

University of Chittagong
Department of Computer Science and Engineering
2nd Semester B.Sc. (Engg.) Examination-2019
Course Code: MAT-231 Course Title: Calculus and Differential Equations
 Total marks: 54 Marks Time: 4.00 hours

[Answer any *three* questions from each of the *Group-A* and *Group-B*. Separate answer script must be used for Group-A and Group-B. All parts of a question should be answered sequentially.]

Group-A

1.a) Find the domain and range of the function:

$$f(x) = \begin{cases} |x|^2, & -1 < x < 0 \\ e^x, & 0 \leq x < 2 \end{cases}$$

b) If $f(x) = \begin{cases} 3+2x, & 0 \leq x \leq 1 \\ 1-x, & 1 < x < 5 \end{cases}$

Test the continuity and differentiability of $f(x)$ at $x = 1$.

c) Evaluate $\lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$

2.a) State Rolle's theorem. Verify Rolle's theorem for the function $f(x) = x^2(1-x)^2$ in the interval $0 \leq x \leq 1$

b) Find $\frac{dy}{dx}$ if $y = \tan^{-1} \frac{\sqrt{1+x^2}-1}{x}$

c) If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, show that $(1-x^2)y_{n+2} - (2n+3)xy_{n+1} - (n+1)^2 y_n = 0$

3.a) Test the function $f(x, y) = 4x^2 - xy + 4y^2 + x^3y + xy^3 - 4$ for extremum values.

b) If $u = f(x^2 + 2yz, y^2 + 2zx)$, show that $(y^2 - zx)\frac{\partial u}{\partial x} + (x^2 - yz)\frac{\partial u}{\partial y} + (z^2 - xy)\frac{\partial u}{\partial z} = 0$

4.a) Evaluate any three of the following integrals:

(i) $\int \sin^6 x \, dx$

(ii) $\int \frac{x^2+2}{(x+1)^3(x-2)} \, dx$

(iii) $\int_0^{\frac{\pi}{4}} \tan x \, dx$

(iv) $\int_0^{\frac{\pi}{2}} \frac{x \, dx}{\sin x + \cos x}$

b) Establish a reduction formula for $\int \frac{dx}{(x^2+a^2)^n}$ and evaluate $\int \frac{dx}{(x^2+1)^4}$.

Group-B

5. a) Find the total length of the curve.

4.5

$$x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$$

b) The curve $r = a(1 + \cos \theta)$ revolves about the initial line. Find the volume and surface of the figure formed.

4.5

6. a) Solve the following differential equations (answer any two):

6

(i) $x \frac{dy}{dx} + \cot y = 0$, given $y = \frac{\pi}{4}$ where $x = \sqrt{2}$

(ii) $x^2 dy + y(x + y) dx = 0$

(iii) $\frac{dy}{dx} + \frac{y}{x} = \frac{y^2}{x^2}$

b) Solve the exact differential equation:

3

$$(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$$

7. a) Find the general solution of the following equations (answer any three):

9

(i) $(D^3 - 3D^2 + 4D - 2)y = e^x + \cos x$

(ii) $(D^3 - 5D^2 + 7D - 3)y = e^{2x} \cosh x$

(iii) $(D^3 + 2D^2 + D)y = e^{2x} + x^2 + x$

(iv) $(D^2 - 6D + 9)y = x^2 e^{3x} \cos 2x$

8. a) State and prove orthogonal properties of Legendre's polynomial.

4.5

b) Prove that:

4.5

(i) $\frac{d}{dx} [x^{-n} j_n(x)] = -x^{-n} j_{n+1}(x)$

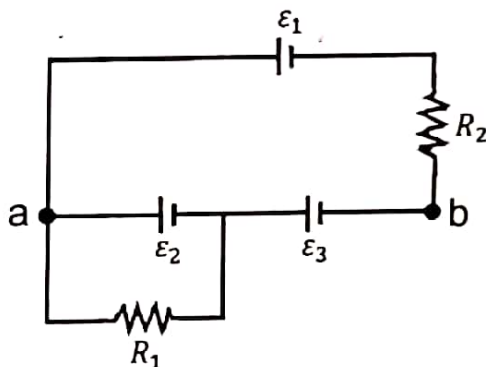
(ii) $x j_n'(x) = -n j_n(x) + x j_{n-1}(x)$

University of Chittagong
Department of Computer Science and Engineering
 2nd Semester B.Sc. (Engg.) Examination-2019
Course Code: PHY-241 Course Title: Electricity, Magnetism and Optics
 Total marks: 54 Marks Time: 4.00 hours

[Answer any **three** questions from each of the **Group-A** and **Group-B**. Separate answer script must be used for Group-A and Group-B. Figures in the right-hand margin indicate full marks.]

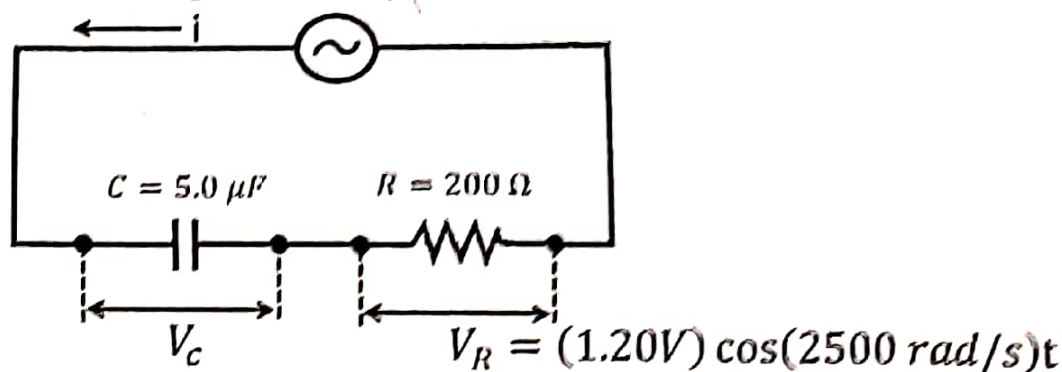
Group-A

1. a) State Coulomb's law in electrostatics and discuss it's significance. 1+1
 - b) Define electric field. 1
 - c) Calculate the electric field \vec{E} at a distance y from an infinite line of charge whose linear charge density has the constant value λ . 4
 - d) What is the magnitude of a point charge chosen so that the electric field 50cm away has the magnitude 2.0 nt/coul.? 2
2. a) State and explain Kirchhoff's laws of electricity. 3
 - b) Why do we need Kirchhoff's laws? 2
 - c) What are meant by ohmic and non-ohmic devices? Give some examples of each. 2
 - d) Find the current in each resistor and the potential difference between 'a' and 'b' in the circuit shown below. Given, $\varepsilon_1 = 6.0$ volts, $\varepsilon_2 = 5.0$ volts, $\varepsilon_3 = 4.0$ volts, $R_1 = 100$ ohms, and $R_2 = 50$ ohms. 2



3. a) How does one define the magnetic field \vec{B} ? What is Lorentz force? 1+1
- b) When does Ampere's law become difficult to apply in a useful way? 1.5
- c) Prove that two long parallel wires separated by a distance ' d ' and carrying currents ' i_a ' and ' i_b ' respectively in the same direction will attract each other. Hence, show that this attraction between two long parallel wires can be used to define the Ampere. 2.5+1
- d) A 10 cm long wire carrying a current of 10 amp is held at an angle 30° with the direction of a uniform magnetic field of strength 1 weber/ m^2 . Calculate the force acting on the wire. 2

4. a) What are root-mean-square (rms) values? Find the rms value of alternating current. 1+2
- b) Derive expressions for current and impedance when an alternating emf is applied to a circuit having capacitor C and a resistor R in series. 4
- c) Find the current through the circuit shown below. Hence, (i) find the capacitive reactance X_C , (ii) the voltage amplitude across the capacitor, and (iii) write an expression for the instantaneous voltage across the capacitor. 2



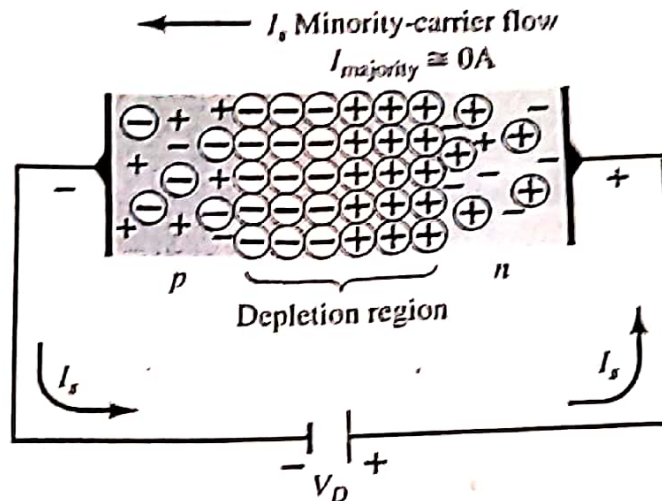
Group-B

5. a) Write the conditions for interference of light. 2
- b) What are Newton's rings and interferometer? 2
- c) Show that the distances between any two consecutive bright or dark fringes formed in Young's double slits experiment is same. 5
6. a) Distinguish between interference and diffraction of light. 2
- b) What is bi-prism? Explain Fresnel bi-prism experiment. 4
- c) Calculate the separation between coherent sources formed by a bi-prism whose inclined faces make angle $1/3^\circ$ with its base, the sources being 2.5cm away from the bi-prism. Assume the refractive index of the material of bi-prism to be 1.45. 3
7. a) Define polarization of light. What are the applications of polarized light? 2
- b) State the postulates of Bohr regarding his atom model. 2
- c) Explain hydrogen spectral series. 5
8. a) Define photoelectric effect. Derive equation of Einstein's photoelectric effect. 1+2.5
- b) What is de Broglie hypothesis? 1
- c) Mention some characteristic properties of nuclei. Define mass defect and binding energy. Plot the variation of binding energy per nucleon as a function of mass number schematically and explain the curve. 1+1+1
- d) Calculate the de Broglie wavelength associated with an electron of energy 5 MeV. 1.5

[Answer any *three* questions from each of the Group-A and Group-B. Separate answer script must be used for Group-A and Group-B. Figures in the right-hand margin indicate full marks.]

Group-A

1. a) What are intrinsic and extrinsic semiconductors? 3
- b) Show that the n-type material is formed by adding donor atoms having five valence electrons. 3
- c) Differentiate between n-type and p-type material. 3
2. a) Why an ideal diode is called ideal? Can you explain the short- and open-circuit equivalence of an ideal diode? 1+2
- b) Which condition of p-n junction diode has been represented in the following figure? Explain your answer. 4

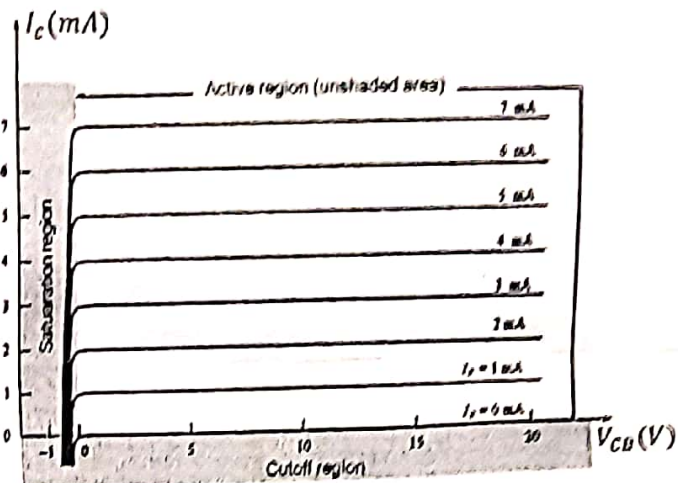
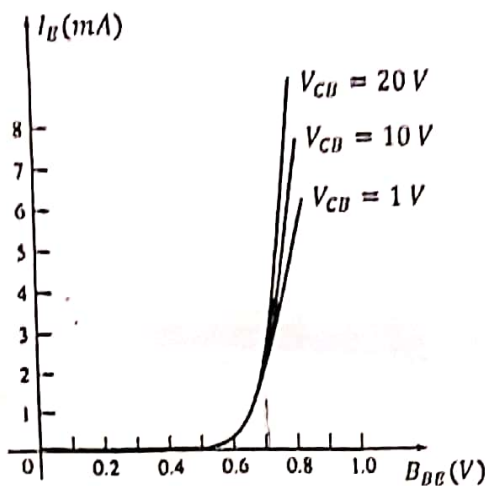


- c) Draw the equivalent circuit of the Zener diode. 2
3. a) Describe the center-tapped transformer by showing the network conditions for the positive and negative region of V_L . 5
- b) Draw the elaborate figures of clipping circuits. 4
4. a) "Half-wave rectification is the process of removing one-half of the input signal to establish a dc level" - Do you agree with the statement? Explain your answer with necessary diagram. 4.5
- b) Write short notes on: i) Photodiode; ii) Power diode; iii) VMOS. 4.5

Group-B

5. a) Differentiate between BJT and JFET. 2
 b) Write the characteristics of JFETs, considering the condition $V_{GS} = 0V$. 2
 c) What is the major difference between a bipolar and a unipolar device? 2
 d) Derive $I_E = (\beta + 1)I_B$ from $I_E = I_B + I_C$. 3

6. a) Briefly describe the common-emitter and common-base configuration graphically. 4.5
 b) i) Using the characteristics of the following figure, determine the resulting collector current if $I_E = 3 \text{ mA}$ and $V_{CB} = 10 \text{ V}$. 4.5
 ii) Using the characteristics of the figure, determine the resulting collector current if I_E remains at 3 mA but V_{CB} is reduced to 2 V .
 iii) Using the characteristics of following figures, determine V_{BE} if $I_C = 4 \text{ mA}$ and $V_{CB} = 20 \text{ V}$.



7. a) Explain the construction and operation of JFET with necessary diagram. 6
 b) Sketch the transfer curve defined by $I_{DSS} = 12 \text{ mA}$ and $V_P = 6 \text{ V}$. 3
8. a) Briefly describe the basic operation of depletion-type MOSFET. 4
 b) Show the schematic diagram of CMOS and explain it. 2
 c) Define the operational amplifier. Write the basic operation of operational amplifier. 1+2

University of Chittagong
Department of Computer Science and Engineering
2nd Semester B.Sc. (Engg.) Examination-2019
Course Code: MAT-233 Course Title: Discrete Mathematics
Total marks: 54 Marks Time: 4.00 hours

[Answer any *three* questions from each of the *Group-A* and *Group-B*. Separate answer script must be used for Group-A and Group-B. Figures in the right-hand margin indicate full marks.]

Group-A

1. a) State the converse, contrapositive, and inverse of each of these conditional statements: 3
i) I go to the beach whenever it is a sunny summer day.
ii) If it snows tonight, then I will stay at home.
- b) Let p, q, r , and s be the propositions: 1
 p : I will get up early this morning. q : There is a lunar eclipse this morning.
 r : There are no clouds in the sky this morning. s : I will see the lunar eclipse.
Express $(p \wedge \neg r) \rightarrow \neg s$ in English sentence.
- c) Use rules of inference to show that the hypotheses "Rahim works hard," "If Rahim works hard, then he is a dull boy," and "If Rahim is a dull boy, then he will not get the job" implies the conclusion "Rahim will not get the job." 2
- d) State the difference between one-to-one and onto function with example. 1
- e) Consider these functions from the set of students in a discrete mathematics class. Determine whether the function is one-to-one or not if it assigns to a student his or her 2
i) mobile phone number. iii) student identification number.
ii) final grade in the class. iv) home town.
2. a) Let p, q , and r be the propositions: 1.5
 p : You have the flu. q : You miss the final examination. r : You pass the course.
Write the following propositions using p, q, r , and logical connectives.
i) Either you have flu and miss the final exam, or you do not miss the final exam and do pass the course.
ii) If you miss the final exam, then you do not pass the course.
iii) It is not true that if you miss the final exam, you will pass the course.
- b) Show that these compound propositions are tautologies. 2
i) $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$ ii) $((p \vee q) \wedge \neg p) \rightarrow q$
- c) The bit string for the set $\{1, 3, 5, 7, 9\}$ is 1010101010, where the universal set is $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. What is the bit string for the complement of this set? 1.5
- d) Let $P(x)$ be the statement " x can drive a car", $Q(x)$ be the statement " x knows the traffic rules" and the domain for quantifiers consists of all friends at your university. Now, express the following statements using predicates and quantifiers. 4
i) There is a friend at your university who can drive a car and who knows the traffic rules.
ii) Every friend at your university either drive a car or knows the traffic rules.
iii) There is a friend at your university who can drive a car but who doesn't know the traffic rules.
iv) No friend at your university can drive a car or knows the traffic rules.

3. a) Find the prime factorization of 126

1

b) Solve the congruence equation $33x \equiv 38 \pmod{280}$

3

c) State the Chinese remainder theorem. Solve the following systems of congruence by using the Chinese remainder theorem.

5

$$x \equiv 2 \pmod{3}$$

$$x \equiv 4 \pmod{5}$$

$$x \equiv 6 \pmod{7}$$

4. a) What is the secret message produced from the message "CSECU" using the Caesar cipher with the encryption function $f(p) = (p + 12) \pmod{26}$.

2.5

b) Express the principle of mathematical induction using rules of inference.

1.5

c) Use mathematical induction to prove that for each $n \in \mathbb{Z}^+$, $\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$ (\mathbb{Z}^+ is the set of positive integers $\{1, 2, 3, \dots\}$).

3

d) Give an inductive definition of the factorial function $F(n) = n!$.

2

Group-B

5. a) How many students must be in the discrete math class to guarantee that at least two students receive the same grade on the final exam if the exam is graded on a scale from 0 to 54 points?

1.5

b) For each of these relations on the set $\{1, 2, 3, 4\}$, decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive.

4

i) $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$

ii) $\{(2, 4), (4, 2)\}$

iii) $\{(1, 2), (2, 3), (3, 4)\}$

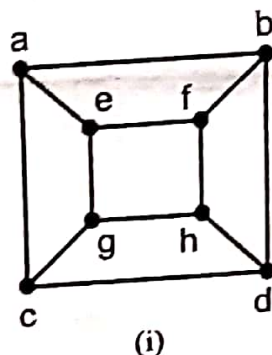
iv) $\{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$

c) Draw the Hasse diagram representing the partial ordering $\{(a, b) \mid a \text{ divides } b\}$ on $\{1, 2, 3, 4, 6, 8\}$. Which elements of this poset are maximal and which are minimal?

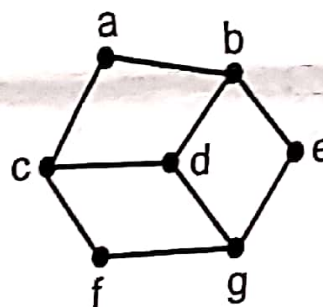
3.5

6. a) Determine whether the following graphs are bipartite or not.

2



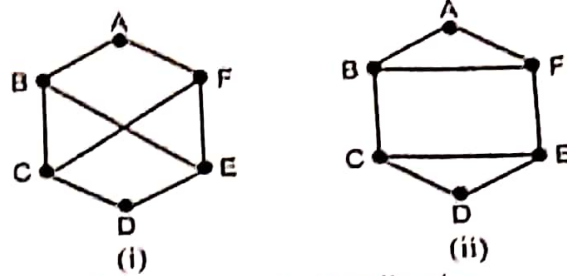
(i)



(ii)

- b) State the Handshaking theorem. Determine whether the given pair of graphs are isomorphic or not.

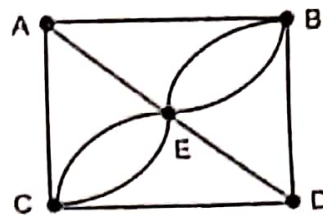
2.5



- c) Write the sufficient conditions for a graph to be Hamiltonian.
 d) Determine whether the following graph has an Euler circuit or path. Identify such a circuit or path if it exists.

2.5

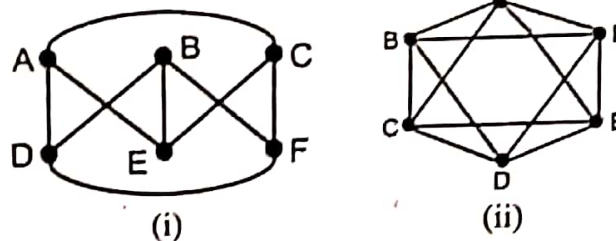
2



7. a) As a computer scientist, in what format (adjacency matrix or adjacency list) would you like to have a graph represented in the computer and why?
 b) Draw a planar representation, if possible, of the following graphs.

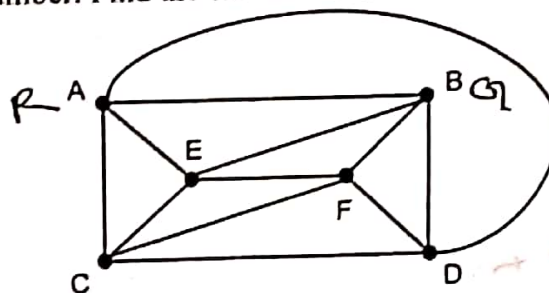
1.5

2



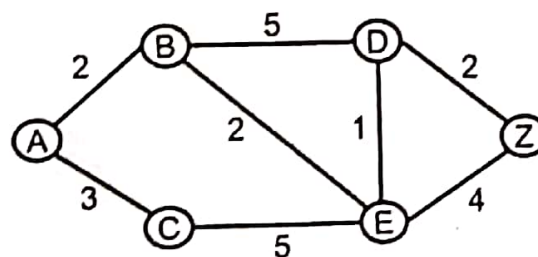
- c) Define the chromatic number. Find the chromatic number of the following graph.

2



- d) Using Dijkstra's algorithm, find the length of the shortest path between A and Z in the given weighted graph.

2.5

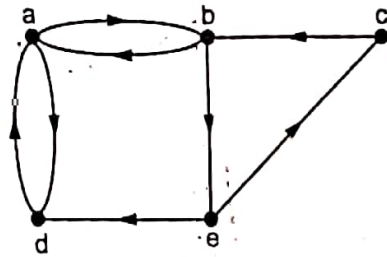


3

- e) Does each of these lists of vertices form a path in the following graph? Which paths are simple? Which are circuits? What are the lengths of those that are paths?

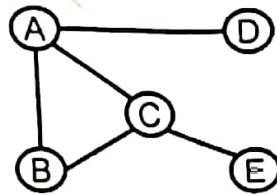
1

- i) a, b, e, c, b ii) a, b, e, c, b, d, a



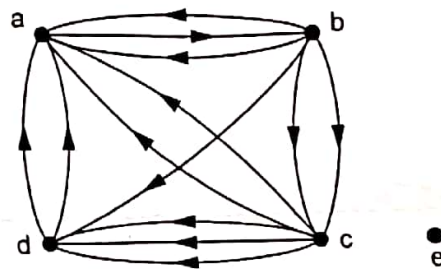
8. a) Starting from vertex A, determine the order of the visitation of the vertices using the depth-first search (DFS) algorithm.

2



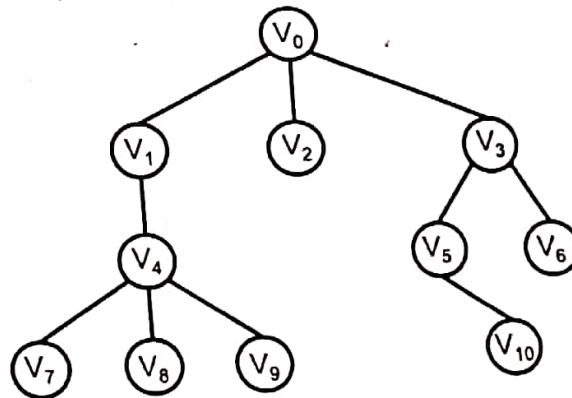
- b) Find the in-degree and out-degree of each vertex in the following graph with directed edges.

1.5



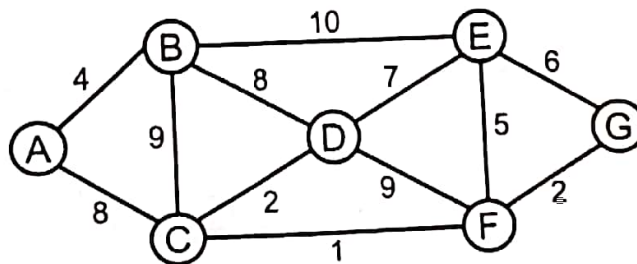
- c) Visit the tree using pre-order, in-order, and post-order tree traversal algorithm.

3



- d) Construct a minimum spanning tree using Kruskal's algorithm of the following graph:

2.5



University of Chittagong
Department of Computer Science and Engineering
2nd Semester B.Sc. (Engg.) Examination-2019
Course Code: ENG-271 Course Title: English
Total marks: 54 Time: 4.00 hours

[Answer any three questions from each of the Group-A and Group-B. Separate answer script must be used for Group-A and Group-B. Figures in the right-hand margin indicate full marks.]

Group-A

1. **Read the following passage and answer the questions (a-b):**
Computers are machines that can help us in many ways. But they cannot think or do things on their own. Humans have to feed them with information and tell them what to do with it. They cannot come up with any new information. But they can save much time and work. For example, all the information and the office files can be stored in a computer's "memory". If a clerk were to trace any information from a particular file, the computer would only take seconds to find it. It would take a clerk days or even weeks to go through every file if no computers were used.

The first computers were huge and costly. They filled up almost the whole floor of large offices. Later, because of the usefulness and demand for computers in business, scientists soon found ways to produce cheaper and smaller computers. They invented chips which made it possible to store more information in less space.

Today, computers are not only cheaper but also more compact. They can just be placed on top of an ordinary writing table. They can even be carried from place to place easily. Computers are not only used in offices by companies, but they are also used at home, by families who can afford them.

Robots, on the other hand, are not mechanical people. They are only moving parts controlled by a computer. A robot can do the same work for twenty-four hours, and yet, it does not complain or get tired. In the United States, robots are computers that tell them where to guard and what to do. These robots are programmed to listen for certain noises and signals for help in case of trouble or danger.

In Japan and in some places in America, robots are used in factories to assemble cars. As computers become more common businesses and factories, people fear that one day computers and computer-controlled robots will put human workers out of work.

- a) **Write the meaning of the following words and make sentences:**

i) Assemble ii) Trace iii) Robot

3.75

- b) **Choose the correct options from the below:**

5

- i. Why do humans have to feed the computers with information and tell them what to do?
- a) Because computers can save time and work.
 - b) Because computers cannot think or do things on their own.
 - c) Because computers can store office information in their memory.
 - d) Because computers can help us in many ways.

- ii. Why did the first computers fill up almost the whole floor?
 - a) Because they were huge and costly.
 - b) Because of the usefulness and demand for computers in businesses.
 - c) Because the office floor was small.
 - d) Because they were huge.
- iii. Find a word in the passage that has the same meaning as more compact.
 - a) Huge
 - b) Cheaper
 - c) Smaller
 - d) Costly
- iv. Which of the following statements is NOT TRUE?
 - a) Robots are controlled by a computer.
 - b) Robots are mechanical people.
 - c) Robots do not get tired of working.
 - d) Robots guard factories and museums in the United States.
- v. Humans fear that one day computers and robots -----
 - a) are busier than humans.
 - b) are cleverer than humans.
 - c) will make humans jobless.
 - d) will make humans listen to certain noises.

8.75

2. **Frame the questions as directed:**

- a) Ravi will prepare the draft today itself. (W/H)
- b) She will invite the CEO as the Chief Guest. (W/H)
- c) You will be treated as a friend. (W/H)
- d) Come with me. (Yes/No)
- e) He got the letter. (Yes/No)
- f) What does an avocado taste like? (Embedded)
- g) We should obey our parents. (Tag)

8.75

3. **Use appropriate modals where needed:**

- a) I _____ run a mile in 8 minutes. (possibility)
- b) You _____ try some of this spaghetti. (opinion/suggestion)
- c) Do you think it _____ rain today? (possibility/wish)
- d) Tasmim _____ be more punctual. (advice/suggestion)
- e) You _____ see a doctor. (advice)
- f) _____ I look at the questions now? (permission)
- g) Touhid _____ take his medicine three times a day. (obligation)

8.75

4. **Make sentences with the following phrases and idioms:**

- | | |
|----------------------------|-------------------|
| a) Beat around the bush | d) Cry wolf |
| b) Penny for your thoughts | e) Dead ringer |
| c) A dumb squib | f) Heat the books |

Group-B

5. Write short notes on the following:

- a) Dark web
- b) Cryptocurrency

8.75

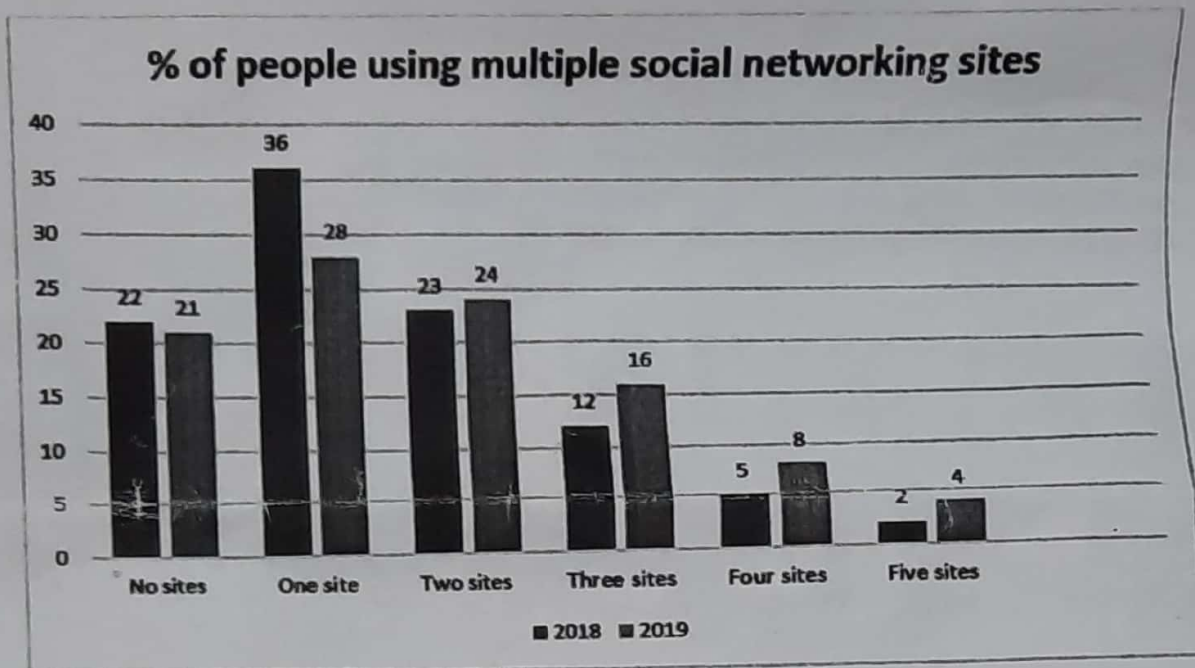
6. Write a paragraph on any of the following:

- a) Programming Language
- b) Technologies in Education

8.75

7. The chart below gives information about the number of social networking sites people used in Canada in 2018 and 2019.

8.75



Summarize the information by selecting and reporting the main features, and make comparisons where relevant.

8. ABC company has recently introduced a policy of subsidizing 50% of the tuition fee of employees' children. Write a memo for announcing this policy.

8.75

[Answer any *three* questions from each of the *Group-A* and *Group-B*. Separate answer script must be used for Group-A and Group-B. Figures in the right-hand margin indicate full marks.]

Group-A

- (a) Define data structure. Illustrate the steps of data structure. 1.5+2
3
- (b) Classify data structure with figure. 2.5
- (c) What do you mean by field, record, and file?
- (a) Define the following terms: graphs, multigraphs, strongly connected graphs, and unilaterally connected graphs. 2
- (b) Consider the directed graph G in Fig. 2.1. (i) Find all the simple paths from X to Z. (ii) Find all the simple paths from Y to Z. (iii) Find in-deg(Y) and out-deg(Y). (iv) Are there any sources or sinks? 2

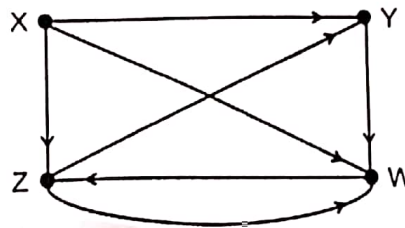


Fig. 2.1

- (c) Write down breadth-first search and depth-first search algorithms. 2.5
- (d) Consider the following graph G in Fig. 2.2. Suppose G represents the daily flights between cities of some airline, and suppose we want to fly from city A to city J with the minimum number of stops. Find out the minimum path P from A to J where each edge has length 1. 2.5

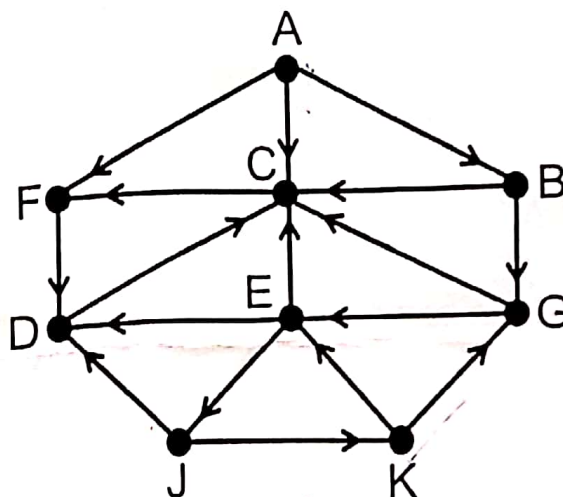


Fig. 2.2 Graph, G

3. (a) Briefly describe the notations of (i) the complexity of an algorithm and (ii) the space-time tradeoff of algorithms. 2
- (b) Suppose a data set S contains n elements. Compare the running time T_1 of the linear search algorithm with the running time T_2 of the binary search algorithm when (i) $n = 1000$ and (ii) $n = 10000$. 2
- (c) Write short notes on merge-sort and radix sort. Suppose 9 cards are punched as follows: 2.5
348, 143, 361, 423, 538, 128, 321, 543, 366
Arrange the 9 numbers in ascending order using the radix sort algorithm.
- (d) What is hashing? Consider the following 4-digit employee number: 2.5
9614, 5882, 6713, 4409, 1825
Find the 2-digit hash address of each number using (i) Division method, with $m = 97$; (ii) Midsquare method; and (iii) Folding method.
4. (a) Write down the procedures to implement PUSH and POP operations in stack. Suppose a given space S of N contiguous memory cells is allocated to $K = 6$ stacks. Describe ways that the stacks may be maintained in S . Explain which technique is more effective to minimize overflow in stacks. 2
- (b) Write short notes on Towers of Hanoi. Illustrate the solution to the Towers of Hanoi problem for $n = 3$. 2
- (c) Write short notes on (i) Queues, (ii) Deques and (iii) Priority queues. 2.25
- (d) Suppose S is the following list of 14 alphabetic characters: 1.5
D A T A S T R U C T U R E S
Suppose the characters in S are to be sorted alphabetically. Use the quicksort algorithm to find the final position of the first character D.
- (e) Suppose S consists of the following $n = 5$ letters: 1.25
A B C D E
Find the number C of comparisons to sort S using quicksort. What general conclusion can one make, if any?

Group-B

5. (a) Define and explain the bubble sort. 3
- (b) Write down the bubble sort algorithm. 3
- (c) Suppose the following numbers are sorted in an array A : 3
32, 51, 27, 85, 66, 23, 13, 57
Apply the bubble sort algorithm to sort the array.

6. (a) Write short notes on the following terms and draw the relevant figures: 2.5
 (i) Garbage collection, (ii) Header linked lists, (iii) Two-way circular header lists.
- (b) Let $p(x)$ denote the following polynomial in one variable (containing four nonzero terms): 1.5

$$p(x) = 2x^8 - 5x^7 - 3x^2 + 4$$

 Represent $p(x)$ using the header link list.
- (c) Describe traversing a link list with necessary algorithm and example. 1.5
- (d) Let LIST be a linked list in memory. Write a procedure which 1.5
 (i) Finds the number NUM of times a given ITEM occurs in LIST
 (ii) Finds the number NUM of nonzero elements in LIST
 (iii) Adds a given value K to each element in LIST
- (e) Describe deletion from a linked list with necessary example. 2
7. (a) Write down the binary search algorithm. Modify the binary search algorithm, so that it becomes a search and insertion algorithm. 3
- (b) Define data items, entity, primary key, and data structure. Give a brief description of traversing, sorting, searching, deleting and inserting. 2
- (c) Find $371 \pmod{8}$, $-371 \pmod{8}$. What are the similarities and dissimilarities between function subalgorithms and procedure subalgorithms? Explain with necessary examples. 2
- (d) The daily flights of an airline company appear in Fig 7.1. CITY lists the cities, and ORIG[K] and DEST[K] denote the cities of the origin and destination, respectively, of the flight NUMBER[K]. Draw the corresponding directed graph of the data. 2

CITY	
1	Chattogram
2	Barishal
3	Dhaka
4	Khulna
5	Rajshahi

(a)

	NUMBER	ORIG	DEST
1	701	2 ✓	3
2	702	3 /	2
3	705	5	3
4	708	3 /	4 ✓
5	711	2 /	5
6	712	5	2
7	713	5	1
8	715	1 ✓	4
9	717	5 ✓	4 /
10	718	4 /	5

(b)

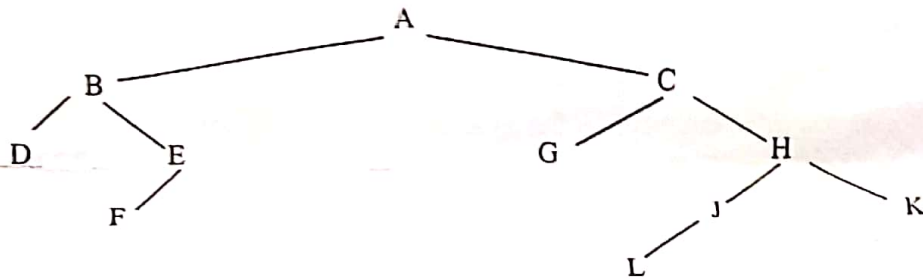
Fig. 7.1

8. (a) Suppose the following eight numbers are inserted in order into an empty binary search tree T:

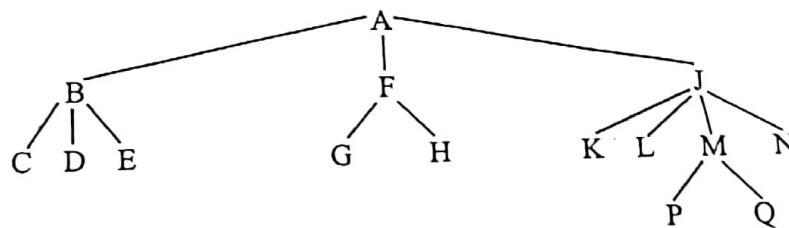
50, 33, 44, 22, 77, 35, 60, 40

Draw the tree T.

- (b) What is the divide-and-conquer algorithm? Write a recursive procedure to calculate $N!$.
- (c) What is the threaded tree? Discuss inorder threading using the following binary tree T



- (d) Compare binary tree and general tree. Consider the general tree T



- (i) Find the corresponding binary T' .
- (ii) Find the preorder, inorder and postorder traversals of T' .

Binary search and insert
 Bubble sort
 Large value
 Linear
 Linked list
 Quicksort
 Tower of Hanoi
 Bfs
 Dfs
 mergesort