Comilla University
Department of ICT
1st Year 1st Semester Final Examination 2022
Session: 2021-2022

Code: MATH 101 **Title: Differential and Integral Calculus** **Marks: 60** **Time: 03 Hours**

Answer any five questions

Q1. a) Define function, domain and range. 3

b) Find the domain and range of the following functions 6

$$(i) f(x) = \frac{1}{x^2+4x-12} \quad (ii) f(x) = \sqrt{x^2+1}.$$

c) Sketch the graph of the following functions 3

$$(i) y = |x+1| + |x| \quad (ii) y = 3 + \sqrt{x-2}$$

Q2. a) Define limit and continuity of a function. 4

b) Show that the function $f(x) = |x|$ is not differentiable at $x = 0$. 4

c) Differentiate with respect to x 4

$$(i)\ y = (x^2+1)sin^{-1}x + e^{-2x} \quad (ii)\ y = e^{5x}tanx$$

Q3. a) Define derivative. Explain the geometrical interpretation of derivative. 5

b) If a function $f(x)$ is differentiable at a point x_0, then show that $f(x)$ is also continuous at x_0. 3

c) If $f(x) = \begin{cases} 3+2x, & -3/2 < x \le 0 \\ 3-2x, & 0 < x < 3/2 \end{cases}$ then show that $f(x)$ is continuous at $x = 0$ but not differentiable there. 4

Q4. a) Find $\frac{dy}{dx}$ where: (i) $\sin(xy^2 + y) = x^3 + y^2$ (ii) $y = \pi^{x \ln x}$ 6

(iii) $x = a(\theta - \sin\theta),\ y = a(1 + \cos\theta)$.

b) State the Leibnitz's theorem. If $y = a\cos(\ln x) + b\sin(\ln x)$, then show that 6

$$x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0.$$

Q5. a) State and prove Rolle's theorem. 7

b) If $f(x) = 2x^3 - 9x^2 + 12x - 3$, then find the intervals on which $f(x)$ is increasing and decreasing. Also sketch the graph of $f(x)$ 5

Q6. a) Evaluate any **Three (3)** of the following integrals: 6

(i) $\int e^{-x}\sin 2x\,dx$ (ii) $\int \frac{x^2+x-16}{(x-3)^2(x+1)}dx$ (iii) $\int \frac{dx}{x^2\sqrt{9-x^2}}$

(iv) $\int_0^{\pi/2} \cos^7 x\,dx$

b) Define average value and average velocity. Show that if a body released from rest (initial velocity zero) is in free fall, then its average velocity over a time interval $[0,T]$ during its fall is its velocity at time $t = \frac{T}{2}$. 6

Q7. a) Define definite and Indefinite integral. 2

b) State and prove fundamental theorem of calculus. 6

c) Show that $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx, & when\ f(x)\ is\ even \\ 0, & when\ f(x)\ is\ odd \end{cases}$ 4

Q8. a) Write down the area formulae. Find the area of the region in xy −plane bounded the graphs of $2y = 16 - x^2$ and $x + 2y = 4$. 5

b) Find the area enclosed between the parabolas $y^2 = 12x$ and $x^2 = 12y$. 3

c) Evaluate $\int_0^{\pi} \frac{xsinx}{1+\cos^2 x}dx$. 4

Department of ICT

Comilla University, Cumilla

1st year 1st Semester Final Examination-2022 (Session: 2021-2022)

Course Code: PHY-111 Course Title: Physics

Total Marks: 30 Time: 2.0 Hours

Answer any four (4) questions. The figures in the margin indicate full marks.

1. (a) What is electric lines of forces? Write the properties of electric lines of forces? 3.5
   (b) Show that at great enough distance a charged ring behaves like a point charge. 4

2. (a) Show that current falls exponentially with time when a capacitor is charged. 4
   (b) What is dielectric constant? Derive an expression of capacitance for a spherical capacitor 3.5

3. (a) The magnetic field measured at the center of a coil is 7.5×10^{-2} weber/m^2 when a current of 3 amp pass through the coil. If the diameter of the coil is 40 cm, find the number of turns of the coil. 3.5

   (b) Using Biot-Savart law prove that the magnetic field at the center of coil is $B=(\mu IN)/2r$, Where symbol has there as-usual meaning. 4

4. (a) What is magnetic induction? Briefly discuss about the different types of magnetic materials. 3.5
   (b) Write the Maxwell's equations and explain their physical significance. 3
   (c) What is pointing vector? 1

5. (a) Explain why newton's ring is produced. 2.5
   (b) What is meant by polarization of light? State and derive Brewster's law. 5

6. (a) What is polarizing angle? Explain the polarization by reflection. 2.5
   (b) Find the wave length of a monochromatic light by Newton's ring method. 5

Department of Information & Communication Technology
Comilla University, Cumilla
B.Sc. (Engg.) 1st Year 1st Semester Final Examination-2022
Session: 2021-2022 Course Code: ICT-103
Course Title: ICT Fundamental

Full Marks: 60 Time: 3 Hours

[N.B. Figures in the margin indicate full marks. Answer any Five questions]

1.	a)	What do you mean by computer? Why do you use transistor, integrated circuit and microprocessor to make a computer?	1+2
	b)	How do you multiply between two numbers 456 and 768 by using Napier Bones theory?	3
	c)	How do you allocate the memory in according to the address?	2
	d)	What is the main objective of 'KEY' in a database system?	2
	e)	Why do you use object code?	2
2.	a)	Shortly discuss about the computer system based on the applications.	3
	b)	What do you mean by Bit and Byte? Why do you use binary system in a computer?	2+2
	c)	Explain the working principle of SSD and HDD. Why SSD is faster than that of HDD?	4+1
3.	a)	Shortly discuss about the parts of a computer system.	4
	b)	Convert the following Hexadecimal numbers into its corresponding octal number. I. 6DE9 II. 7B2.ACE	4
	c)	Write down the basic properties of primary key and foreign key with example.	4
4.	a)	What are the main impacts of the 4th industrial revolution (4IR)?	2
	b)	How do you consider the variables in memory for executing the instruction $y=x_1+x^2+5$?	5
	c)	How do you solve a problem in step by step?	2
	d)	In the case of data communication, when do you say that your communication is more accurate in according to present technology?	3
5.	a)	Briefly describe the functions of a processor with the help of a flowchart.	4
	b)	What is the motherboard? List the main components of a motherboard and briefly describe their uses.	4
	c)	What is language translator? Compare interpreter and compiler.	4
6.	a)	What is CPU scheduling? Discuss the general goals of scheduling.	4
	b)	What is an OS? What are the four primary functions that an operating system performs?	4
	c)	Define Process. What are the activities of an OS in regard to process management?	4
7.	a)	Write down the main objectives of memory in computer system. Shortly describe the memory hierarchy.	1+2
	b)	What is communication? How do you communicate from source to destination?	1+2
	c)	What is operating system? Describe the types of operating system.	1+2
	d)	Why do you use IP address in a network? Write down the range of classes in IP address.	1+2
8.	a)	What is protocol? Why are protocols needed?	4
	b)	Name the four basic network topologies and cite advantages of each type.	4
	c)	Define e-commerce? What are the four main components of IoT system? Explain.	4

Session: 2021-2022, Course Code: ICT-107

Course Title: Technical and Communicative English

Full Marks: 30 Time: 2 Hours

[N.B. Figures in the margin indicate full marks. Answer all the parts which carry 10 marks each.]

Part-I

1. Read the text carefully and answer the questions that follow:

A. A. In 1912 an American shipping company launched a new ship called the "Titanic. It was the largest and most luxurious ocean liner of that time. It weighed 46,000 tons and could carry about 2,200 passengers. Experts said that nothing could sink it. It was definitely unsinkable. On 14 April 1912, the ship sailed on its first voyage across the Atlantic from Southampton in England to New York in the United States, with 2224 passengers, men, women and children. On 15 April, just before midnight, the ship struck an iceberg. The iceberg tore a great hole in the ship's side, and unsinkable "Titanic" began to sink.

B. There was great alarm on broad. Warning bells rang out. Everyone ruched to the lifeboats, but there was not enough room for them all. There was room for only 1,178 passengers. The lifeboats took mostly the women and children. It was a terrible scene. Wives were weeping because they had to leave their husbands to drown. Children were crying because they had to say goodbye to their fathers. The men had to remain on the ship. The "Titanic" sent out signals for help, but no help came. Another ship, the "Californian", was only twenty miles away, but her radio operator was asleep and did not hear the distress signals.

C. In the early hours of the morning the "Titanic" sank, while her band was playing bravely on deck. Twenty minutes later, another liner, the "Carpathia", arrived on the scene and helped to rescue survivors from the icy water. But of the 2,224 passengers, only about 700 survived.

D. It was a terrible disaster. But something good came out of the sinking of the "Titanic". In 1913 there was a committee of inquiry into the disaster. This committee drew up the many new rules for shipping companies. Since then, every ship has had to organize lifeboat places for each voyage. Every ship has had to carry enough radio operators so that there is always one of them on duty. Another important result of the sinking of the "Titanic was the formation of an international ice patrol. This patrol warns ships about ice and icebergs in the North Atlantic.

(a) Answer the following short questions: 5

i. What did the experts say about "Titanic" on its launching?
ii. When did the "Titanic" sink?
iii. Who took the lifeboats mostly?
iv. When did "Carpathia" arrive on the scene to rescue the survivors?
v. Which lessons did the world take from the disaster?

(b) Fill in the blanks with modal auxiliaries, i.e., *can, could, may, might, should, cannot, could not, may not,* etc. whichever is needed: 5

i. "The ship ____ sink," said the experts who built the "Titanic".
ii. Liners ____ sailed without enough lifeboats for all their passengers.
iii. A radio operator ____ do his duty if he is asleep.
iv. Lifeboats ____ be needed quickly if there is a collision.
v. You ____ not understand why it sank so quickly, perhaps, but you ____ be quite sure that it did.

Part - II

[Answer any two of the following (2-5) items] 5*2= 10

2. Put the verb into the correct form.
   a. The police.... (be) questioning a man.
   b. The headmaster along with his students..... (enter) the class.
   c. Two-thirds of the work.... (be) done.
   d. If it.... (rain) today, I shall not go to the class.
   e. He speaks as if he.... (know) everything.

3. Fill in the blanks with present participle/past participle/infinitive which are used as modifiers.
   a. I saw a girl ____ in a bar.
   b. Don't try to get into a ____ train.
   c. They took the ____ man to hospital
   d. The ____ egg is nutritious.
   e. She got a nice pen ____ write with.

4. Use prefixes to find the opposite of these verbs and make sentences:

   i. Wrap
   ii. Close
   iii. Fold
   iv. Spell
   v. Use
   vi. Engage
   vii. Behave
   viii. Agree
   ix. Understand
   x. Connect

5. a) What is research report? What is the writing style of a standard report?
   b) What are the key elements of a report?

Part – III

[Answer any one of the following (6-8) items.] 10

6. a) Suppose you have completed M.Sc. recently and now you are seeking a job. Apply for the post of a Research Officer with a cover letter and a resume in American style.
   b) What is memo? Write n interoffice memorandum with imperative information.

7. Outline the body of a research paper on the negative aspects of "Artificial Intelligence" (AI).

8. Write a composition in about 400 words on any one of the following:
   a) Merits and demerits of living in-campus at Comilla University.
   b) Cyber Security of Women in Bangladesh.

Department of Information and Communication Technology
Comilla University

B.Sc. (Engg..) 1st Year 1st Semester Final Examination-2022
Session: 2021-2022, Course Code: ICT-105
Course Title: Structured Programming

Full Marks: 60 Time: 3 Hours

[N.B. Figures in the margin indicate full marks. Answer any FIVE questions]

1. a) Fill in the blanks with appropriate words in each of the following statements. 6

(i) Every program statement in C program must end with a _____.
(ii) A _____ is a data name that may be used to store a data value.
(iii) The switch expression must be an _____ type.
(iv) The _____ statement is used to skip a part of the statements in a loop.
(v) A for loop with no test condition is known as _____ loop.
(vi) _____ is a fixed size sequence collection of elements of the same data type.
(vii) The function strcat has _____ parameters.
(viii) A _____ is a collection of data items under one name in which the items share the same storage.
(ix) A pointer variable contains as its value the _____ of another variable.
(x) The mode _____ is used for opening a file for updating.
(xi) The header file _____ is required when using standard I/O functions.
(xii) All _____ have fixed meanings and these meanings can not be changed.

b) What is machine language? How does machine language differ from high-level languages? 2

c) Explain the process of executing a program written in C programming language with suitable diagram. 4

2. a) What is variable? Mention whether the following variables are valid or invalid, and if they are invalid, explain why. 1+2

(i) 8th (ii) x$ (iii) int_x (iv) (number)

b) Classify the data types in C. Write about the primary data types in C. 6

c) Write a program that displays the sum of the following series up to N terms, where N is a positive integer and given input. 3

1+3+5+7+.....+N

3. a) How can the value of an expression be converted to a different data type? What 2

is this called? 2

b) A C program contains the following declarations and initial assignments:

```
int i= 8,  j = 5,  k;
float x = 0.005, y = -0.01, z;
char a, b, c = 'c', d = `d';
```

Determine the value of each of the following assignment expressions. Use the values originally assigned to the variables for each expression

(i) k = z = x

(ii) k = (j = =5) ? i : j

c) Write a program using while loop to calculate and print the first m Fibonacci numbers (1 1 2 3 5 8.....). 4

d) Describe different types of "for" loop. 4

Analyses the output of the following C program

```
main()
{
  int i, j, x = 0;
  for ( i = 0; i < 5; ++ i )
      for ( j = 0; j < i; ++ j)
          {
              x + = ( i  + j – 1 );
              printf ( " %d ", x );
          }
      printf ( " \ n x = % d ", x );
}
```

4. a) What is an array, and why is it used? Explain the Recursive function with an example. 3+4

b) What is string? What is the meaning of **5 , '5' and "5"** 2

c) Write program to display the reverse a given string without using ***strrev*** function. 3

5. a) What do you mean by looping? What is the difference between ***entry-controlled*** and ***exit-controlled*** loop. Explain with proper example. 5

b) Write a program to display the individual digit(s) of a given integer number (As for ex, if input is 235 the result will be 2 3 5) . 3

c) What will be the output of the following program: 2

```
void main()

{ int i, j, a[]={1,2,3,4,5,6,7,8,9};
```

```
for(i=1;i<=2;i++)
{ for(j=1;j<=2;j++)
  printf("%d\n",a[i]+a[j]); }
}
```

d) Determine the value of each of the following logical expression if a=5, b=6, c=10; 2

(i) a>b && b<c || c+a>=b
(ii) (ii) a<b+5 || b>10 && a+b>=10
(iii) (iii) a<b || c+a>b && c>=10 example.

6. a) What is function? State three advantages of using functions. 2
b) Describe "call by value" and "call by reference". 2
c) What are formal arguments? What are actual arguments? What is the relationship between formal arguments and actual arguments? 2

d) Write a function that will calculate and display the real roots of the quadratic equation 4

$$ax^2 + bx + c = 0$$

Using the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Assume that a, b, and c are floating point arguments, whose values are given, and that x_1 and x_2 are floating point variables. Also, assume that $b^2 > 4*a*c$, so that calculated roots will always be real.

e) What will be the output of the following segment? 2

```
char s1[ ] = " Rajshahi " ;
char s2[ ] = " Dhaka ";
strcpy ( s1, s2 );
printf(" % s ", s1);
```

7. a) What is the difference between structure and union? How are they initialized? 3
b) What is meant by the scope of a variable within a program? 1
c) Explain word boundary and slack bytes with suitable example. 3

d) Define a structure data type named date containing three integer members day, month and year. Develop an interactive modular program to perform the following tasks: 5
To read data in to structures members by a function
To validate the date entered by another function
To print the date in the format April 14, 2023 by a third function.

The input data should be three integers like 29, 4, and 2023 corresponding to day, month, and year. Example of invalid data:

31, 4, 2020---- April has only 30 days.
29 2, 2018 ---- 2018 is not a leap year.

8. a) What is pointer? How is a pointer initialized? 2

b) Given the following declarations: 4

```
int x = 10 , y = 20 ;
int *p1 = &x,  *p2 = &y ;
```

What is the value of each of the following expression?

(i) (*p1) ++ **(ii)** -- (*p2) **(iii)** *p1 + (*p2) -- **(iv)** ++ (*p2) - *p1

c) What is file and file pointer? Write a program that will create a new text file. The program will read the contents from the user and write them into the file. 4

d) Mention the different operations that can be performed on "File" using the C program. 2

Session: 2021-2022, Course Code: ICT-109

Course Title: Basic Electrical Circuits

Full Marks: 60 Time: 3 Hours

[N.B. Figures in the margin indicate full marks. Answer any FIVE questions]

1. (a) Eight holiday lights are connected in series as shown in the following figure: 4

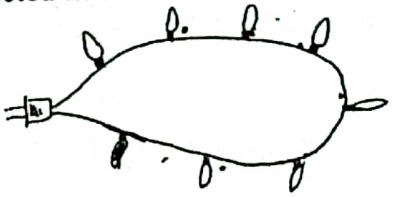


Fig: 1(a)

i. If the set is connected to a 120V source, what is the current through the bulbs if each bulb has an internal resistance of 28 Ω?

ii. Determine the power delivered to each bulb.

iii. Calculate the voltage drop across each bulb.

iv. If one bulb burns out, what is the effect on the remaining bulbs? Why? 3

(b) Assuming identical supplies, determine the current I and resistance R for the following parallel network.

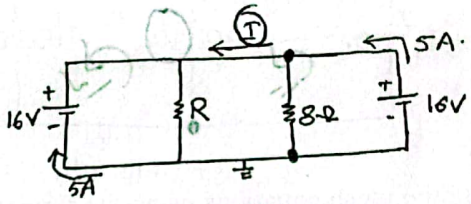


Fig. 1(b)

(c) Find the unknown quantities for the following network using the information provided. 5

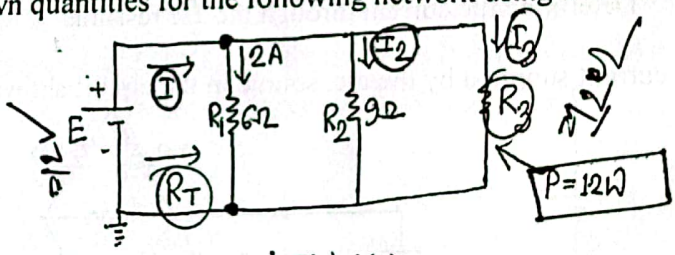


Fig. 1(c)

2. (a) For the following networks, 5

i. Find the voltage V_a and V_b.

ii. Find the currents I_1 and I_s.

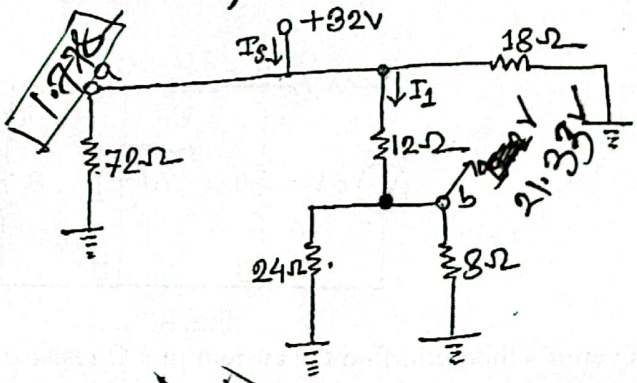


Fig. 2(a)

(b) For the following networks, 7

i. Determine voltages V_a, V_b, and V_c.

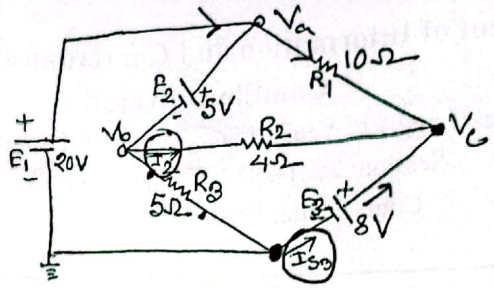


Fig. 2(b)

3. (a) Using branch current analysis, find the current through each resistor for the following network. The resistors are all standard values. 5

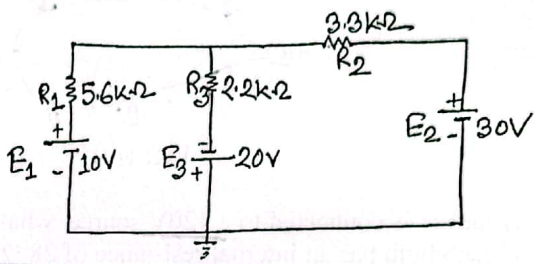


Fig. 3(a)

(b) For the following network,

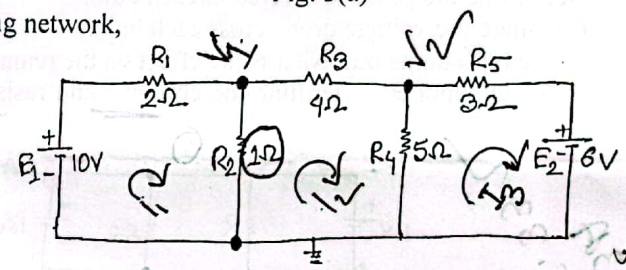


Fig. 3(b)

i. Write the mesh equations using the format approach to mesh analysis.
ii. Solve for the three mesh currents, using determinants.
iii. Determine the current through the 1Ω resistor.

4. (a) Find the current supplied by the d.c. source in the circuit shown in Fig. 4(a). 4

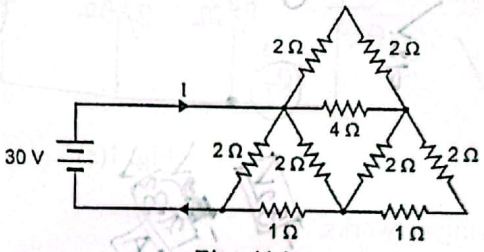


Fig. 4(a)

(b) Using source conversion technique, find the load current I_L in the circuit shown in Fig. 4 (b). 4

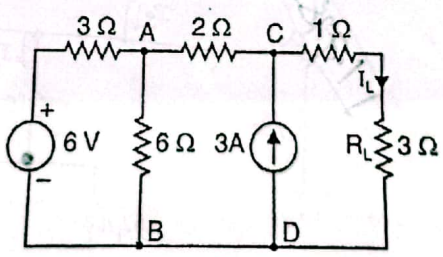
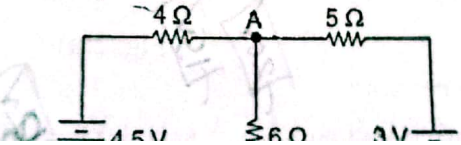


Fig. 4(b)

(c) Using Thevenin's theorem, find the current in 6 Ω resistor in Fig. 4(c). 4



5. (a) For the following R-C network, composed of standard values: 6

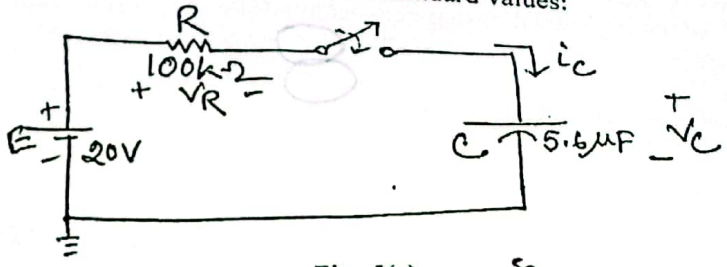


Fig. 5(a)

i. Determine the time constant of the circuit.
ii. Write the mathematical equation for the voltage V_c following the closing of the switch.
iii. Determine the voltage V_c after one, three, and five time constants.
iv. Write the equations for the current i_c and the voltage V_R.
v. Sketch the waveform for V_c.
vi. Sketch the waveform for i_c.

(b) Find the voltage across and the charge on each capacitor for the following circuit, 4

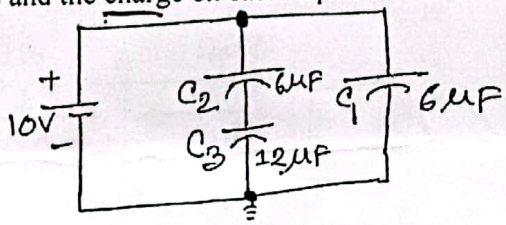


Fig.5(b)

(c) If the energy stored by a 6μF capacitor is 1200J, find the charge Q on each plate of the capacitor. 2

6. (a) For the circuit shown in Fig. 6(a), find the currents flowing in all branches. 4

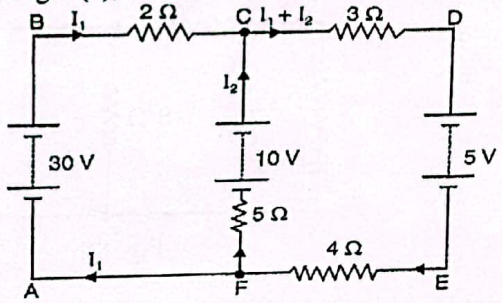


Fig. 6(a)

(b) By superposition theorem, find the current in resistance R in Fig. 6(b). 4

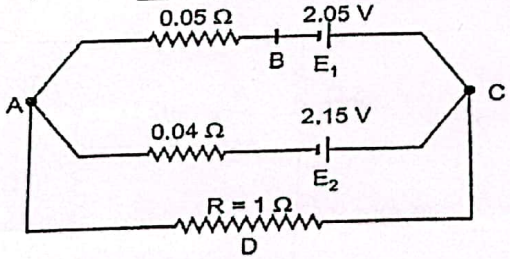
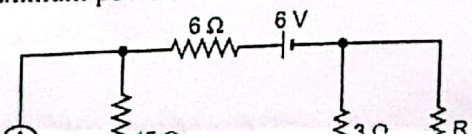


Fig. 6(b)

(c) Calculate the value of R which will absorb maximum power from the circuit of Fig. 6(c). 4
Also, find the value of maximum power.



(a) Write down the important parameters for a sinusoidal voltage by sketching a sine wave. 4

(b) Find the phase relationship between the following waveforms: 4

$v = -4\cos(\omega t + 90^\circ)$

$i = -2\sin(\omega t + 10^\circ)$

(c) Find the average values of the following periodic waveforms over one full cycle. 4

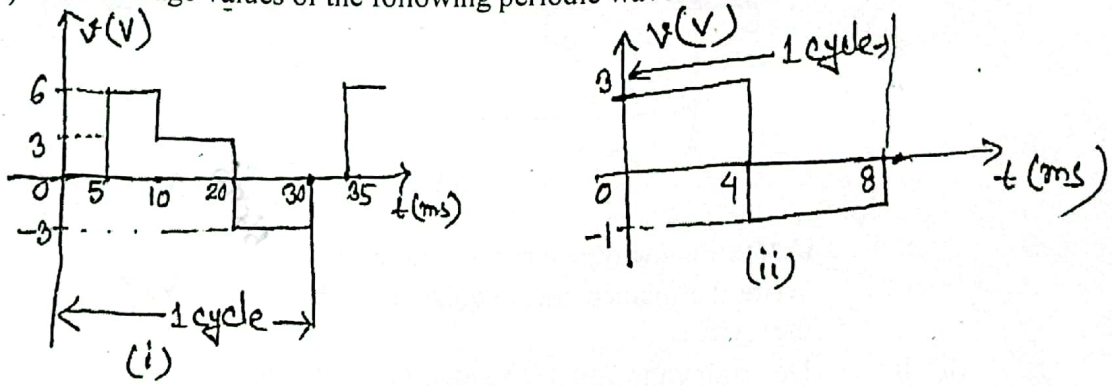


Fig. 7(c)

8. (a) Find the current in various resistors in the circuit shown in Fig. 8(a) by converting voltage sources into current sources. 4

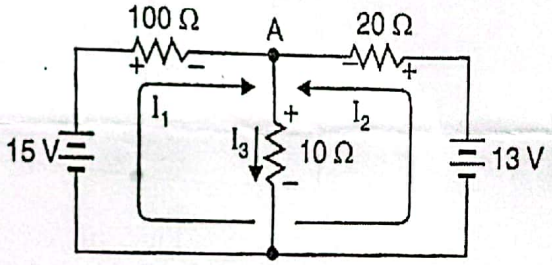


Fig. 8(a)

(b) Use nodal analysis to find the voltage across and current through 4 Ω resistor in Fig. 8(b). 4

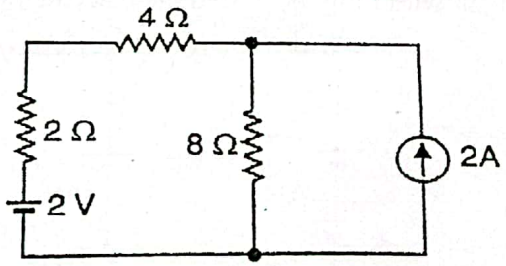


Fig. 8(b)

(c) Obtain current I_0 in Fig. 8(c) using Norton's theorem. 4

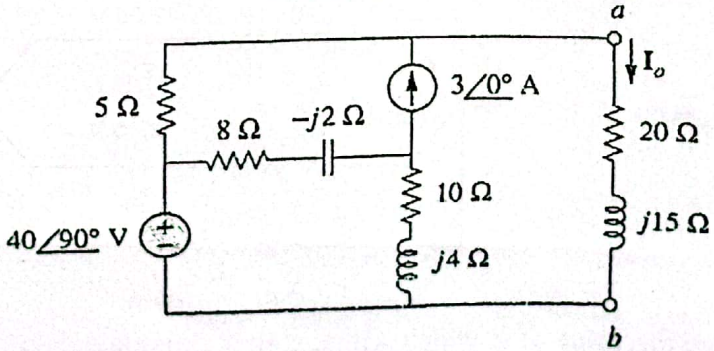


Fig. 8(c)

Department of Information & Communication Technology

B.Sc. (Engg.) 1st Year 1st Semester Final Examination-2022

Session: 2021-22, Course Code: ICT-106,

Course Title: Structured Programming Sessional

1. Write a program that read temperature in Fahrenheit and display in Celsius and vice versa.
2. Write a program to swap two numbers (i) with using third variable (ii) without using third variable.
3. Write a program to find the odd numbers in the range 1 to 200. Use continue to avoid even number.
4. Write a program to find if a number is Palindrome or not.
5. Write a program to add the digits of a number. For example if the input is 591 then the output will 15.
6. Write a program to reverse a number. For example if the input number is 523 then the output number will 325.
7. Write a program to print Fibonacci series up to 100.
8. Write a program to add two numbers using pointers.
9. Write a program to add two matrixes.
10. Write a program that read an array and display minimum.
11. Write a program that searches any number from an array.
12. Write a program to find 2.5.8+5.8.11+8.11.14+.....upto n'th term.
13. Write a program to find 1.2^2+2.3^2+3.4^2+.....upto n'th term.
14. Write a program to print the following:

```
5   5   5   5   5
4   4   4   4
3   3   3
2   2
1
```

15. Write a program to reverse a string.
16. Write a program to print the following:

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

17. Write a program that displays first n prime numbers.
18. Write a program that read three numbers (a, b, c) and determine the roots of the quadratic equation: ax^2+bx+c.
19. Write a program that read a digit and display by spelling
20. Write a program that performs some basis string operations.
21. Write a program that read some students name, three subjects mark and display name, total, average mark and grade point average using structure.
22. Write a function that gets radius of a circle and returns area
23. Write a recursive function that gets any positive integer and returns factorial
24. Write a program that swaps two numbers using pointer.
25. Write a program that read first n numbers in a file and display in another file.