Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Final Examination, Fall-2023

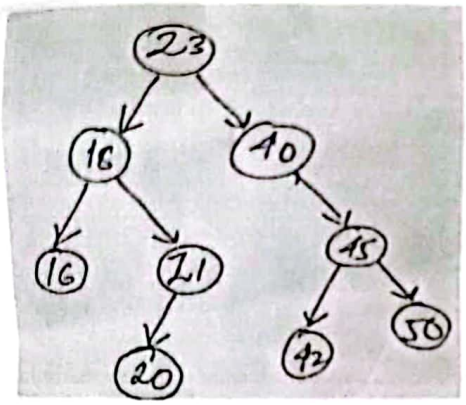
Course Code: CSE134, Course Title: Data Structures

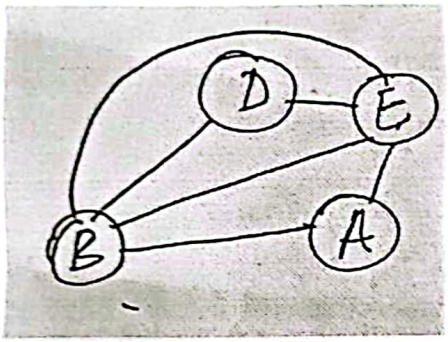
Level:1 Term:2 Batch: 64

Time: 2 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.		Consider the following figure of a BST:  Answer the following questions: (A) Show the traversal of the tree using inorder, preorder and postorder traversal technique. (B) Suppose a new node having data 12 is to be inserted and node 18 is to be deleted, show the operation of insertion and deletion and elaborate briefly. (C) Show the implementation scheme using link list nodes for the above BST. (D) Why BST is important in computing.	4 3 2 2	CO2 CO2 CO2 CO1
2.		(A) A given set of data in an array is {23, 11, 14, 17, 26, 7, 13, 10, 6, 3}. Insert the above data in an empty AVL tree and show each step of AVL formation including rotations. (B) Why AVL plays a significant role in data search using BST.	8 2	CO2 CO1
3.		For the data set shown in an array {45, 11, 21, 5, 37, 47, 3, 65, 18, 27, 41, 2}, answer the following questions:	4 3	CO2 CO2

		(A) Form a minHeap and maxHeap and show each necessary intermediate tree. Identify total number of percolations needed for minHeap and maxHeap. (B) Suppose the node 37 is to be deleted in minHeap you have formed above, write the process of deletion for node 37. (C) How heap data structure is different from BST. (D) Why percolation is needed in Heap.	2 2	CO1 CO1
4.		Consider the following Graph: Answer the following questions:  (A) Represent the graph using Adjacency matrix and Adjacency list. (B) Why Graph data structure implementation is challenging. (C) What are indegree and outdegree of the graph shown above.	4 2 2	CO2 CO1 CO1

Good Luck

Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall-2023
Course Code: PHY102, Course Title: Physics II: Basic Electricity and Magnetism and Modern Physics
Level: 1 Term: 2 Batch: 64

Time: 2 Hour **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	What was the problem in Rutherford Atomic Model?	2	CO1
	b)	State Isotope and Isotone with examples in your own words.	2	
	c)	Show the Binding Energy per nucleon curve.	1	
	d)	Define Half-life and X-ray?	2	
	e)	What can you say about nuclear fusion and chain reaction?	2	
	f)	Illustrate Capacitance.	1	
2.	*a)*	How is mass related to energy according to Einstein? Explain it.	4	CO2
	b)	How would you categorize the capacitance of a parallel plate capacitor.	4	
	c)	Discover Einstein's photo electric equation.	3	
	d)	Simplify the radio active decay law.	4	
3.	*a)*	What approach would you use to calculate the energy of 12 atomic mass unit in electron volt (eV).	3	CO3
	b)	How would you solve the problem that how long will it take to decay 60% of a piece of radon? Half-life of radon is 3.82 days.	3	
	c)	What would result if a woman at the age of 35 left in a spacecraft moving with velocity 0.98 c for trip to the space with leaving behind a daughter of 10 years old on earth. According to the counting of time she returned to the earth spending 30 years in space. After returning whose age was what among them?	3	
	d)	What facts would you select to show when a photon of wavelength 0.40 nm after collision with an electron at rest is deflected through an angle 150° with respect to the previous path. Calculate the velocity and frequency of the deflected photon.	3	
	e)	What other way would you plan to find the energy that is released if two protons and two neutrons combine to form an alpha particle? [Mass of $^{1}_{1}H$ atom is 1.007825 amu; Mass of neutron is 1.008665 amu and Mass of $^{4}_{2}He$ atom is 4.00260 amu].	3	

Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall-2023
Course Code: MAT 102, Course Title: Mathematics II
Level: 01 Term: 02 Batch: 64

Time: 2 Hours **Marks: 40**

Answer All Questions

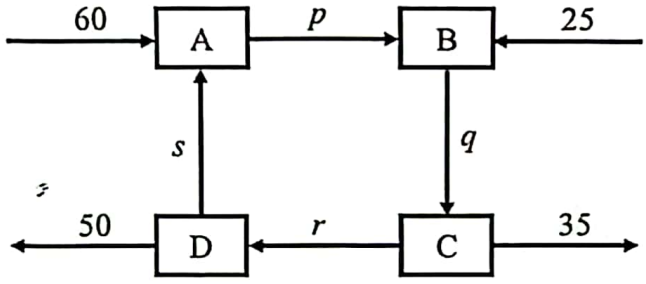
[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. a) Given $M = \begin{bmatrix} 6 & 2 & 0 \\ -2 & -1 & 4 \\ 3 & -5 & 6 \end{bmatrix}$. [3+5+5] CO2

(i) Divide M into symmetric and skew-symmetric matrix.
(ii) Determine the Rank, the RREF and the NF of M.
(iii) Compute M^{-1}.

b) List examples: [2]
(i) an Orthogonal matrix (5×5). (ii) a Symmetric matrix (6×7).

2. a) The following figure describes the outskirts of a residential area. [3+4] CO4
Here p, q, r and s denote the number of vehicles passing everyday along given paths.
(i) Demonstrate the scenario by a SLE.
(ii) Evaluate p, q, r and s when there exists no congestion at the intersecting points.



b) Examine whether the vectors $(5,-2,4), (2,-3,5)$ and $(4,5,-7)$ are linearly independent or dependent. [3]

3. Given $M = \begin{bmatrix} 1 & 1 & 2 \\ -1 & 2 & 1 \\ 0 & 1 & 3 \end{bmatrix}$. [4+2+2] CO3

(i) Identify the eigenvalues of M.
(ii) Estimate the spectrum of M^{-5}.
(iii) Identify the trace of M^{-3}.

4. $P(x,y,z) = (2x, 4x-y, 3y-z)$, $Q(x,y,z) = (2x-y, xy+z, z-x)$, [4+3] CO4
$R(x,y,z) = (3x, x-y, 2x+y+z)$, $S(x,y,z) = (x+y-z, 2y+z)$.

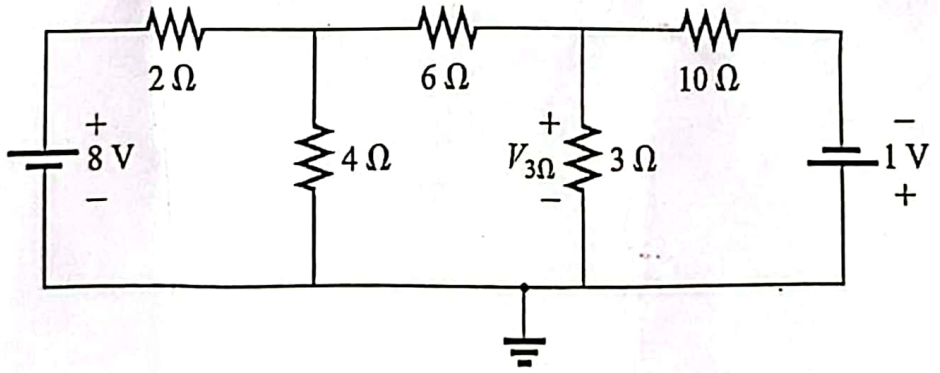
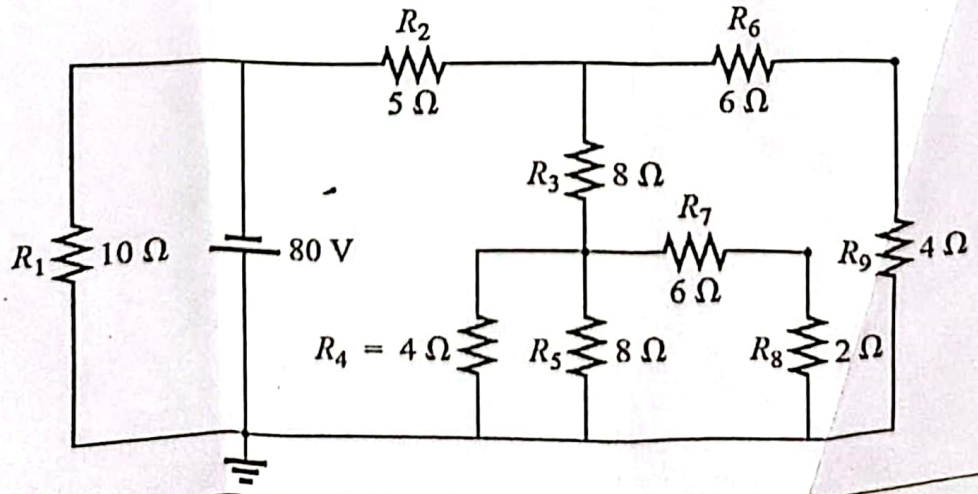
(i) Examine which are LT.
(ii) Evaluate RoP and PoS.

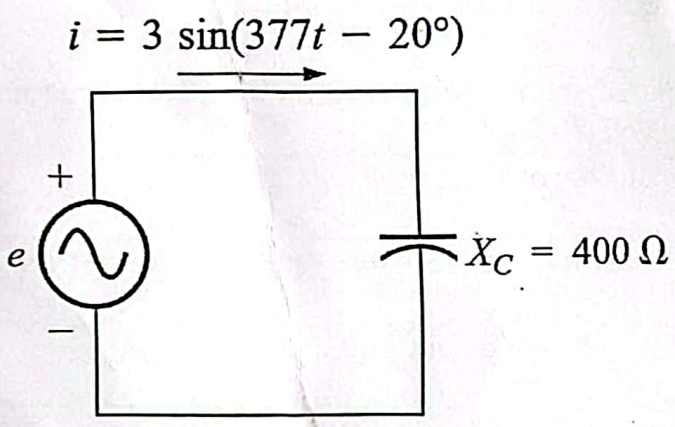
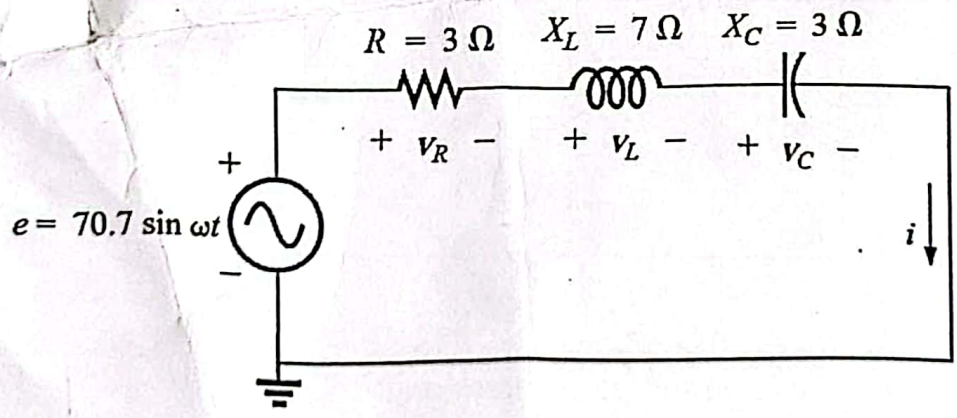
Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall-2023
Course Code: CSE121, Course Title: Electrical Circuits
Level:1 Term:2 Batch:64

Time: 2 Hours **Marks: 40**

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a)	**Interpret** the factors related with determining the number of required equation/s for Nodal Analysis?	[2]	CO1
	b)	**Explain** the significance of Phasor Diagram?	[2]	
	c)	**Compare** AC & DC response in resistive elements in terms of frequency?	[2]	
	d)	**Illustrate** the peak-to-peak value of a sinusoidal wave?	[2]	
	e)	**Show** the frequency response of the ideal inductor?	[2]	
2.		**Apply** nodal analysis to determine the voltage across 3-Ω resistor: 	[6]	CO2
3.		**Solve** the following circuit to determine the total resistance R_T and source current I 	[6]	CO2

4.	**Simplify** the following equation to determine the effective values of the waveforms followed by I-V plot: a. $v = 7.07 \sin 377t$ b. $i = 16 \times 10^{-3} \sin(377t - 10°)$	[6]	CO3
5.	**Analyze** the circuit below to determine the following: a. Sinusoidal expression for *e* b. Value of capacitance in microfarads c. Average power loss in capacitor 	[6]	CO3
6.	**Examine** the following R-L-C circuit to determine the Z_T, I, P_T followed by phasor diagram: 	[6]	CO3

Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall 2023
Course Code: ENG102; Course Title: Writing & Comprehension
Level: 1; Term: 2; Batch: 64

Time: 2:00 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

Question 1 (Reading)	**20 x 1 = 20 marks**	**CO1**

Reading Passage 1: Read the following passage and answer questions 1-2.

a. There are now over 700 million motor vehicles in the world - and the number is rising by more than 40 million each year. The average distance driven by car users is growing too - from 8 km a day per person in western Europe in 1965 to 25 km a day in 1995. This dependence on motor vehicles has given rise to major problems, including environmental pollution, depletion of oil resources, traffic congestion and safety.

b. While emissions from new cars are far less harmful than they used to be, city streets and motorways are becoming more crowded than ever, often with older trucks, buses and taxis, which emit excessive levels of smoke and fumes. This concentration of vehicles makes air quality in urban areas unpleasant and sometimes dangerous to breathe. Even Moscow has joined the list of capitals afflicted by congestion and traffic fumes. In Mexico City, vehicle pollution is a major health hazard.

c. Until a hundred years ago, most journeys were in the 20 km range, the distance conveniently accessible by horse. Heavy freight could only be carried by water or rail. The invention of the motor vehicle brought personal mobility to the masses and made rapid freight delivery possible over a much wider area. Today about 90 per cent of inland freight in the United Kingdom is carried by road. Clearly the world cannot revert to the horse-drawn wagon. Can it avoid being locked into congested and polluting ways of transporting people and goods?

d. In Europe most cities are still designed for the old modes of transport. Adaptation to the motor car has involved adding ring roads, one-way systems and parking lots. In the United States, more land is assigned to car use than to housing. Urban sprawl means that life without a car is next to impossible. Mass use of motor vehicles has also killed or injured millions of people. Other social effects have been blamed on the car such as alienation and aggressive human behaviour.

e. A 1993 study by the European Federation for Transport and Environment found that car transport is seven times as costly as rail travel in terms of the external social costs it entails such as congestion, accidents, pollution, loss of cropland and natural habitats, depletion of oil resources, and so on. Yet cars easily surpass trains or buses as a flexible and convenient mode of personal transport. It is unrealistic to expect people to give up private cars in favour of mass transit.

f. Technical solutions can reduce the pollution problem and increase the fuel efficiency of engines. But fuel consumption and exhaust emissions depend on which cars are preferred by customers and how they are driven. Many people buy larger cars than they need for daily purposes or waste fuel by driving aggressively. Besides, global car use is increasing at a faster rate than the improvement in emissions and fuel efficiency which technology is now making possible.

g. One solution that has been put forward is the long-term solution of designing cities and neighborhoods so that car journeys are not necessary - all essential services being located within walking distance or easily accessible by public transport. Not only would this save energy and cut

carbon dioxide emissions, it would also enhance the quality of community life, putting the emphasis on people instead of cars. Good local government is already bringing this about in some places. But few democratic communities are blessed with the vision - and the capital - to make such profound changes in modern lifestyles.

h. A more likely scenario seems to be a combination of mass transit systems for travel into and around cities, with small 'low emission' cars for urban use and larger hybrid or lean burn cars for use elsewhere. Electronically tolled highways might be used to ensure that drivers pay charges geared to actual road use. Better integration of transport systems is also highly desirable - and made more feasible by modern computers. But these are solutions for countries which can afford them. In most developing countries, old cars and old technologies continue to predominate.

A **Reading Passage 1 has seven paragraphs a-h. Which paragraph contains the following information?**
Write the correct letter A-H after the information below. NB You may use any letter more than once.

i. A comparison of past and present transportation methods
ii. How driving habits contribute to road problems
iii. The writer's own prediction of future solutions
iv. The increasing use of motor vehicles
v. The impact of the car on city development

B ***Do the following statements agree with the information given in Reading Passage 1?***
On your answer sheet, write

YES, if the statement agrees with the claims of the writer
NO, if the statement contradicts the claims of the writer
NOT GIVEN, if it is impossible to say what the writer thinks about this

i. Vehicle pollution is worse in European cities than anywhere else.
ii. Transport by horse would be a useful alternative to motor vehicles.
iii. Nowadays freight is not carried by water in the United Kingdom.
iv. Most European cities were not designed for motor vehicles.
v. Technology alone cannot solve the problem of vehicle pollution.

Reading Passage 2: Read the following passage and answer questions 3-4.

Throughout history, the clash between the old and the young has been a defining feature of both reality and literature. Parents have power over their children… but as those juveniles approach adolescence, they begin to put pressure on their parents' power. They test the rules; they rebel; they create their own rules. The parents are puzzled, frustrated and resentful about the shift in the balance of power. They fight back; try to exert their leadership in an attempt to maintain their power. But as they grow towards old age, they are forced to relinquish it, while the world changes into a place they cease to recognize from their youth.

The friction between old and young is set to become a feature of the twenty first century, as we approach a period where the balance of power reaches virgin territory. This is not to say that relationships between the generations are expected to worsen; rather that the unprecedented demographic changes to come will have knock-on effects that we cannot yet imagine.

How can we be so sure that trials lie ahead? Demographic trends are incredibly easy to predict. Decades pass between the birth of children and their growth into adulthood, while rises in life expectancy due to affluence and better medical care are gradual. Consequently, it is possible to predict accurately what proportion of the population will be economically active, and what proportion will be dependent, for a considerable time in the future. Hence, we know that rising as people are living longer and having fewer children – and having them later in life - population structure will skew much more towards the aged.

Statistical prediction is one thing. Predicting the implications of such trends on society is another thing entirely. In the 1900s, demographers could – or at least should – have predicted that trend toward city-living as opposed to country-living was likely to continue, as indeed it did, becoming one of the most defining features of the twentieth century. The political, economic, social and environmental implications of this shift were much harder to predict, however.

Many economically developed countries already fear that by 2025, there will be too few young tax-payers in the working population to support those in old age. This is the generation that requires pensions, medical care, local services and other benefits. Governments are already putting in steps, such as compulsory work pensions and increases in the retirement age in an attempt to mitigate the problem. How effective these measures prove to be remained to be seen. Moreover, this isn't just a predicament for richer countries. All less economically developed countries outside the AIDS stricken regions of Sub-Saharan African are experiencing the same demographic trends, and, unless their economies develop extremely quickly, their populations will suffer much more.

Economically, therefore, adults will be at the mercy of the elderly. Governments will be obliged to put money and efforts into the provision for the elderly and working adults will have to forego their share. But perhaps such a conclusion is too glib. The scenario could pan out in differently. After all, rising elderly populations also bring opportunities for the young, such as in employment in products and services geared towards the older generation. Moreover, the shift comes at a time when seniority is beginning to count for less in the workplace than in the past. Youthful traits, such creativity and familiarity with new technology are being recognized more and more. Perhaps power will not shift towards the elderly as much as demographic data suggests.

Add another twist, and we realize that the older generation are not the old-fashioned bedridden fuddy-duddies that they perhaps were perceived to be in the past. The over-seventies look younger and are fitter than ever. Moreover, their tastes are less divergent from those of younger generations than they used to be. They listen to rock music, study at university, embrace new hobbies, travel and socialize. The lines between youth and age, culturally at least, have blurred.

This may mean that a standard retirement age may become a thing of the past, as vigorous people in their seventies and eighties choose to carry on working. Such a trend would greatly ease the tax burden on the younger generations, as well as giving the older generation more choice. However, it comes as a two-edged coin, as young, inexperienced workers would be forced to compete for jobs with the seasoned workers; while those in employment may never get the promotion they desire if the old guy at the top refuses to quit.

Of course, the predictions envisaged in this scenario will only come to pass if the world develops in a relatively benign way. In the twentieth century population shifts were irrevocably altered by world war and economic depression, and similar events could afflict coming generations too. Until we know for sure, we can rest easy in the knowledge that the problems which arise now are the problems of success – problems that arise through economic growth, better medication, reduced inequality and by maintaining peace.

C *Complete the Gaps with ONE or TWO words from the text.*

The difference between the definition of an old person and a young one is more **i.** _____ than in the past. In future, governments may abolish the fixed **ii.** _____, meaning that fitter elderly could help to contribute towards relieving the **iii.** _____ on the working population. However, there are negative implications of this, as experienced workers may be considered more employable, and there would be fewer opportunities for **iv.** _____ among younger workers. However, it is worth remembering that all these difficulties come as a result of **v.** _____ .

D Write **NO MORE THAN TWO WORDS** from the passage for each answer.

Write your answers in boxes **I–V** on your answer sheet.

i. What are governments already doing to address the potential economic strain caused by demographic shifts?
ii. According to the passage, what is expected to be a feature of the twenty-first century?
iii. What demographic changes are discussed as contributing to the potential challenges between generations?
iv. What traits are increasingly recognized in the workplace, diminishing the influence of seniority?
v. According to the passage, what could ease the tax burden on younger generations?

Question 2 (Grammar)	**7 x 1 = 7 marks**	**CO2**

A Some of these are correct sentences. Others are fragments or run-ons. Write **C** if they are correct and **I** if fragments or run-ons. If incorrect, write the correct answer.

i. Suddenly, silence reigned after a long violent storm.
ii. I went in, I bought the painting, I drove straight home.
iii. Hurry up!
iv. America, the greatest country in the world.
v. Reading the book with the gold lettering on the cover.
vi. On the ledge far above us sat a curious mountain lion.
vii. The first evening of rehearsal was a fiasco no one knew his lines.

Question 3 (Writing)	**13 x 1 = 13 marks**	**CO3**

A News media nowadays have influenced people's lives in negative ways. To what extent do you agree or disagree with the statement?

Write an essay supporting your arguments based on your knowledge and experience.

Write at least 250 words.