

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

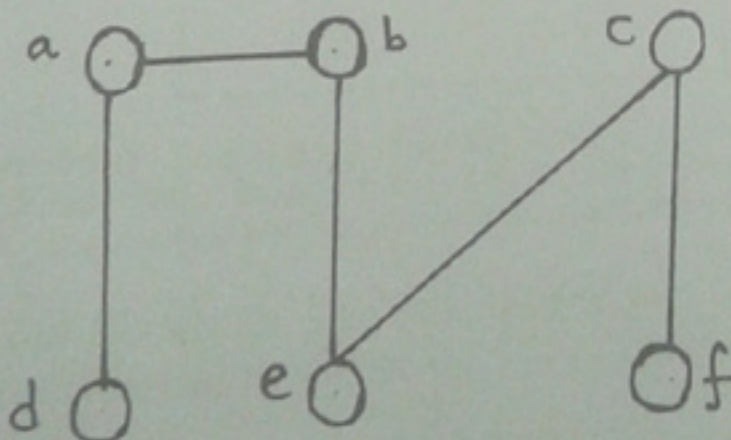
Answers may be given either in English or in Bengali but all answers must be in one and the same language.

Answer any five questions

1. (a) Minimize the following using Karnaugh Map
 - i) $F(A,B,C,D) = \prod m(0,1,3,8,10,15) + \prod d(11,13,14)$
 - ii) $F(A,B,C,D) = \sum m(0,1,2,5,8,14) + \sum d(4,10,13)$
 - (b) Find the minimal sum-of-products form of the following F :
 $F(A,B,C,D) = A.B + \bar{A}BC + \bar{A}B\bar{C}D$
 - (c) Calculate the base of a number system such that the following equation is true :

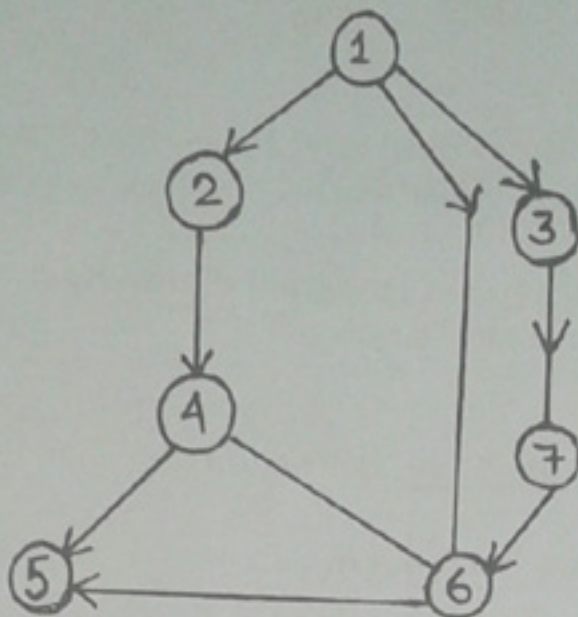
$$\frac{417}{20} = 21.1$$
 - (d) Perform the arithmetic operation $(-25)_{10} + (-15)_{10}$ in sign 2's complement method.
 - (e) Find out the 6's complement of $(1256)_7$. 8+8+8+8+8
2. (a) What is a complete binary tree ? Illustrate.
 - (b) A two-dimensional array $A[6][8]$ is stored in row-major order with base address 128. What is the address of $A[3][4]$.
 - (c) Which sorting algorithm is best if the list is already sorted ? Why ?
 - (d) What is expression tree ? Represent the following expression using a tree. Comment on the result that you get when the tree is transed in preorder, inorder and postorder :

$$(a-b) / ((c*d) + e)$$
 10x4
3. (a) What is a complete graph ? Show that the sum of degrees of all the vertices in a graph is always even.
 - (b) Explain the operation of Breadth-first search on an undirected graph given below taking vertex 'b' as source :



P.T.O.

(c) For the following graph in figure below find 'adjacency matrix'.



(d) Give a recursive procedure/function to search for an element in an array using binary search.

(e) Sort the following sequence of keys using merge sort :
66, 77, 11, 88, 99, 22, 33, 44, 55

5+10+5+10+10

4. (a) Solve the following L.P. problem :

Find the minimum value of

$$Z = 3x_1 + 2x_2$$

subject to the constraints

$$2x_1 + x_2 \geq 6$$

$$x_1 + x_2 \geq 4$$

Where $x_1, x_2 \geq 0$

(b) There are two factories located at places 'A' and 'B'. From these locations certain commodity is to be delivered to each of three depots situated at P, Q and R. The weekly requirements of the depots are respectively 5, 5 and 4 units of the commodity and the production capacity of the factories at 'A' and 'B' are 8 and 6 units respectively. The cost of transportation per unit is given below:

From/To	Cost (in Rs.)		
	P	Q	R
A	160	100	150
B	100	120	100

How many units should be transported from each factory to each depot in order that the transportation cost is minimum. What will be the minimum transportation cost ?

20+20

5. (a) Calculate by Simson's One third rule the value of the integral $\int_0^1 \frac{x dx}{1+x}$ corrected up to three significant figures.

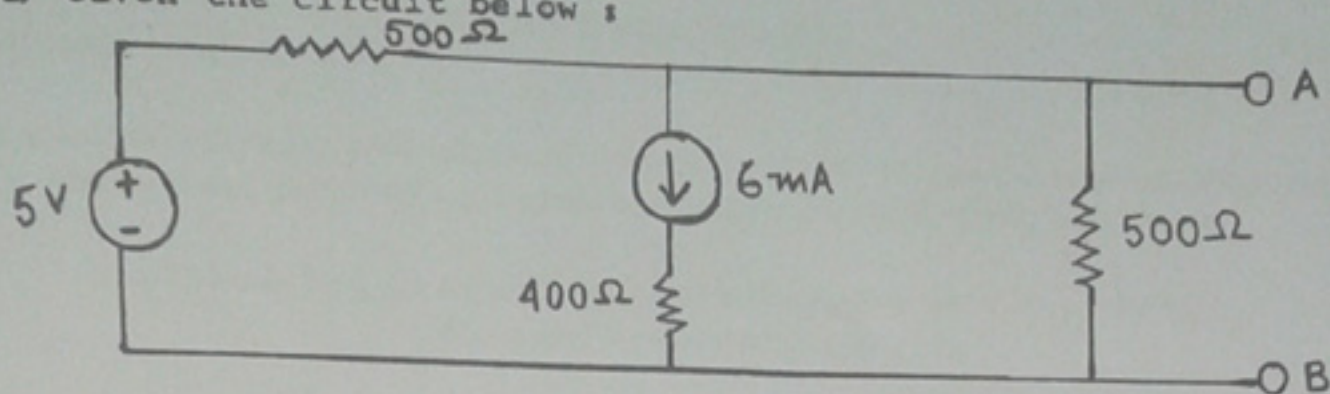
(b) Find the inverse of the following matrix using Gauss Elimination method :

$$\begin{pmatrix} 1 & 2 & 6 \\ 2 & 5 & 15 \\ 6 & 15 & 46 \end{pmatrix}$$

20+20

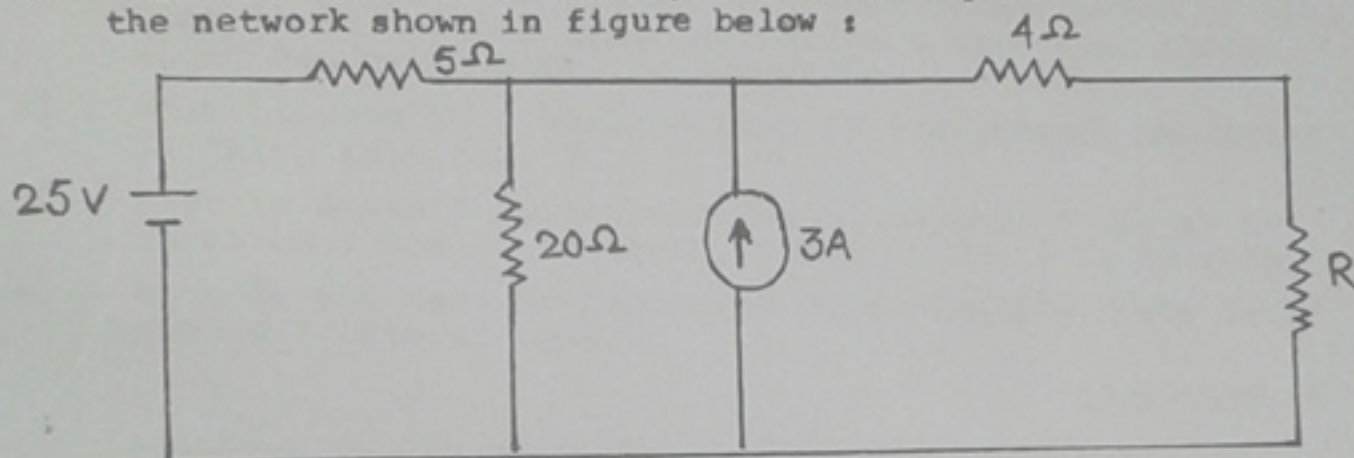
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6. (a) Given the circuit below :



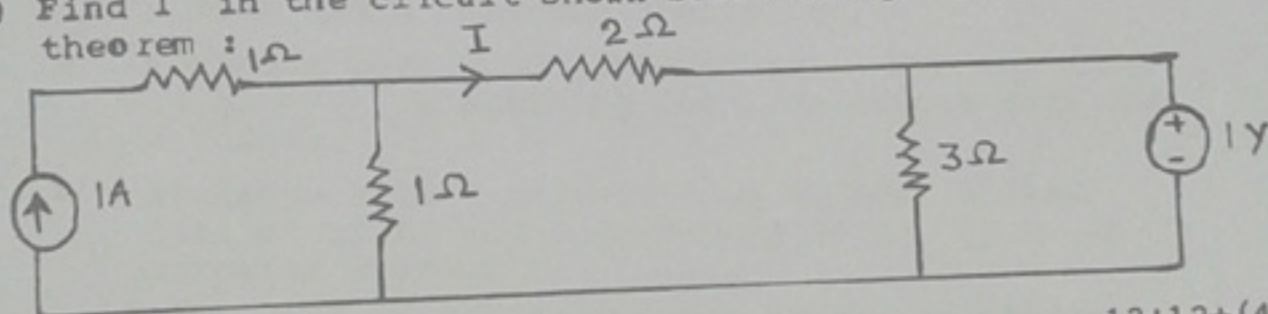
Find the open circuit voltage V_{TH} across terminals A and B of the Thevenin Equivalent Circuit.

(b) Find the value of R (in Ω) for maximum power transfer in the network shown in figure below :



(c) i) State Superposition Theorem.

ii) Find I in the circuit shown below using superposition theorem :



12+12+(4+12)

7. (a) Explain how a network congestion is controlled using slow start algorithm with the help of an illustration.

(b) Explain and illustrate sliding window protocol with window size of 5. How does the scheme improve the efficiency of transmission.

(c) What is parity bit ? Explain how single Error correcting (SEC) Code uses parity bits. If an 8-bit data 10101010 on transission is received as 10111010 then how the SEC Code will detect and correct this error ?

(d) Explain the single precision floating point IEEE 754 representation. Give the number ranges that can be represented by this representation

ii) Convert $(124.32)_{10}$ in IEEE 754 representation.

10x4

8. Write short notes on any four of the following :

i) Frequency Division Multiplexing

ii) Direct Cache Mapping

iii) AVL Tree

iv) Quick sort algorithm and its time complexity

v) Programmed I/O Versus Interrupt driven I/O.

10x4