

Khulna University of Engineering & Technology  
B. Sc. Engineering 2<sup>nd</sup> year 1<sup>st</sup> Term (Regular) Examination, 2017  
Department of Electrical and Electronic Engineering  
CSE 2131

Data Structures and Algorithms

Time: 3 hours

Full Marks: 210

- N.B.: (i) Answer **ANY THREE** questions from each section in separate scripts.  
(ii) Figures in the right margin indicate full marks.

**Section A**

- Q1. (a) Define machine language, assembly language and high level language with example. (08)  
(b) Define Object Oriented Programming (OOP). Write down the characteristics of OOP and structured programming. (09)  
(c) What is the significance of 'typedef' and 'enum' keyword? Explain with example. (07)  
(d) Write a program in C++ to show different types of parameter passing methods. (11)
- Q2. (a) What is an inline function? When does an inline function do not work? Explain with example. (10)  
(b) What are the properties of a static member? Give a coding example where static member variable is necessary. (12)  
(c) What are the special characteristics of a friend function? Create two classes EEE and CSE having one private member X and Y of type string, respectively. Write a friend function "Exchange (...)" to exchange the values of the member of between two classes. (13)
- Q3. (a) What is the purpose of using constructor? List some of the special features of constructors. (10)  
(b) Write down the differences between private and protected access modifier. (06)  
(c) What are the purposes of function overloading? Explain with example. (10)  
(d) Write a program in C++ to show the scopes of variables. (09)
- Q4. (a) While overloading an operator using non-member function; is it mandatory to make that function a friend function? If so, explain why. (10)  
(b) What is inheritance? Write down the benefits of using inheritance? (08)  
(c) Write down the difference between private and public access modifier. Explain with example and necessary code. (12)  
(d) Which components of a base class do not get inherited by a derive class and why? (05)

**Section B**

- Q5. (a) Define data structure. What are the commonly used operations in a data structure? Describe them briefly. (10)  
(b) Define algorithm. What is "complexity of algorithm"? Write down the importance of calculating "complexity of algorithm". (08)  
(c) What is array and linked list? Describe the trade-off between array and linked list. (10)  
(d) Suppose you have the following sequence of data: M, N, O, Q, R. Show the array representation of data. Then insert 'P' in the array so that the alphabetic order is maintained. (07)

- Q6. (a) “Does binary search work on sorted linked list”? Explain your answer if you say “yes” or give a counter logic if you say “no”. (07)
- (b) Apply bubble sort algorithm to sort the following data in descending order. (14)  
Show all steps:  
11, 20, 15, 40, 25, 18
- (c) Consider the following memory representation of linked list: (14)

	Info	Link
1	A	2
2	B	8
3		6
4	C	7
5	D	NULL
6		NULL
7	E	1
8	F	5

Start = 4  
Avail = 3

Fig. for Q.6(c)

- Now, (i) Find the sequence of characters in the list.  
(ii) Redraw it after deleting ‘F’.  
(iii) Then insert ‘G’ at the beginning of the list.  
(iv) Then delete ‘C’ from the list.  
(v) Then transverse the list.

- Q7. (a) Differentiate between stack and Queue. (04)
- (b) Convert the following infix expression to postfix:  $7 - (2 * 3 + 5) * (8 - 4/2)$  (12)  
Then evaluate the postfix expression.
- (c) Consider the following circular Queue: (12)

		D	E	
1	2	3	4	5

Now redraw the Queue as each of the following operations take place. Also show the “front” and “rear” value in each case:

- (i) ‘F’ inserted (ii) ‘D’ deleted (iii) ‘G’ inserted (iv) ‘H’ inserted (v) ‘E’ deleted
- (d) Define priority Queue. Show the linked list representation of priority queue. (07)
- Q8. (a) What do you mean by heap and heap property? (07)
- (b) The Pre-order and In-order of T yield the following sequences of nodes. (13)  
Pre-order: 30, 20, 10, 12, 40, 37, 45  
In-order: 10, 12, 20, 30, 37, 40, 45  
Draw the tree diagram.
- (c) Construct a max-heap H from the following list of numbers: (15)  
34, 30, 40, 22, 50, 2, 55, 77, 55, and  
(i) Insert another item 70 into constructed heap.  
(ii) Then delete the number 22 for reheaping it.  
What are the correct steps in both cases. Explain.

Khulna University of Engineering & Technology  
 B. Sc. Engineering 2<sup>nd</sup> year 1<sup>st</sup> Term (Regular) Examination, 2017  
 Department of Electrical and Electronic Engineering  
 IEM 2103  
 Industrial Management

Time: 3 hours

Full Marks: 210

- N.B.: (i) Answer **ANY THREE** questions from each section in separate scripts.  
 (ii) Figures in the right margin indicate full marks.

**Section A**

- Q1. (a) Define management. Briefly explain about the fundamental functions of management. (12)  
 (b) How does committee structure improve interpersonal relations among the departments? (10)  
 (c) What are the merits and limitations of committee? What should a manager do to improve the effectiveness of the functioning of committees? (13)
- Q2. (a) Discuss the relationship between management and administration. (10)  
 (b) What is the meaning of span of management? Is there a numerical limit to the span of management? (08)  
 (c) Discuss the nature and objectives of delegation. How can delegation be made more effective? (12)  
 (d) What is authority? Why do people accept authority? (05)
- Q3. (a) What is Computer Aided Process Planning (CAPP)? Explain in brief about the various steps for the development of a process plan. (15)  
 (b) What is wage? Differentiate wages from incentives. (05)  
 (c) Pepsi company produces a single article. Following cost data is given about its product. (15)

Table Q.3(c)

Selling price per unit	50 TK
Marginal cost per unit	35 TK
Fixed cost per unit	24000 TK

Calculate: (i) P/V ratio, (ii) Break even sales, (iii) Sales to earn a profit of 3000 TK, (iv) Profit at sales of 80000 TK and (v) New break-even sales, if selling price is reduced by 10%.

- Q4. (a) Discuss ‘Maslow’s Need Hierarchy Theory’ of motivation. How can a manager use this theory for motivating his employees? (10)  
 (b) Money holds the key to motivation in modern business organization. Discuss. (07)  
 (c) Define leader and leadership. What are the characteristics of Laissez-Faire leadership? (10)  
 (d) What type of wage system is preferable for an automated manufacturing industry? Why? (08)

**Section B**

- Q5. (a) “Production is a value addition process”. Comment on the statement with an example. (07)  
 (b) Differentiate between operations management and production management. (06)  
 (c) A firm believes that its annual profit depends on its expenditures for research. The information for the preceding six years is given below. Estimate the profit when the expenditure is 8 units. (15)

Table Q.5(c)

Year	Expenditure for Research	Annual Profit
1997	3	22
1998	4	27
1999	6	36
2000	5	32
2001	12	45
2002	7	36
2003	8	?

- (d) “Inventory is used as a tool for separating or decoupling operation” –Justify this statement. (07)
- Q6. (a) What are the basic requirements for managing inventory effectively? (05)

- (b) What is meant by quantity discounts? Surge Electric uses 4,000 toggle switches a year. Switches are priced as follows: 1 to 499, 90 cents each; 500 to 999, 85 cents each; and 1,000 or more, 80 cents each. It costs approximately \$30 to prepare an order and receive it, and carrying costs are 40 percent of purchase price per unit on an annual basis. Determine the optimal order quantity and total annual cost (15)
- (c) The product structure tree for end item E follows: The manager wants to know the material requirements for ordered part R that will be needed to complete 120 units of E by the starts of week 5. Lead times are one week for level 0 items, one week for level 1 items and two weeks for level 2 items. There is a schedule receipt of 60 units of M at the end of week 1 and 100 units of R at the start of week 1. Lot-for-lot ordering is used. (15)

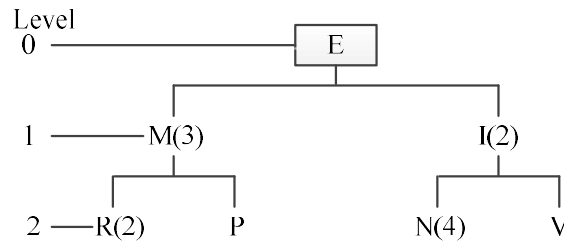


Fig. for Q.6(c)

- Q7. (a) Write short notes on level capacity strategy and chase demand strategy that are used in aggregate planning. (06)
- (b) A manager is attempting to put together an aggregate plan for the coming nine months. She has obtained a forecast of expected demand for the planning horizon. The forecasted values are given below. (15)

Table Q.7(b)

Period	1	2	3	4	5	6	7	8	9	Total
Forecast	190	230	260	280	210	170	160	260	180	1940

The department has now 20 full time employees, each of whom can produce 10 units of output per period. The manager is considering a plan that involves hiring two people to start working in period 1, one on a temporary basis who would work only through period 5. Make a production plan for this strategy.

- (c) Define scheduling. Processing times (including setup times) and due dates for six jobs waiting to be processed at a work center are given in the following table. Determine the sequence of the jobs, the average flow time, average tardiness and average number of jobs at the work center for the following rules. (14)
- (i) SPT (ii) EDD

Table Q.7(c)

Job	Processing Time (Days)	Due date (days)
A	2	7
B	8	16
C	4	4
D	10	17
E	5	15
F	12	18

- Q8. (a) Define the following term- (09)
- (i) Network diagram, (ii) Critical path and (iii) Slack
- (b) The network diagram for a project is shown in the accompanying figure, with the three time estimates for each activity. Activity times are in weeks. Do the followings: (14)
- (i) Compute the expected time for each activity and expected duration for each path.
- (ii) Identify the critical path.

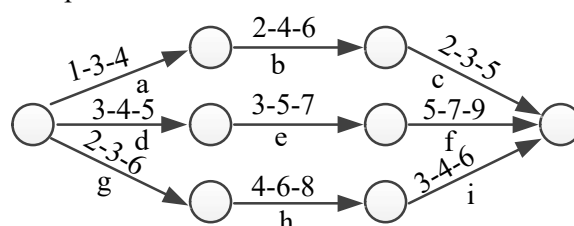


Fig for Q.8(b)

- (c) Write short notes on the following term. (12)
- (i) Organizational conflict, (ii) Maintenance management and (iii) Plan layout

Khulna University of Engineering & Technology  
 B. Sc. Engineering 2<sup>nd</sup> year 1<sup>st</sup> Term (Regular) Examination, 2017  
 Department of Electrical and Electronic Engineering  
 Math 2103

Mathematics III

Time: 3 hours

Full Marks: 210

- N.B.: (i) Answer **ANY THREE** questions from each section in separate scripts.  
 (ii) Figures in the right margin indicate full marks.

**Section A**

- Q1. (a) The position vector of a particle at time  $t$  is  $\underline{r} = \cos(t - 1)\underline{i} + \sinh(t - 1)\underline{j} + at^3\underline{k}$ . Find the condition imposed on  $a$  by requiring that at time  $t = 1$ , the acceleration is normal to the position vector. (10)
- (b) Find the directional derivative of  $f(x, y, z) = x^2y^2z^2$  at the point  $(1, 1, -1)$  in the direction of the tangent to the curve  $x = e^t, y = 2 \sin t + 1, z = t - \cos t$  at  $t = 0$ . (11)
- (c) Evaluate  $\nabla \cdot \frac{\underline{r}}{r}$  and  $\nabla \times \frac{\underline{r}}{r}$ . (14)
- Q2. (a) Test whether the force field  $\underline{F} = (2xy + z^3)\underline{i} + x^2\underline{j} + 3xz^2\underline{k}$  is conservative or not. If  $\underline{F}$  is conservative, then find the scalar potential and then determine the work done in moving an object in this field from point  $(1, -2, 1)$  to  $(3, 1, 4)$ . (12)
- (b) Evaluate  $\int_S \underline{A} \cdot \underline{n} \, ds$ , where  $\underline{A} = 18z\underline{i} - 12\underline{j} + 3y\underline{k}$  and  $S$  is that part of the plane  $2x + 3y + 6z = 12$  which is located in the first octant. (13)
- (c) If  $\underline{F} = (2x^2 - 3z)\underline{i} - 2xy\underline{j} - 4x\underline{k}$ , then evaluate  $\int \int \int \nabla \cdot \underline{F} \, dv$ , where  $v$  is the enclosed region bounded by the planes  $x = 0, y = 0, z = 0$  and  $2x + 2y + z = 4$ . (10)
- Q3. (a) Express Green's theorem in the plane in vector notation. Evaluate  $\oint_c (3x + 4y)dx + (2x - 3y)dy$  by using Green's theorem, where  $c$  is a circle of radius two with centre at the origin of the  $xy$ - plane, is traversed in the positive sense. (15)
- (b) Express the divergence theorem in words and write it in rectangular form. (08)
- (c) Use the divergence theorem to evaluate  $\int_S \underline{A} \cdot \underline{n} \, ds$  where  $\underline{A} = 4x\underline{i} - 2y^2\underline{j} + z^2\underline{k}$  taken over the region bounded by  $x^2 + y^2 = 4, z = 0$  and  $z = 3$ . (12)
- Q4. (a) Prove that  $xJ'_n(x) = nJ_n(x) - xJ_{n+1}(x)$ , where  $J_n(x)$  represents the Bessels's functions of the first kind of order  $n$ . (12)
- (b) Express  $J_4(x)$  in terms of  $J_0(x)$  and  $J_1(x)$ . (10)
- (c) Express  $2xi + yj - zk$  in orthogonal curvilinear coordinates system. (13)

**Section B**

- Q5. (a) Discuss with example those arithmetic operations and rules in matrices which are different from the arithmetic operations and rules in real numbers. (13)
- (b) Write any  $3 \times 3$  matrix (which is not null and identity matrix) and reduce it as a sum of symmetric and skew symmetric matrices. (12)
- (c) Prove that  $A \cdot adj A = |A| \cdot I$ . Hence, find  $|A \cdot adj A|$ ; where  $A$  be a square matrix. (10)

- Q6. (a) Reduce the following matrix to its echelon form, canonical form, and finally normal form. Hence, find its rank, where (19)

$$A = \begin{bmatrix} 0 & -4 & 1 & -2 \\ 1 & 2 & 1 & 1 \\ 2 & 0 & 1 & 0 \end{bmatrix}$$

If each row of matrix  $A$  be the vectors  $X, Y$  and  $Z$ , respectively. Are the vectors linearly independent, why? If possible express the vectors as a linear combination.

- (b) What is meant by the invertible matrix? What is the necessary and sufficient condition for existence of inverse of a matrix? Test whether the following matrix  $A$  is invertible or not? If yes, then find  $A^{-1}$ , where (16)

$$A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 3 & 4 \\ 1 & 4 & 3 \end{pmatrix}.$$

Given that  $AX = H, H = [1 \ 0 \ 1]^t$ , then find the value of  $X$ .

- Q7. (a) Given that  $2x - y + 3z = 0, 3x + 2y + z = 0, x - 4y + 5z = 0$ . If  $A$  be the coefficient matrix of the above system of linear equation i.e  $AX = 0, X =$  (18)

$[x, y, z]^t$  and  $B = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$  be the transition matrix, then find the solution

of the new system of linear equation  $(BA)X = 0$ . Hence find the nullity and basis of the null space. Also sketch the solution.

- (b) Find the eigen values and eigen vectors corresponded to the largest eigen values of  $A$ . Also find the eigen values of  $A^{10}$  and  $A^{-1}$  by using properties; where (10)
- $$A = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}.$$

- (c) Using Cayley-Hamilton theorem find  $A^2$  and  $A^{-2}$  (if possible), (07)
- where  $A = \begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$ .

- Q8. (a) Define regular singular point. When do you need Frobenius method to solve Ordinary Differential Equation (ODE)? Briefly write down the main steps of Frobenius method to solve ODE. (12)

- (b) Using Rodrigue's for formula find  $P_2(x)$  and then find  $P_2(-1), P_2(0)$  and  $P_2(1)$ . Finally sketch a rough figure of  $P_2(x)$ . (10)

- (c) Write down the Fourier-Legendre expression. Hence expand the following function. (13)

$$f(x) = \begin{cases} 0 & \text{when } -1 \leq x \leq 0 \\ 1 & \text{when } 0 \leq x \leq 1 \end{cases}$$