Department of Computer ...

1st Year 1st Semester Final Examination – **2016**

Course No: **CSE-133** (Structure Programming Language)

Credits : **3.0** Full Marks : **100** Time : **3 Hours**

Answer any five questions from each group

Group A

Q1 a. Write a program which will read the four values corresponding to the x and y axes of two points in the plane, p1 (x1, y1) and p2 (x2, y2) and calculate the distance between them. 5

b. Write a program which will read an integer value, which is the duration in seconds of a certain event in a factory, and inform it expressed in hours:minutes:seconds. 5

Q2 Write a program to print the following pattern where 3<=N<=7: 10

N=4

```
****    ****    ****
*         *       ***
*           *     ***
****    ****    ****
```

Q3 Write a program to calculate the cumulative sum of N integer. You will be given N and in the next line, there will be N numbers. You have to print cumulative sums from 1st to nth number. 10

Input	Output
12 0 8 7 6 1 2 4 -3 -1 11 0 5	0 8 15 21 22 24 28 25 24 35 35 40

Q4 a) Write C function headings for the following functions described. Note that you need write only the headings, not the body. 4

i. *sum_of_digits()* takes a *string* argument and an *int* argument, and returns a *double*.

ii. *random()* takes no argument and returns an *int*.

b) Consider the variable declaration: *double num[10];* 6

i. How many elements does the array have?

ii. What kind of value can be stored in each element?

iii. Which of the following is a correct usage of scanf() with this array?

scanf()"%lf", num[2]); scanf()"%lf", &num[2]); scanf()"%lf", &num);

Q5 a. Write a program that take two integer N and M as input and check if the sum of N^{th} and M^{th} Prime is even or odd? 5

b. Write a program to check where a number is palindromic number or not? [121 is an example] 5

Q6 Write a program to search a value from the Given N numbers using Binary search 10

Input	Output
5 3 0 1 2 3 4 5 6 0 1 2 7 9	Case 1: Yes, Found at 4 position Case 2: No!!!

Q7 a) Determine which of the followings are valid identifiers. If invalid, explain why? 3

i) __ *(two are given)* ii) *$tax* iii) *4t* iv) *while* v) *If* vi) *Abc123xyz*

b) What is wrong with this attempted declaration of a character string? 4

char name[] = {'p', 'r', 'i', 'm', 'i', 'm', 'e'};

c) When should we use pointers in a C program? 3

Q1 a) Differentiate between pass by value and pass by reference. Describe with proper example — 5

b) Write a program that generates first 20 Fibonacci numbers. (Use recursive technique) — 5

Q2 What will be the output of the following programs? — 2*5

```
#include <stdio.h>

int c[10]={11,2,3,4,5,6,7,8,9,110};
main(){
  int a,b=0;
  for(a=0;a<10;++a)
      if ((c[a]%2)==1) b+=c[a];
      printf("%d",b);
}
```

```
#include <stdio.h>

int main(){
  int a[10]={2,5,6,3,4,1,3,7,8,9};
  int i;
  for(i=0;i<10;i++)
      a[i] += (a[i] - i);
  for(i=0;i<10;i++)
      printf("%d\n",a[i]);
return 0;

}
```

Q3 a) Write a program to count total number of letters, digit, and vowels, consonant and print them all in a line separated by space. — 5

b) Write a program which will take two number as a input and calculate the LCM and GCD of those two number. — 5

Example: input 4 6 Output: GCD = 2 and LCM = 12

Q4 a. What will be the output of the following program — 5

```
#include <stdio.h>
main() {
 int n = CALL(2, 3);
 printf("%d",n);
}
```

```
int CALL(int x, int y) {
  if(x <0 || y >5) return 0;
  CALL(x-, y++);
  printf("%d %d",x,y);
  return x;
}
```

b. Write a program to convert a decimal number to a binary number — 5

Q5 a) Answer the following questions? — 6

i. Can a program be compiled without main() function?
ii. Can we assign a float variable to a long integer variable?
iii. What is an infinite loop?
iv. What is typecasting?
v. What is a constant?
vi. What is a unary operator and what are unary operators present in C?

b) Write a program that asks the user to enter the number of days and then converts that value to weeks and days. — 4

For example, it would convert 18 days to 2 weeks, 4 days. Display results in the following format: 18 days are 2 weeks, 4 days.

Q6 a) Write the output of the code block *code-1*: — 5

```
int X[10]={8,5,6,0,4,2,3,7,1,9};

for (int i=0; i<10; i++){
   if(X[i]&1)
       X[i]++;
       X[i] = X[i] * i ;
       printf ("%d %d\n", i , X[i]);
}
```

code -1

```
int main(){
  int i, n = 20;

  for (i = 0; i < n; i--)
     printf("*");

  return 0;
}
```

code -2

b) Change/add only one character and print '*' exactly 20 times for the code block *code-2*. — 5

Q7 a) Write a program to reverse a string. — 4

b) Which of the following "for" loops declaration in C is valid and why? — 6

i. for (i < 10; i = 0; i++)
ii. for (i < 10; i++; i = 0)
iii. for (i = 0; i < 10; i++)
iv. for (i = 0; i++; i < 10)
v. for (i++; i = 0; i < 10)
vi. for (i++; i < 0; i = 10)

(c) State Green's theorem in the plane. Verify Green's theorem in the plane $\oint_C (2xy - x^2)dx + (x + y^2)dy$, where C is the closed curve of the region bounded by $y = x^2$ and $x = y^2$. 6

7. (a) Transform the equation $11x^2 + 24xy + 4y^2 - 20x - 40y - 5 = 0$ to rectangular axes through the point $(2, -1)$ and inclined at angle $\tan^{-1}(4/3)$. 5

(b) Find the condition that the general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ may represent a pair of straight lines. 4

(c) Show that the equation $2x^2 - 2xy + x + 2y - 3 = 0$ represents a pair of straight lines. Also find their point of intersection and the angle between them. 5

8. (a) Define direction cosines of a line. Find the direction cosines of the line which is equally inclined to the axes. 3

(b) Find the equation of the plane through the points $(2, 2, 1)$ and $(9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z = 9$. 5

(c) Find the equations of the line perpendicular to both line $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z+2}{3}$, $\frac{x+2}{2} = \frac{y-5}{-1} = \frac{z+3}{2}$ and passing through their intersection. 6

Subject: Mathematics; Course Code: MAT 102D
Credit: 3.0; Course Title: Matrices, Vector Analysis and Geometry

Time: 03 hours | Full Marks: 70

Answer FIVE questions taking at least TWO from each group.

Group A

1. (a) If A and B are orthogonal matrices, each of order n, then show that the matrices AB and BA are also orthogonal. 4

   (b) Show that every square matrix can be uniquely expressed as the sum of a symmetric matrix and a skew-symmetric matrix. 5

   (c) Solve the following system of linear equations by using matrix inversion method: 5

$$2x - 3y + 4z = 1,$$
$$3x + 4y - 5z = 10,$$
$$5x - 7y + 2z = 3.$$

2. (a) For what values of λ and μ the following system of linear equations has (i) no solution, (ii) more than one solution, (iii) a unique solution: 5

$$x + y + z = 6,$$
$$x + 2y + 3z = 10,$$
$$x + 2y + \lambda z = \mu.$$

   (b) Define rank of a matrix. Find rank of the matrix $A = \begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ 2 & 3 & 2 & 5 \end{bmatrix}$. 4

   (c) Determine whether the vectors $u_1 = (1, \frac{1}{2}, \frac{1}{4}), u_2 = (-2, -4, -8), u_3 = (3, 9, 27)$ generate $\mathbb{R}^3$. 5

3. (a) Define eigenvalues and eigenvectors of a matrix. Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$. 8

   (b) Using Cayley-Hamilton theorem find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 3 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$. 6

4. (a) Define dot product and cross product of two vectors. Find the projection of the vector $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$ on the vector $\vec{B} = \hat{i} + 2\hat{j} + 2\hat{k}$. 4

   (b) A particle moves along the curve $x = 2t^2, y = t^2 - 4t, z = -t - 5$, where t is the time. Find the components of its velocity and acceleration at time $t = 1$ in the direction $\hat{i} - 2\hat{j} + 2\hat{k}$. 6

   (c) Suppose $\nabla\Psi = (y^2 - 2xyz^3)\hat{i} + (3 + 2xy - x^3z^3)\hat{j} + (6z^3 - 3x^2yz^2)\hat{k}$. Find Ψ. 4

Group B

5. (a) Define gradient of a scalar function, divergence and curl of a vector function. Find the unit normal vector to the surface $\emptyset(x, y, z) = y^2 - 3yz^2 - 3xz^3 = -2$ at the point $(0, 1, -1)$. 6

   (b) If $\vec{A} = (3x^2 + 6y)\hat{i} - 14yz\hat{j} + 20z^2\hat{k}$, evaluate $\int_C \vec{A}.d\vec{r}$ from $(0,0,0)$ to $(1,1,1)$ along the following path C: (i) $x = t, y = t^2, z = t^3$ (ii) the straight line joining $(0,0,0)$ and $(1,1,1)$. 5

   (c) Show that $\vec{\nabla}r^n = nr^{n-2}\vec{r}$, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$. 3

6. (a) Show that the vector $\vec{r} = (6xy + z^3)\hat{i} + (3x^3 - z)\hat{j} + (3xz^2 - y)\hat{k}$ is not solenoidal. 3

   (b) If $\vec{F} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$, evaluate $\iint_S \vec{F}.\hat{n}dS$, where S is the surface of the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. 5

1. Answer any fifteen questions in one line or less. [15x1]

(a) Write the truth table of $p \oplus q$.
(b) If N(x)= "x is the new kid"; A(x, y) = "x is afraid of y"; and Domain x is SUST students. Translate the following quantifiers in English: N(Gullu) $\wedge \forall x$ A(x, Gullu);
(c) Find truth value of P(1) and P(-1) If P(x) is $x = x^2$, domain is all integer.
(d)What are relative prime numbers?
(e) How many primes are in between 10000 and 100000?
(f) $2^{61} - 1$ is a Mersenne prime. Write the prime number in binary number system.
(g) True or False? $23 \equiv 16 \bmod 7$;
(h) Arrange the following function as increasing complexity: log n, n log n, b^n, n!, constant, n^b
(i) Is the relation R ={(1,1), (1,2), (1,3), (1,4), (2,2), (2,3), (2,4), (3,3), (3,4), (4,4)} symmetric or anti-symmetric?
(j) Find the value of $\lfloor 1/2 + \lceil 3/2 \rceil \rfloor . \lfloor 1/2 . \lfloor 7/2 \rfloor \rfloor$
(k)Find if the function f(a) = b, f(b) = c, f(c) = d, f(d) = a from {a, b, c, d} to it self is one to one, onto, both one to one and onto or none.
(l) Define Θ if f(x) is O(g(x)) and f(x) is Ω(g(x)).
(m) Find the generating function if $a_k = \frac{1}{k!}$;
(n) What is the chromatic number of a Bipartite graph.
(o) True or False: Two graphs are isomorphic if they have same number of vertices, edges and degrees.
(p) A tree traversed in pre-order, in-order and post-order are ABC, BAC and BCA, draw the tree.
(q) What are the operations of Boolean Algebra?
(r) Draw the circuit X.Y + Y.Z ;

2. Answer any three questions. [3x5]

(a) Proof that: for $n \geq 1$, $2 + 2^2+2^3+2^4+\ldots\ldots+2^n = 2^{n+1}-2$.

(b) Show that the Tower of Hanoi problem can be solved in $2^n - 1$ moves.

(c) Generate pseudo-random numbers using $x_{n+1} = (ax_n + c) \bmod m$ where $a = 7$, $c = 4$ and $x_0 = 3$. Find a suitable m which will generate a reasonably long sequence.

(d) Write the adjacency matrix of the given graph (Fig. 1). Using this adjacency matrix find the total number of paths of length 1, 2, 3 and 4 between a to c and a to d.

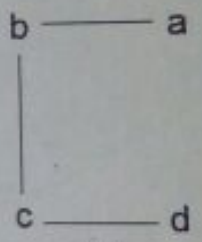


Fig.1

3. Answer any two questions. [2x10]

(a) Find Minimum Spanning Tree from the following graph (Fig. 2) using Kruskel's algorithm . Use Prim's algorithm to find a minimal spanning tree different from the previous one, if exists.

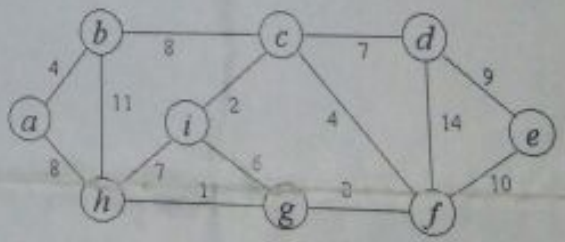


Fig.2

(b) Express the mathematical expression $\sqrt{\left(\frac{x}{2}+1\right)^2 + (2 \times y - 1)^2}$ in a binary tree using leaves as variables and internal vertices as operators using only 5 operations, +, -, *, / and ↑ Traverse the tree in pre-order, in-order and post order. Evaluate the value using pre-order, in-order and post-order traversal for $x = 6$ and $y = 2$ showing each step.

(c) Design a digital circuit which will produce HIGH output only when the prime numbers from 0 to 9 are applied using four inputs as binary sequence. Follow the following steps: (i) use sum of products for selecting the given numbers between 0 and 9 (ii) Use Karnaugh map for minimizing the sum of products (iii) If possible minimize more using the don't- care terms (iv) draw the circuit using two input gates.

Course Code: CSE 143, Course, Title: Discrete Mathematics
Credit: 03, Full marks: 100, Time: 3 Hours

(Answer every question)

Group A

1. Answer any fifteen questions in one line or less. [15x1]

(a) Is $x + 3 = 2$ a proposition?
(b) If C(x) : "x had coffee" and T(x) : "x had tea" then Express the proposition: "Every student either had coffee or had tea" using proper Quantifier.
(c) Find the truth value of $\exists n(5n = 7n)$ if n is integer.
(d) A, B and C are sets then find $(A - C) \cap (C - B)$.
(e) Express decimal 769 in base 13.
(f) Find LCM of 95256 and 144.
(g)Find GCD of 112651 and 121121.
(h)Find the pseudo random numbers using $x_{n+1} = (7\ x_n + 4) \bmod 8$ for $x_0 = 3$;
(i) Find if the Relation R is Reflective, Symmetric, Anti- Symmetric, Transitive or none.
R = {(2, 1), (3, 1), (3, 2), (4,1), (4,2), (4,3)} ;
(j) Given f(x)= 4x + 2 and g(x)= 3x + 7. Now, find the value of **f o g** and **g o f**.
(k) Determine if the function from Z to Z is one-to-one, onto, both or none: $f(n) = n^2 + 1$;
(l) Find C and k for f(x) is O(x) f(x) = 3x + 7.
(m) What is the sequence of the generating function, $f(x) = \frac{1}{1-ax}$?
(n) A map is drawn with 23 vertices and 79 edges, how many countries are there?
(o) Will you be able to draw the Olympic Symbol without lifting your pen?
(p) What is the difference between a tree and a graph?
(q) Which set of operators are functionally complete in Boolean algebra?
(r) Design an OR gate using only NAND gates.

2. Answer any three questions. [3x5]

(a) $\neg(p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q$ Check if the two statements $p \vee (q \rightarrow r)$ and $(p \vee q) \rightarrow (p \vee r)$ are logically equivalent or not.

(b) Plot the function : $\lceil x/3 \rceil + \lfloor x/3 \rfloor$ for = $-9 < x < 9$;

(c) Find $7^{341} \bmod 679$.

(d) Draw the graph G = (V, E) where the seven vertices are given by V = {AB, BC, BF, CD, CE, DE, EB }. The directed edges are given by E = {between the vertices where end letter of one vertex is same as the start letter of the other vertex}. Does it have Euler circuit? Euler Path? Write all of them.

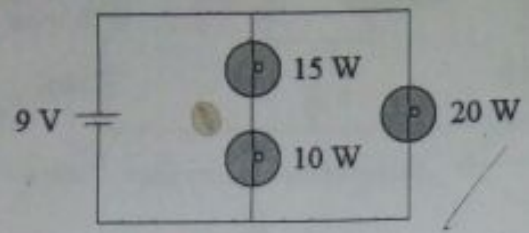
3. Answer any two questions. [2x10]:

(a) Find the solution of the recurrence relation: $a_n = 2a_{n-1} + a_{n-2} - 2a_{n-3}$ if $a_0 = 0$, $a_1 = 1$ and $a_2 = 2$

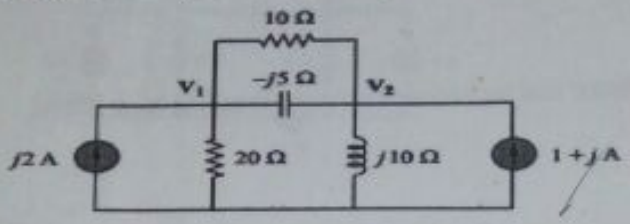
(b) Suppose the letters A, B, D, E, G, H, L, N and S are used 16, 11, 5, 28, 4, 8, 10, 6 and 12 percent of times. (i) Generate prefix codes for these letters using a binary tree using Huffman coding and find out what is written by: 0101110001111110000000110011 (ii) Write BANGLADESH using these codes.

(c) (i) RSA encryption of an integer M is given by $C = M^e \bmod (pq)$ where p, q are prime numbers. If p = 5 and q = 7, Find the smallest e and use that to find C for M=11. (ii) RSA decryption is given by $M = C^d \bmod (pq)$ find d if p = 5, q = 11 and e = 3. If C = 18 decrypt to find M.

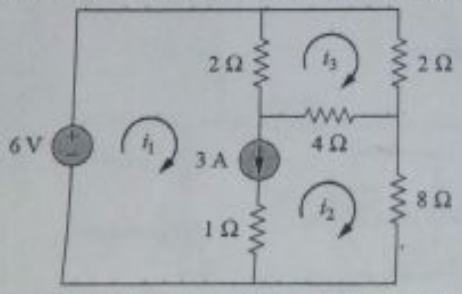
6. (a) Three lightbulbs are connected to a 9-V battery as shown in Fig. 4. Calculate: (a) the total current supplied by the battery, (b) the current through each bulb, (c) the resistance of each bulb.



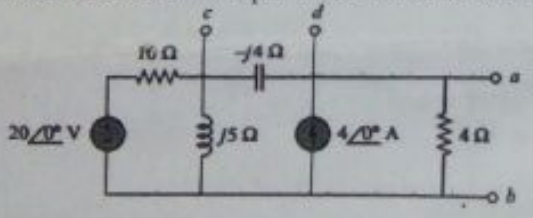
(b) Using nodal analysis find V_1 and V_2 in the circuit.



(c) Use mesh analysis to determine i_1, i_2 and i_3 in the following figure



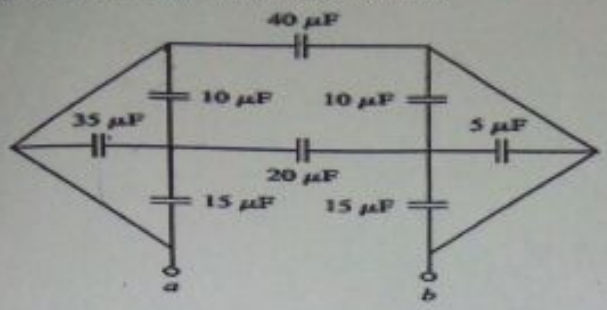
(d) *Find the Thevenin equivalent circuit as seen from a-b.*



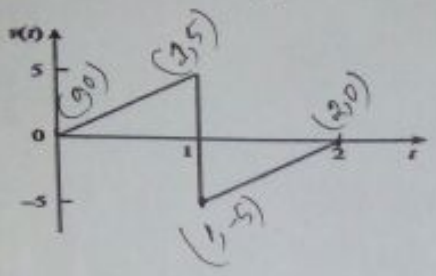
$i(t) = \begin{cases} te^{-5t} \text{ A}, & t > 0 \end{cases}$

Find the voltage v(t).

(c) Find the equivalent capacitance for a-b terminals. 7



(d) If the voltage waveform is applied to a 10mH inductor find the inductor current i(t) and assume i(0)=0. 6



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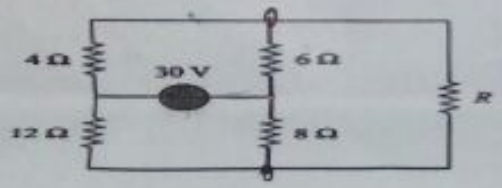
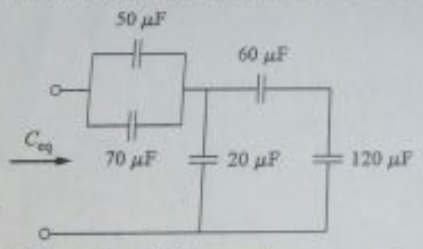
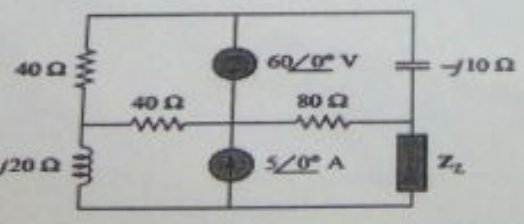
5. (a) For what value of R is the power dissipated in R maximum? Calculate that power. 6



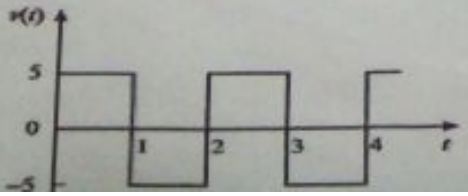
(b) Find the equivalent capacitance seen at the terminals of the following circuit. 6



(c) Find the value of Z_L for maximum power transfer. 7



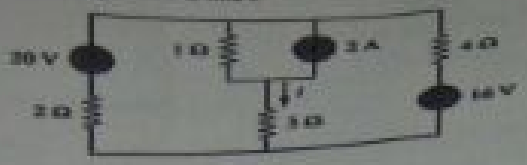
(d) Determine the rms value of the waveform. 6



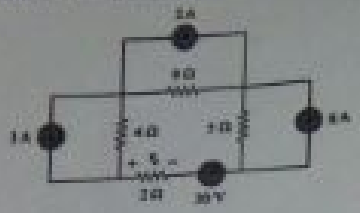
$= \sqrt{\frac{1}{2}\int_0^1 25\,dt + \frac{1}{2}\int_1^2 25\,t}$

$= J$

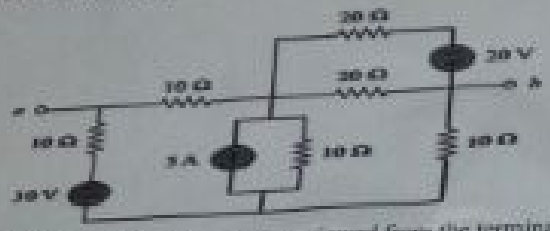
(b) Use superposition to find i.



(c) Obtain V, using source transformation.



3. (a) Find the Thevenin equivalent circuit between the terminals a and b.



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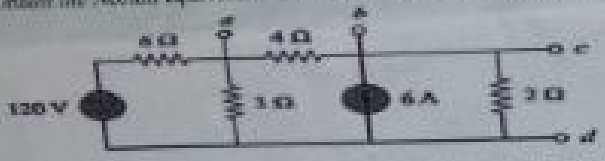
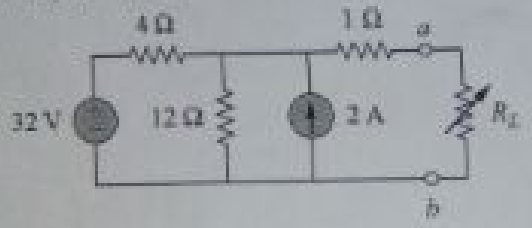
(b) Obtain the Norton equivalent circuit as viewed from the terminal (I) a-b (II) c-d.



(c) Find the Theverin equivalent circuit of the circuit shown in Fig. 10, to the left of the terminals a-b. Then find the current through R_L = 6,16 and 36 ohm. 7



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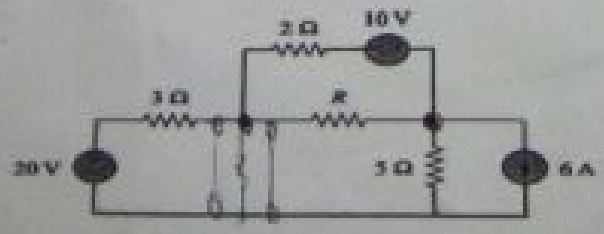
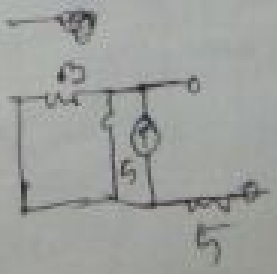
Part- B

(Answer any two of the following questions)

4. (a) Find the maximum power that can be delivered in the resistor R.





(b) The current through a 40mH inductor is

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Final Term Examination-2017

Course No: EEE 109

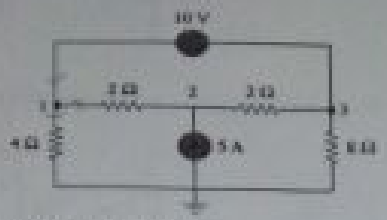
Course Title: Electrical Circuits

Total Marks: 100 Total Time: 3 Hour

Part – A

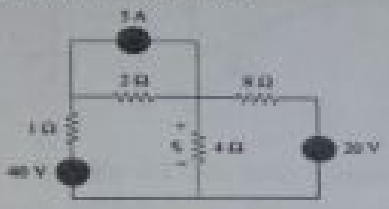
(Answer any two of the following questions)

1. (a) Determine the node voltages in the circuit using nodal analysis



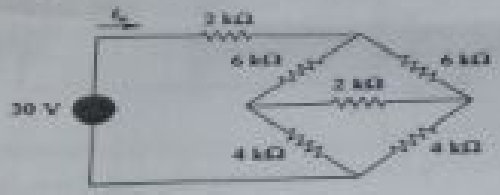
6

(b) Using nodal analysis find V_x



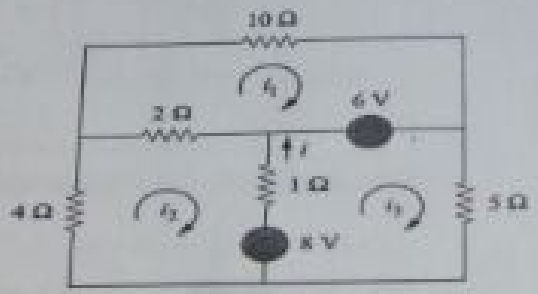
6

(c) Find i_b using mesh analysis.



7

(d) Find i in the circuit.



25

2. (a) Determine V_x using superposition principle.