

Sylhet Engineering College, Sylhet
(Shahjalal University of Science & Technology)
Department of Electrical and Electronic Engineering

Final Examination, 2024
 Course No: EEE 0713-1121
 Time: 03 (Three) hours

1st year 1st semester
 Course Title: Electrical Circuit I
 Full Marks:60

N.B.: (i) Answer all questions from each PART

(ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin

(iv) Using pen or pencil for drawing will not affect your marks

PART A

1. (a) Use mesh analysis to find i_1 , i_2 and i_3 in the circuit of Fig. 1(b). 04

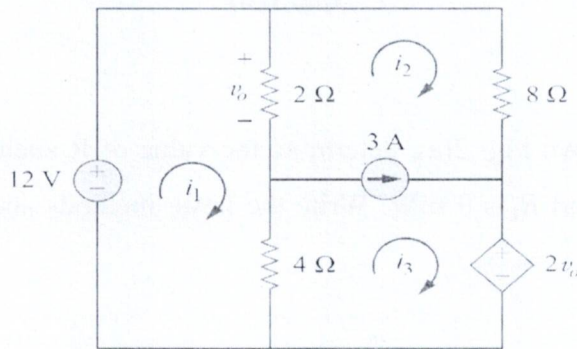


Fig. 1(b)

- (b) Find I_0 to inspecting Thevenin's theorem for the circuit shown in Fig. 1(b). 06

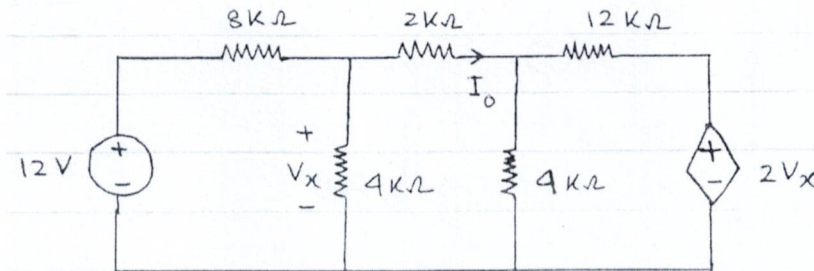


Fig. 1(b)

Or,

- (a) Find I_0 using nodal analysis for the circuit shown in Fig. 1(a). 04

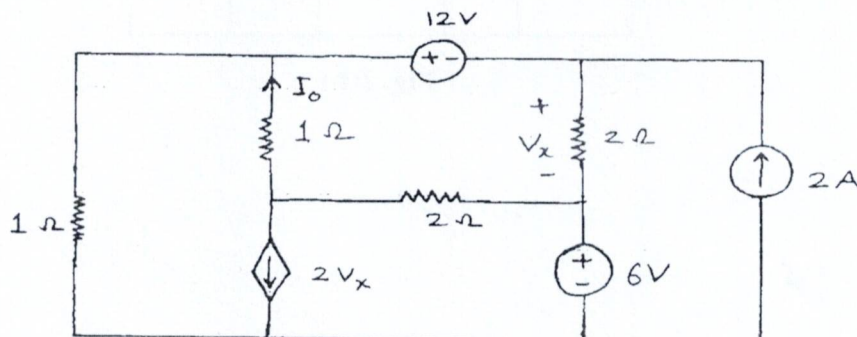


Fig. 1(a)

(b) Analyzing the superposition principle to find V_1 and I_1 in the circuit of Fig. 1(b).

06

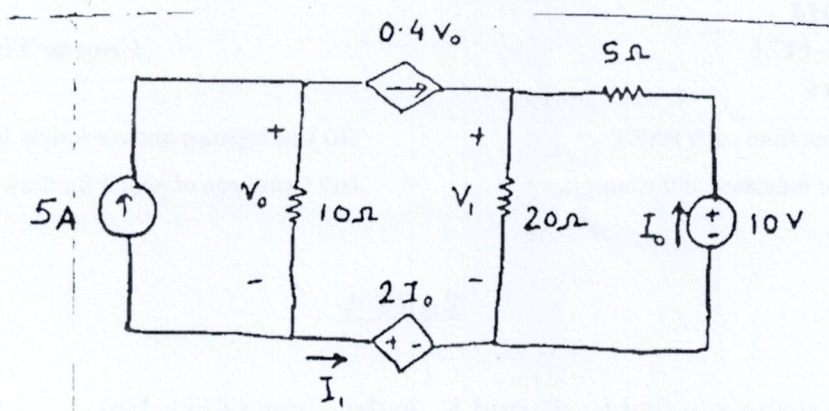


Fig. 1(b)

2. (a) For the circuit shown Fig. 2(a), determine the value of R such that the maximum power delivered to the load R_L is 3 mW. Write the laws, methods and/or theorems you used in solving it.

06

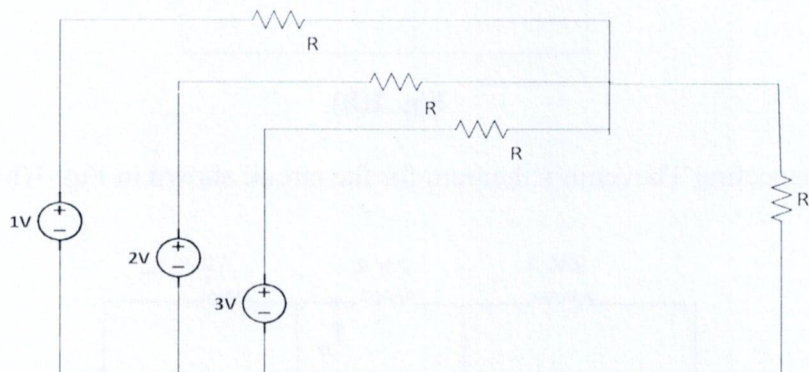


Fig. 2(a)

- (b) Find the value of R in the circuit shown in Fig. 2(b).

04

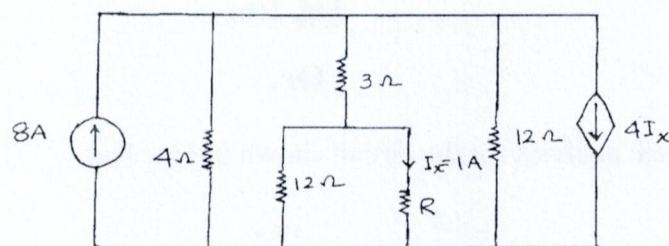


Fig. 2(b)

3. (a) Find the equivalent resistance between terminals 'a' and 'b' in the circuit shown in Fig. 3(a). 05

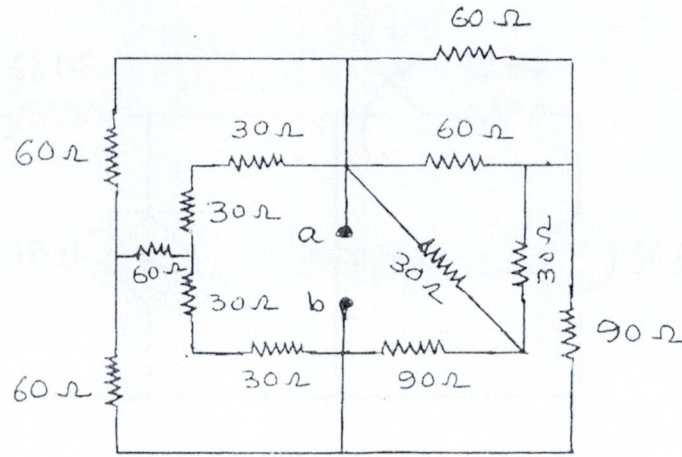


Fig. 3(a)

- (b) What is a linear circuit? The Current, I_0 in the circuit shown in Fig. 3(b) is 2 A. Calculate 05
- V_s
 - The power absorbed by the independent voltage source,
 - The power delivered by the independent current source,
 - The power delivered by the controlled current source, and
 - The power delivered dissipated in $30\ \Omega$ and $10\ \Omega$ resistance.

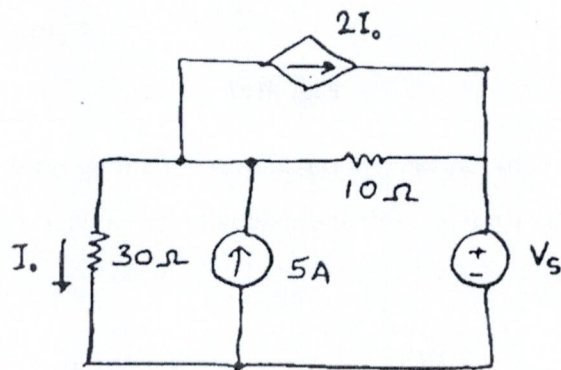


Fig. 3(b)

PART B

4. (a) Determine the current through a $200\text{-}\mu\text{F}$ capacitor whose voltage is shown in Fig. 4(a). 04

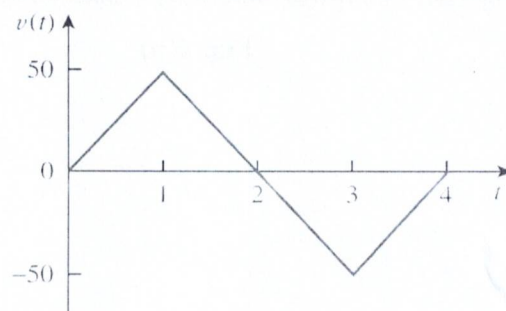


Fig. 4(a)

3. (a) Find the equivalent resistance between terminals 'a' and 'b' in the circuit shown in Fig. 3(a). 05

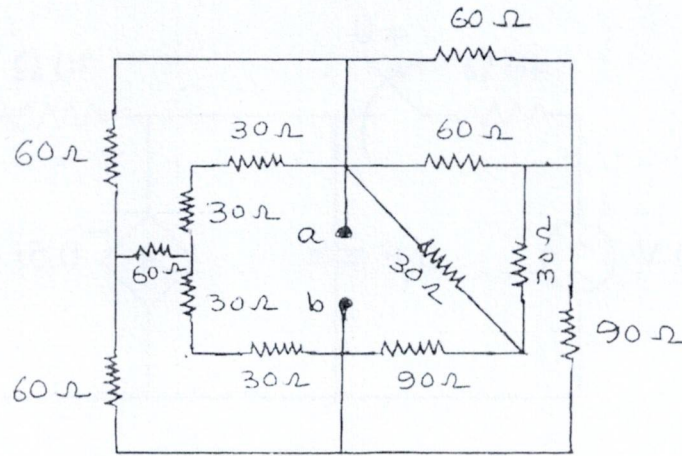


Fig. 3(a)

- (b) What is a linear circuit? The Current, I_0 in the circuit shown in Fig. 3(b) is 2 A. Calculate 05
- V_s
 - The power absorbed by the independent voltage source,
 - The power delivered by the independent current source,
 - The power delivered by the controlled current source, and
 - The power delivered dissipated in $30\ \Omega$ and $10\ \Omega$ resistance.

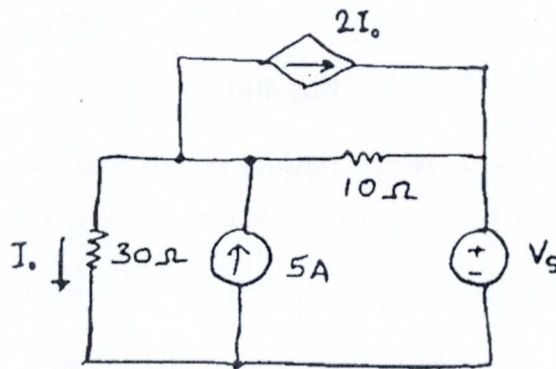


Fig. 3(b)

PART B

4. (a) Determine the current through a $200\text{-}\mu\text{F}$ capacitor whose voltage is shown in Fig. 4(a). 04

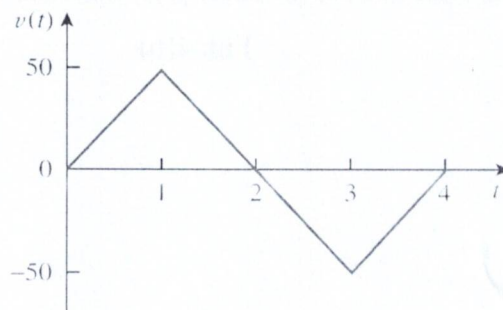


Fig. 4(a)

5. (a) State the Superposition Theorem. What is the difference between Super Mesh & Mesh? 01+02
 (b) Determine the voltage across a $30 \mu F$ capacitor if the current through it is 03

$$v(t) = 6e^{-3000t} \text{ mA}$$

Assume that the initial capacitor voltage is zero.

- (c) Find the current through a 5-H inductor if the voltage across it is 04

$$v(t) = \begin{cases} 10t^2, & t > 0 \\ 0, & t < 0 \end{cases}$$

Also, find the energy stored at $t = 5s$. Assume $i(v) > 0$.

6. A variable load resistor, R_L is connected between terminals A-B in the circuit shown in Fig. 6 for Q. 6. 01+03+03+03

- Find the Thevenin and Norton equivalent circuits at terminals A-B.
- R_L is adjusted for maximum power transfer to R_L . Find the value of R_L . Also maximum power transferred to R_L .
- How much power does the 560 V source deliver to the circuit when R_L is adjusted for maximum power transfer?
- R_L is adjusted so that 40% of total power delivered in the circuit is in R_L . Find the value of R_L for this case.

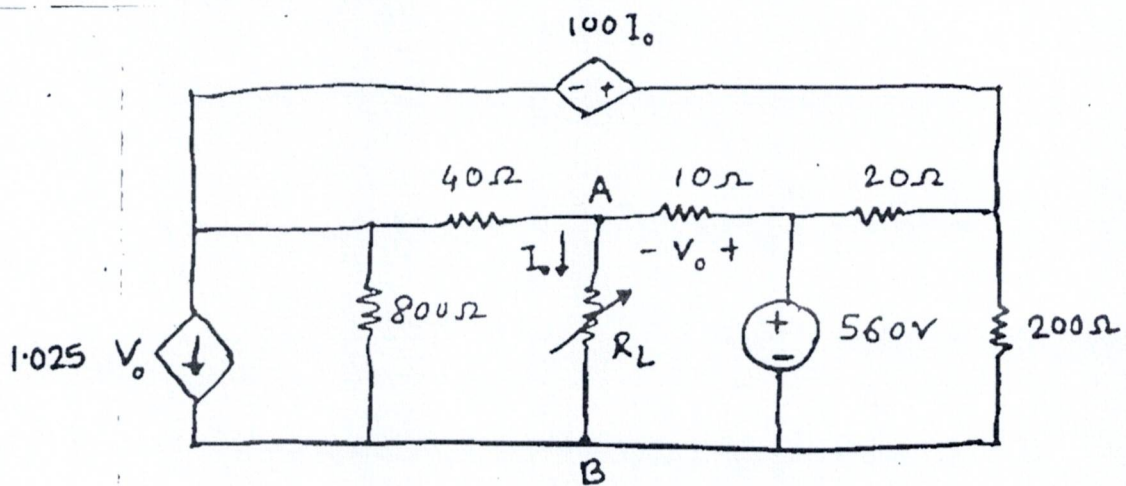


Fig. 6

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Final Examination, 2024

Course No: MATH 0541-1101E

Time: 03(Three) hours

1st year 1st semester

Course Title: Differential and Integral Calculus

Full Marks: 60

N.B.: (i) Answer all question from each PART

(ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin

(iv) Special Instruction (if any)-----N/A----

PART A

1. (a) Write about condition for existence of limit of a function and when a function is not continuous? 03
- (b) If $f(x) = \begin{cases} x^3, & \text{when } x \leq 1 \\ 3x - 2, & \text{when } x > 1 \end{cases}$ 04
Then test continuity and differentiability at the point $x=1$
- (c) If $\ln y = \tan^{-1} x$ then using Leibnitz's theorem find $(n+2)^{\text{th}}$ derivative of y . 03
2. (a) State and prove Rolle's theorem. 05
- (b) Verify mean value theorem for the function $f(x)=x^3+x-4$ in the interval $(-1,2)$. 05
3. (a) Find tangent and normal equation of the curve $x^3 + y^3 = 3xy$ at the point $(\frac{3}{2}, \frac{3}{2})$. 04
- (b) If $u = \ln(x^3 + y^3 + z^3 - 3xyz)$ then find the value of $(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z})u$ 04
- (c) If $u = \tan^{-1} \frac{x^3+y^3}{x+y}$ Then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$. 02

OR

- (a) Find minimum and maximum value of the function $f(x) = \frac{u}{x} + \frac{36}{2-x}$. 04
- (b) Evaluate: (i) $\lim_{x \rightarrow \infty} (1 + \frac{1}{x})^x$ (ii) $\lim_{x \rightarrow 2} [\frac{1}{x-2} + \frac{1}{\ln(x-1)}]$ 02
- (c) Find n^{th} differentiation of the function $y=\ln(x-2)$ 04

PART B

4. (a) (i) Define integration graphically. Solve (ii) $\int_0^1 x(\tan^{-1}x)^2 dx$ 1+3+3
(ii) $\int_0^{\frac{\pi}{2}} \ln(\tan x + \cot x) dx$
- (b) Using reduction formula find the value of $\int_0^{\frac{\pi}{6}} \sin^4 3x dx$. 03

5. (a) Prove that

2.5+2.5

i) $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx = \frac{\left(\frac{m+1}{2}\right)\left(\frac{n+1}{2}\right)}{2\left(\frac{m+n+2}{2}\right)}$

ii) $\left(\frac{1}{2}\right) = \sqrt{\pi}$

(b) Evaluate: $\int_0^{\infty} \frac{x dx}{(1+x)(1+x^2)}$

03

(c) Define Gamma and Beta functions.

02

OR

(a) Evaluate: $\lim_{n \rightarrow \infty} \left[\frac{1^2}{n^3+1^3} + \frac{2^2}{n^3+2^3} + \frac{3^2}{n^3+3^3} + \dots + \frac{n^2}{n^3+n^3} \right]$

05

(b) Evaluate: $\int_0^{\frac{\pi}{2}} \sin^4 x \cos^5 x dx$

03

(c) Evaluate: $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{1/x}$

02

6. (a) Find the area enclosed by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.

05

(b) Find the volume of the solid formed by the revolution of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about y-axis.

05

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Department of Electrical and Electronics Engineering

Final Examination, 2024

Course No: PHY 0533-1101E

Time: 03(Three) hours

1st year 1st semester

Course Title: Physics I

Full Marks: 60

N.B.: (i) Answer all question from each PART

(ii) Use separate answer scripts for each PART

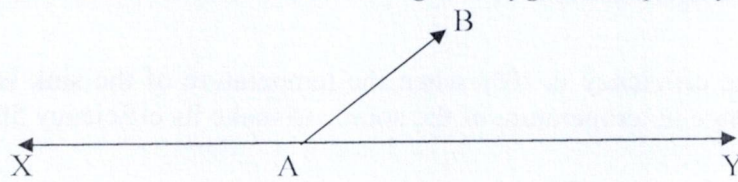
(iii) Marks allotted are indicated in the margin

(iv) Special Instruction (if any)-----N/A----

PART A

(Answer all questions)

1. (a) What is Huygens principle in regard to the conception of light wave? 03
- (b) Let a plane wavefront ΛB incident on a plane reflecting surface XY . Where will be the secondary wavefront after reflection according to Huygens? Explain your answer. 05



- (c) Write down the limitations of Huygens principle? 02

OR

- (a) What is interference? Write down the condition for interference. 01+02
- (b) How can you block the following waves by using interference. 05

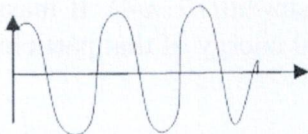


Fig. (i)

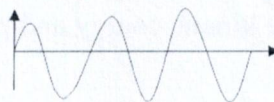


Fig. (ii)

- (c) For Fig.(i) calculate the path difference for bright and dark fringe if wavelength 5100\AA , slit separation is 1.9 mm and the screen is held at a distance of 100cm from the slit. 02
2. (a) what is Biprism? How can you determine wavelength by using biprism? 1+4
- (b) Discuss maxima for single slit diffraction. 02
- (c) In double slit Fraunhofer diffraction, calculate the fringe spacing on a screen 50 cm away from the slits, if they are illuminated with blue light ($\lambda=4800\text{\AA}$) slit separation $b=0.1$ mm and slit width $a=0.020$ mm. 03
3. (a) What do you mean by polarization of light. 02
- (b) Why the center of Newton's ring is dark? Explain with figure. 04
- (c) The diameter of a tenth dark ring in a newtons ring system viewed normally by reflected light of wavelength 5900 \AA is 5 mm. Calculate radius of curvature of the lens and the thickness of air film. 04

PART-B

4. (a) State 1st law of thermodynamics. 02
- (b) Discuss application of 1st law of thermodynamics in isobaric process and adiabatic process. 04
- (c) A quantity of dry air at 27° C is compressed (i) slowly and (ii) suddenly to 1/3 of its vol. Find the change in temperature in each case. ($\gamma=1.4$) 04

OR

- (a) What is the difference between reversible engine and irreversible engine? 02
- (b) State and prove Carnot theorem. 04
- (c) A Carnot engine efficiency is 30% when the temperature of the sink is 27°C. What must be the change in temperature of the source to make its efficiency 50%. 04
5. (a) Apply 1st law of thermodynamics to explain following situations: 04
- i) Heat supplied to the system converted into increase in internal energy work done by the system.
- ii) Heat supplied to the system entirely converted into work done by the system.
- (b) Derive an expression of total energy of a vibrating particle. 03
- (c) A particle executes SHM given by the equation $y=12\sin(2\pi t/10+\pi/4)$. If mass of the particle is 0.01gm calculate kinetic energy and potential energy of that particle. 03
6. (a) What is damped harmonic oscillation? Derive an expression of damped frequency. 1+3
- (b) An object of mass $m=0.2\text{kg}$ is hung from spring ($k=80\text{N/m}$). Resistive force $-vb$ exists where $b = 4 \text{ Nm}^{-1} \text{ S}$. Does block oscillate? If yes find T. 03
- (c) Distinguish between longitudinal and transverse wave. 03

Sylhet Engineering College, Sylhet
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Department of Electrical and Electronic Engineering

Final Examination

1st Year 1st Semester

Course No: CSE 0011-1101E

Course Title: Introduction to Computer Language

Time: 02 (Two) hours

Full Marks: 60

N.B. : (i) Answer all the questions from each PART
(iii) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART
(iv) Special Instruction (if any)-----N/A-----

Part A
[Answer all the questions]

1. a) What is a computer? 2
- b) What is use of C programming real life? 2
- c) Explain the history of evolution of computer. 5
- d) Draw and describe the Von-Neumann Architecture. 6
2. a) What are the basic data types available in C? Give examples. 3
- b) What is the difference between while () and do..while() loops? 3
- c) What are the errors of this code, rewrite the whole code without error- 4
- ```
#include <stdio.h>
int main() {
 int num = 10;
 if num > 5 {
 printf("Number is greater than 5\n")
 }
 else (num <= 5){
 printf("Number is 5 or less\n");
 }
 return 0;
}
```
- d) What are the errors of this code, rewrite the whole code without error- 5
- ```
#include <stdio.h>
int main() {
    int num = 10;
    if num > 5 {
        printf("Number is greater than 5\n")
    }
    else (num <= 5){
        printf("Number is 5 or less\n");
    }
    return 0;
}
```

OR

- a) What is a bus in computer architecture? 2
- b) Differentiate between primary memory and secondary memory with examples. 3
- c) Convert $(1011)_2$ to decimal. 5
- d) Draw and label the basic architecture of a computer. 5

Part B
[Answer all the questions]

3. a) List different types of operators in C and give an example of each. 3
- b) Explain the use of if...else statement with a syntax example. 4
- c) Write a C program to print the following pattern: 8
- ```
1
1 2
1 2 3
1 2 3 4
```
4. a) What is recursion in C programming? What is the base condition? 2
- b) What is the difference between strlen() and sizeof() when used on strings in C? Explain the role of the #include <string.h> directive in C. 4
- c) What will be the output of the following code? - char a[10] = "Data";  
char b[10] = "Base";  
strcat(a, b);  
printf("%s", b); 4
- d) Write a code in C programming language to check a number is Palindrome or not. 5

**OR**

- a) What is function in C programming? 1
- b) Write the syntax for defining a simple class in C++. 2
- c) Give the output - 6
- ```
#include <stdio.h>
struct Student {
    int id;
    float marks;
};
int main() {
    struct Student s1 = {101, 85.5};
    struct Student s2;
    s2.id = s1.id + 10;
    s2.marks = s1.marks + 5;
    printf("Student 1: ID = %d, Marks = %.1f\n", s1.id, s1.marks);
    printf("Student 2: ID = %d, Marks = %.1f\n", s2.id, s2.marks);
    return 0;
}
```
- d) Write a C++ code to print a Fibonacci series up to n numbers using recursive function. 6

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Department of Electrical and Electronic Engineering

Final Examination, 2024
Course No: SSS 0312-1101
Time: 03 (Three) hours

1st year 1st semester
Course Title: History of the Emergence of Independent Bangladesh
Full Marks:60

N.B. : (i) Answer all questions from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Using pen or pencil for drawing will not affect your marks

PART A

1. (a) What is the 'Two Nations Theory'? 03
(b) Why the proposal of United Bengalee was not implemented? 07
2. (a) When and why our language movement took place? 03
(b) What is the significance of our language movement in 1952 07
3. (a) What is military rule? 03
(b) Described the merits and demerits of military rule. 07

Or,

What is your opinions on the military rule in a democratic state 10

PART B

4. (a) What is six points demand? 03
(b) Was the six points demand politically inevitable in 1966? 07
5. (a) Why did the mass-uprising in 1969 took place? 03
(b) What was the significance of mass-uprising 1969? 07
6. (a) Why the 1971 is important in our life? 03
(b) How did we get our victory on December 16th, 1971? 07

Or,

Narrate an essay on the war of our Liberation in 1971. 10

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Department of Electrical and Electronics Engineering

Final Examination, 2024

Course No: MATH 0541-1103E

Time: 03(Three) hours

1st year 1st semester

Course Title: Complex Variable and Vector Analysis

Full Marks: 60

N.B.: (i) Answer all question from each PART

(ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin

(iv) Special Instruction (if any)-----N/A-----

PART A

1. (a) Define Modulus of a complex number. For any two complex numbers z_1 and z_2 prove that $|z_1 + z_2| \leq |z_1| + |z_2|$ 1+3=4
- (b) Define conjugate complex number. Describe geometrically the regions: 1+5=6
- i) $2 \leq |z + i| \leq 5$
- ii) $\text{Im}\left(\frac{1}{z}\right) \leq \frac{1}{2}$;
- where z is a complex number.
2. (a) Define limit and continuity of a complex function. 3
- (b) Show that the function $f(z) = \begin{cases} \frac{(1+i)x^3 - (1-i)y^3}{x^2 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ 7
- is continuous and that the C-R equations are satisfied at $(0, 0)$.
3. (a) Define Harmonic function. Prove that the function $u = 3x^2y + 2x^2 - y^3 - 2y^2$ is harmonic. Find its harmonic conjugate and express $u + iv$ as an analytic function of z . 1+4=5
- (b) Show that $\oint_C \frac{e^{tz}}{z + \frac{\pi}{2}} dz = 2\pi i \sin t$, where C is the circle $|z| = 3$. 5

OR

- (a) Define residues. State and prove the Cauchy's residues theorem. 1+4=5
- (b) Evaluate the integral $\oint_C \frac{e^{-iz}}{(z+3)(z-i)^2} dz$, $C = \{z: z = 1 + 2e^{i\theta}, 0 \leq \theta \leq 2\pi\}$ 5
- using Cauchy's residue theorem.

PART-B

4. (a) State and prove the Tailors theorem for the complex function. 5
- (b) Evaluate the integration by contour method $\int_0^{2\pi} \frac{d\theta}{5+4\cos\theta}$ 5
5. (a) Define divergence of a vector function. Show that 1+4=5
 $\text{div} (\underline{A} \times \underline{B}) = \underline{B} \cdot (\underline{\nabla} \times \underline{A}) - \underline{A} \cdot (\underline{\nabla} \times \underline{B})$
- (b) Define Gradient of a scalar function. Show that $\nabla r^n = nr^{n-2}\underline{r}$ and hence show 1+3+1=5
that $\underline{\nabla} \cdot \underline{r} = 3$
6. (a) State and prove the Gauss divergence theorem. 5
- (b) Verify Green's theorem in the plane for $\oint_C (xy + y^2)dx + x^2 dy$ 5

where C is the closed curve bounded by $y = x$ and $y = x^2$.

OR

- (a) Verify Stoke's theorem where $\vec{A} = (2x - y)\hat{i} + yz^2\hat{j} - y^2z\hat{k}$ and S is the upper surface of the sphere $x^2 + y^2 + z^2 = 9$ and C is its boundary. 05
- (b) Find the equations of the tangent plane and normal line to the surface 05
 $x^2 + y^2 + z^2 = 9$ at the point (2, -1, 2).