...). Show only the final breadth first tree along with **d** and π values. You don't need to show the intermediate steps.

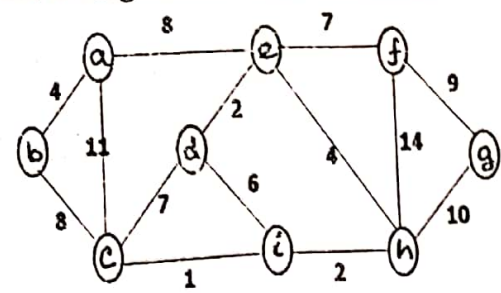
OR

Traverse the graph using Depth First Search and show the discover time **d** and finish time **f**. You don't need to show the intermediate steps.

b) Write an algorithm for finding the in-degree of each vertex a graph **G**. **G** is represented with an adjacency list. What will be the running time of your algorithm?

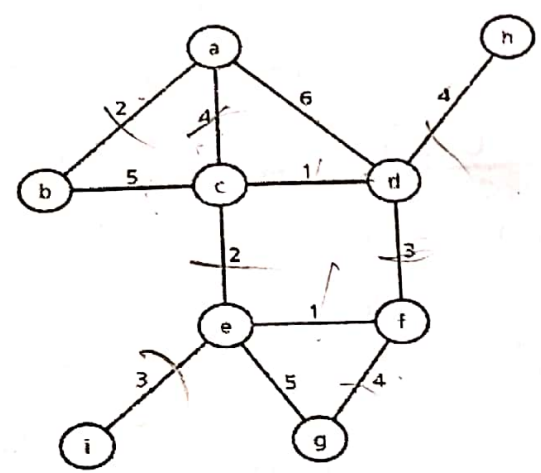
3 CO2

2) Write the definition of minimum spanning tree. Consider the following graph. What minimum spanning tree would Prim's algorithm produce? Write the edges in the order that the algorithm would add them to its result.



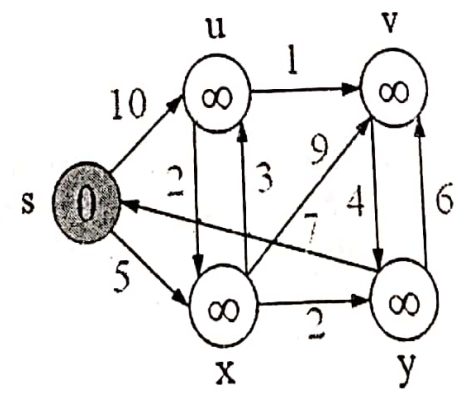
OR

Write the definition of minimum spanning tree. Consider the following graph. What minimum spanning tree would Kruskal's algorithm produce? Write the edges in the order that the algorithm would add them to its result.



Group B

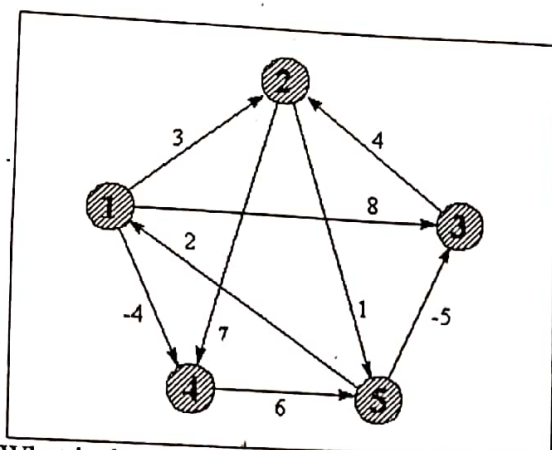
3) Run the Dijkstra's algorithm to find single source shortest path on the weighted directed graph in following figure. 5 CO2 U



b) Describe the Bellman-Ford algorithm with necessary figure. OR

Consider the following graph for finding all pair shortest path using Floyd-Warshall algorithm.

C05 E



	0	3	8	7	-4
	inf	0	Inf	1	7
D(3) =	inf	4	0	5	11
	2	-1	-5	0	-2
	inf	inf	Inf	6	0

What is the value of matrix D(4) calculated from matrix D(3) given above.

4.

- a) Let $P_1(x_1, y_1)$, $P_2(x_2, y_2)$ and $P_3(x_3, y_3)$ are three points. Show using the concept of that if going through P_1 , P_2 , P_3 has a left turn at P_2 then going through P_3 , P_2 , P_1 has a right turn at P_2 . You have to show it using the concept of cross product.

3 C01 A

OR

Suppose, you are given two points $P_1(3, 7)$ and $P_2(9, 2)$. Determine which one has greater polar angle with respect to

- Origin (0, 0)
- (20, 0)

- b) How can you determine whether two line segments are collinear or not? Describe the basic idea using figure.

3 C01 C

OR

Given three points on a 2D plane, how can you determine whether they form a triangle or not using the concept of cross product?

- c) Prove that the subpaths of shortest paths are also shortest paths.

4 C03 N

5.

- a) Consider the 4-queen problem. Your task is to place the 4 queens in 4X4 chessboard so that no two queens attack each other.

3 C02 A

- What is a dead node in N-queen problem?
- Design a state space tree which represents all possible arrangements for 4 non-attacking queens.

- b) Define the following classes: P, NP, NP-complete.

3 C04 U

- c) What is the basic principle of a Branch-and-Bound algorithm? Explain how you will apply it in solving travelling salesman problem.

4 C05 A

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE Final Examination, Autumn 2022

Course Code: CSE 2423 Course Title: Database Management System

Total marks: 30

Time: 2 hours 30 minutes

[Answer all the questions; in some questions, there are options; solve the one which you have been instructed to solve; Precisely follow the guideline for preparing and submitting the answer script; Figures in the right-hand margin indicate full marks]

Course Outcomes (COs) of the Questions

CO1	Understand Relational Databases, Database design, Data Storage and Querying, Transaction Management.
CO2	Apply Relational Algebra, SQL, Query Optimization techniques, Data Integrity, Security, normalization techniques, Indexing Techniques, and ACID Properties.
CO3	Create an enterprise data model that reflects the organization's fundamental business rules.

1. (a) Consider the following relational schema and briefly answer the questions that follow:

CO DL
6 CO2 Ap

Emp(*eid*: integer, *ename*: string, *age*: integer, *salary*: real)

Works(*eid*: integer, *did*: integer, *pct time*: integer)

Dept(*did*: integer, *budget*: real, *managerid*: integer)

1. Write the SQL statements required to create these relations, including all integrity constraints such as primary and foreign keys.
2. Define a domain constraint on Emp that will ensure that every employee makes at least \$10,000.
3. Define an assertion on Dept that ensure that all managers have *age* > 30.

1. (b) Define referential integrity. Explain the tests that must be made to preserve referential integrity for *delete* operation.

4 CO1 Un

2. Suppose you are given a relation *R* with four attributes *ABCD*. For each of the following sets of FDs, assuming those are the only dependencies that hold for *R*, do the following:

10 CO2 Ap

- a) Identify the candidate key(s) for *R*.
- b) Identify the types of functional dependencies (FD) that exist. Why do you think those are FDs?
- c) Identify the best normal form that *R* satisfies (1NF, 2NF, 3NF, or BCNF).
- d) If *R* is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

1. $C \rightarrow D, C \rightarrow A, B \rightarrow C$

2. $B \rightarrow C, D \rightarrow A$

3. $ABC \rightarrow D, D \rightarrow A$

4. $A \rightarrow B, BC \rightarrow D, A \rightarrow C$

5. $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$

OR

2. When a relational schema will be in 1NF, 2NF, and 3NF. Illustrate with an example how you can convert the following Schema *Sales Record* into 3NF.10

CustName	Item	ShippingAddress	Newsletter	Supplier	SupplierPhone	Price
Hasan	Galaxy	3/1 Ctg	Gal-News	Samsung	22-8805568	25000
Kamal	iPhone	2-A Dhk	I-News	Apple	66-5668412	65000
Sojib	Galaxy, iPhone	255 Raj	Gal-News, I-News	Wholesale	Toll-Free	90000
Hasan	iPhone	1/6A Syl	I-News	Apple	66-5668412	65000

GROUP-B

3. (a) Construct a B+-tree for the following set of key values
6, 3, 2, 7, 8, 12, 18, 17, 19, 23, 29, 31, 35, 38, 40, 50, 45, 56, 58, 62, 70, 73, 71, 75, 77, 85, 81, 82
Assume that the tree is initially empty and Node Size: Four

5 CO2 Ap

3. (b) Explain how you will assess the quality of an index using index evaluation metrics. Compare between:

5 CO1 Un

1. Clustering and Non-Clustering indexes.
2. Dense and Sparse indexes.

4. (a) What is a transaction? Explain its ACID properties with examples.

4 CO1 Re

4. (b) Explain how lock-based protocol supports concurrency control. Illustrate how deadlock and starvation occur in the lock-based protocol.

6 CO1 An

OR

4. a) What is the phantom problem? Can it occur in a database where the set of database objects are fixed and only the values of objects can be changed?

6 CO1 Un

- b) Consider a database with objects *X* and *Y* and assume that there are two transactions *T1* and *T2*. Transaction *T1* reads objects *X* and *Y* and then writes object *X*. Transaction *T2* reads objects *X* and *Y* and then writes objects *X* and *Y*.

4 CO1 Un

1. Give an example schedule with actions of transactions *T1* and *T2* on objects *X* and *Y* that results in a write-read conflict.
2. Give an example schedule with actions of transactions *T1* and *T2* on objects *X* and *Y* that result in a read-write conflict.
3. Give an example schedule with actions of transactions *T1* and *T2* on objects *X* and *Y* that results in a write-write conflict.
4. For each of the three schedules, show that Strict 2PL disallows the schedule.

5. (a) Draw the state diagram of a transaction and describe its states with an example. Explain how the shadow copy technique supports durability.

5 CO1 Un

5. (b) Write down the differences between log-based recovery and checkpoint-based recovery with appropriate examples.

5 CO1 An

Shahrian Jh

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE Final Examination, Autumn 2022

Course Code: CSE-2425 Theory of Computing

Total marks: 50

Time: 2 hours 30 minutes

[Figures in the right-hand margin indicate full marks]

Course Outcomes and Bloom's taxonomy levels are mentioned in additional columns]

Bloom's Taxonomy Levels (Cognitive Domain)						
Letter Symbols	R	U	A	N	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group-A

CO DL

1.

- a) Construct a Context-Free Grammar (CFG) for the regular expression $(0 + 1)^*01^*$, that is, any combination of 0 and 1 followed by a single 0 and ending with any number of 1.

3 CO1 A

OR,

Construct a CFG for the regular expression $0^*1(0 + 1)^*$, that is, any number of 0 followed by a single 1 and ending with any combination of 0 and 1.

- b) Consider G whose productions are

$S \rightarrow aAS/a$,

$A \rightarrow SbA/SS/ba$.

Show that $S \rightarrow aabbba$ by constructing a derivation tree, by rightmost derivation, whose yield is aabbba.

2 CO2 A

- c) Consider the grammar

$S \rightarrow iCtS/iCtSeS/a$

$C \rightarrow b$

5 CO2 N

This grammar is ambiguous. Show in particular that the string ibtibtaea has two:

(i) parse trees,

(ii) leftmost derivations,

(iii) rightmost derivations.

2.

- a) How do you use the pumping lemma to determine if a language is context-free?

3 CO1 N

OR

Can you describe a regular language using context-free grammar? Illustrate using an example.

- b) Can you give a context-free grammar (CFG) for the following languages 3 CO2 E
over the alphabet $\Sigma = \{a, b\}$:-
All strings in the language $L: \{a^n b^{2n} c^{4n} \mid n \geq 0\}$
If you cannot, justify the reason.

- c) Give a context-free grammar (CFG) for each of the following languages 4 CO2 C
over the alphabet $\Sigma = \{a, b\}$:-
- All strings in the language $L: \{a^n b^{2n} \mid n \geq 0\}$
- All nonempty strings that read the same from left or right.

OR

How can Context-Free Grammar (CFG) be simplified? Write down the procedure for eliminating unit productions from a CFG. Remove the unit productions from the following grammar:

$S \rightarrow AB, A \rightarrow a, B \rightarrow C/b, C \rightarrow D, D \rightarrow E, E \rightarrow a.$

Group-B

3.
a) What are ϵ -rule and unit rules? 2 CO2 U
b) Construct a pushdown automaton that recognizes the following 4 CO3 C/
language $L: \{a^n b^{2n} \mid n \geq 0\}$ E

OR

Suppose the PDA $P = (\{p, q, f\}, \{0, 1\}, \{0, 1, Z_0\}, \delta, q, Z_0, \{f\})$ has the following transition functions:

$\delta(q, 0, Z_0) = \{(q, XZ_0)\}, \quad \delta(q, 0, X) = \{(q, XX)\},$
 $\delta(q, 1, X) = \{(p, \epsilon)\}, \quad \delta(p, 1, X) = \{(p, \epsilon)\},$
 $\delta(p, \epsilon, Z_0) = \{(f, Z_0)\}.$

Starting from the initial ID (q, w, Z_0) , show all the reachable ID's when the input w is:

(i) 00001111

(ii) 00011

- c) Convert any one of the following context-free grammar (CFG) to an 4 CO1 N
equivalent pushdown automaton

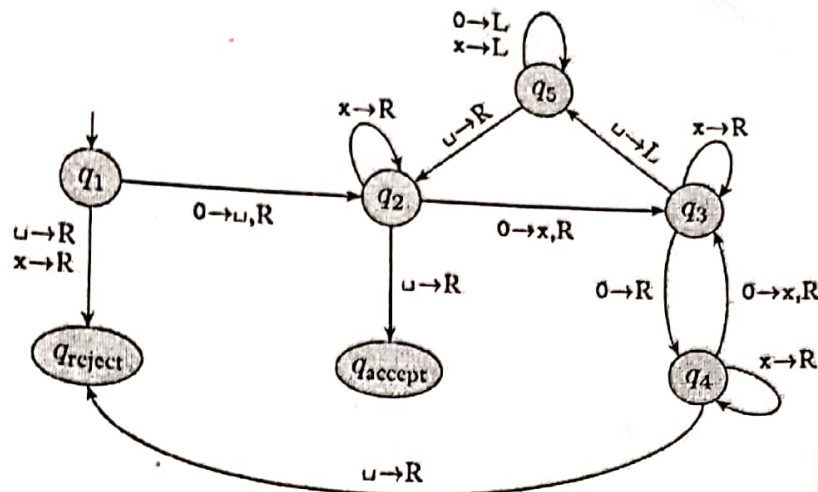
$S \rightarrow aSb \mid bY \mid Ya$
 $Y \rightarrow bY \mid aY \mid c \mid \epsilon$

OR

$S \rightarrow aXbX$
 $X \rightarrow aY \mid bY \mid \epsilon$
 $Y \rightarrow X \mid c$

4. a) Consider the following Turing machine.

4 CO3 A



Give the sequence of configurations that the machine enters when started with the following strings.

- i. 0000
- ii. 000000

- b) Give the implementation-level description of Turing Machine that accepts the following languages (*any two*):

6 CO3 C

- (i) $L = \{w \mid w \text{ is the set of strings with an equal number of 0's and 1's}\}.$
- (ii) $L = \{ww^R \mid w \text{ is any string of 0's and 1's}\}.$
- (iii) $L = n - 1$, where $n > 0$.

5.

- a) Convert any one of the following CFG into an equivalent CFG in Chomsky normal form.

4 CO2 A

$$S \rightarrow aSb \mid bY \mid Ya$$

$$Y \rightarrow bY \mid aY \mid c \mid \epsilon$$

OR

$$S \rightarrow aXbX$$

$$X \rightarrow aY \mid bY \mid \epsilon$$

$$Y \rightarrow X \mid c$$

- b) Find out whether the following problem is decidable or not.
Is a number 'm' prime?

3 CO4 E

OR

Determining if a given graph G is connected.

- c) What are NP-complete and NP-Hard problems? How can you show that a problem is NP-complete?

3 CO5 U

International Islamic University Chittagong
Department of Computer Science & Engineering

B.Sc. in CSE Final Examination, Autumn 2022

Course Title: Mathematics-IV Course Code: MATH-2407 (New)

Course Title: Mathematics-V Course Code: MATH-3501 (Old)

Time: 2 Hours 30 Minutes

Full Marks: 50

[The figures in the right-hand margin indicate full marks, Separate answer scripts must be used for Group A and Group B, Course Outcomes and Bloom's Levels are mentioned in additional Columns]

Course Outcomes (COs) of the Questions

CO1	Demonstrate the understanding of the basic principles and operations on set theory, mathematical operations with complex numbers, geometrical interpretation and the related fundamental theories involving complex functions and the concept of transformation in a complex plane and waves
CO2	Apply the concept of transformation of an object into complex space and different mathematical operation of complex functions
CO3	Use Fourier series, Laplace's Transforms, Fourier Transform in different scenario
CO4	Analyze the harmonics & spectrum of different types of waves
CO5	Demonstrate the harmonic analysis using MATLAB

Bloom's Levels of the Questions

Letter Symbols	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group A

Answer the following questions

1. Define Fourier series in the interval $(-L, L)$. Sketch the following function for four cycles, CO3 U 1

$$y = f(t) = \begin{cases} 0; & -4 \leq t < 0 \\ 4; & 0 \leq t < 4 \end{cases}$$

Also find the Fourier series for the function.

OR

Derive the complex form of Fourier series.

2. a) Find Harmonic analysis of the given Fourier series CO4 An

$$f(t) = \frac{4}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^{n+2}}{n} \sin \frac{n\pi t}{3}$$

b) Plot the line (at least 6) spectrum (discrete frequency spectra) for the Fourier series CO4 An

$$\underbrace{f(t)}_{\text{Complex wave}} = \underbrace{5}_{\text{DC value}} + \underbrace{\sum_{n=1}^{\infty} \frac{4}{n} \sin 2n\pi t}_{\text{AC value}}$$

Group B
Answer the following questions

- 3 a) Prove that $L(f''(t)) = s^2 L\{f(t)\} - s f(0) - f'(0)$

CO3 Ap 5
p

OR

Find the inverse Laplace transform of $\frac{s+4}{s(s-1)(s-2)}$

U

- b) Express the following function in terms of unit step functions and find its Laplace transform

CO3 Ap 5
p

$$f(t) = \begin{cases} 10; & t < 3 \\ 8; & t > 3 \end{cases}$$

OR

Find Fourier Transform of

$$f(t) = \begin{cases} 1 & ; 0 \leq t < 1 \\ -1 & ; -1 \leq t < 0 \\ 0 & ; |t| > 1 \end{cases}$$

- 4 a) State first shift theorem. Using the theorem evaluate $\mathcal{L}\{e^{-4t}t^2\}$

CO1 U 5

CO1 U 5

- b) Define unit step function. Sketch the following function,

$$x(t) = -u(t+3) + 2u(t+1) - 2u(t-1) + u(t-3)$$

- 5 a) Write **MATLAB code** to sketch line spectrum (at least 6) for the following Fourier series

CO5 Ap
p

$$f(t) = \underbrace{2}_{\text{DC value}} + \underbrace{\left[\sum_{n=1}^{\infty} (\cos n\pi + 1) \sin \frac{n\pi t}{3} \right]}_{\text{AC value}}$$

- b) Make a function in **MATLAB environment** to raise a complex wave $f(t)$ in the time interval of $[-4, 20]$ for the following Fourier series:

CO5 Ap
p

$$f(t) = 4\pi + \sum_{n=1}^{\infty} \frac{3}{n\pi} \cos n\pi t$$

- c) If $x[n] = 5; n=0$
 $= 6; n=1$

and

$$h[n] = 3; n=0 \\ = -2; n=1$$

CO5 Ap
p

Write **MATLAB code** to find the convolution sum of the above signals.