

Hall Ticket Number :									
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**R-20**

**Code: 20AC21T**

I B.Tech. II Semester Supplementary Examinations December 2023

## Differential Equations and Vector Calculus

(Common to all Branches)

Max. Marks: 70

Time: 3 Hours

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- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. In Part-A, each question carries **Two marks**.  
 3. Answer **ALL** the questions in **Part-A** and **Part-B**

### PART-A

(Compulsory question)

- |   |   | CO | BL |
|---|---|----|----|
| 1. Answer ALL the following short answer questions ( 5 X 2 = 10M )                                    |   |    |    |
| a) Find the particular integral of $(D^2 - 2D + 1)y = e^{3x}$   | 1 | 1  | 2  |
| b) Write the second order Legendre's Linear Equation form   | 2 | 2  | 3  |
| c) Solve p-q=1  | 3 | 3  | 2  |
| d) Find curl F at the point (1,2,3) given $F = (x^2yz\mathbf{i} + xy^2z\mathbf{j} + xyz^2\mathbf{k})$ | 4 | 3  | 3  |
| e) State Gauss Divergence Theorem   | 5 | 3  | 3  |

### PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

- |   |     |   |   |
|---|-----|---|---|
|   |     |   |   |
| <b>UNIT-I</b>   |     |   |   |
| 2. Solve $(D - 2)^2 y = e^{2x} + \sin 2x + x^2$   | 12M | 1 | 3 |
| <b>OR</b>   |     |   |   |
| 3. Solve $(D^2 + 3D + 2)y = e^{-x} + x^2 + \cos x$  | 12M | 1 | 3 |
| <b>UNIT-II</b>  |     |   |   |
| 4. Solve $x^2 \frac{d^2 y}{dx^2} + -2x \frac{dy}{dx} - 4y = x^2 + 2 \log x$   | 12M | 2 | 3 |
| <b>OR</b>   |     |   |   |
| 5. An uncharged capacitor of capacity C is charged by applying an e. m.f $\frac{Es \sin t}{\sqrt{LC}}$ through leads of self-inductance L and negligible resistance, prove that at any time t, the charge on one of the plates is $\frac{EC}{2} \left\{ \sin \frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}} \cos \frac{t}{\sqrt{LC}} \right\}$ | 12M | 2 | 3 |
| <b>UNIT-III</b>   |     |   |   |
| 6. a) Form the partial differential equation by eliminating arbitrary functions f and g from $z = f(x+at) + g(x-at)$  | 6M  | 3 | 3 |
| b) Identify the appropriate form and solve $p^2 + q^2 = x + y$  | 6M  | 3 | 3 |

OR

7. Using the method of separation of variables solve  
 $3 \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0, u(x, 0) = 4e^{-x}$

12M 3 3

## UNIT-IV

8. a) Find the directional derivative of  $f = x^2 - y^2 + z^2$  at the point  $p(1, 2, 3)$  in the direction of the line PQ.

Where Q is the point  $(5, 0, 4)$ 

6M 4 3

- b) Find  $\text{div } \vec{F}$  and  $\text{Curl } \vec{F}$  where  
 $\vec{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$

6M 4 3

OR

9.  $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$   
 Identify whether the above vector is irrotational or not. If so, find its scalar potential

12M 4 3

## UNIT-V

10. Using Green's theorem, evaluate  $\int_C (y - \sin x)dx + \cos y dy$  where C is the plane triangle enclosed by the lines  $y = 0, x = \frac{\pi}{2}$  and  $y = \frac{2x}{\pi}$

12M 5 3

OR

11. Apply Stokes theorem to evaluate  $\int_C (y dx + z dy + x dz)$  where C is the curve of intersection of  $x^2 + y^2 + z^2 = a^2$  and  $x + z = a$

12M 5 3

\*\*\* End \*\*\*

**Code: 20A224T**

I B.Tech. II Semester Supplementary Examinations December 2023

**Electrical Circuits and Technology**  
(Electronics and Communication Engineering)

Max. Marks: 70

Time: 3 Hours

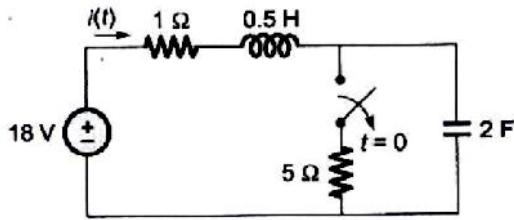
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- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. In Part-A, each question carries **Two marks**.  
 3. Answer **ALL** the questions in **Part-A** and **Part-B**

**PART-A**

(Compulsory question)

1. Answer ALL the following short answer questions ( 5 X 2 = 10M ) CO BL  
 a) Determine the initial conditions of inductor and capacitor shown in the circuit.



- b) Define bandwidth and the impact of resistance on bandwidth. CO1 L3  
 c) Express the symmetric and reciprocity condition of a network in terms of transmission parameters. CO2 L2  
 d) Mention the merits and demerits of electric braking. CO3 L2  
 e) A 3-phase, 50Hz Squirrel cage induction motor runs at 4% slip. What will be the frequency of rotor currents? CO4 L2

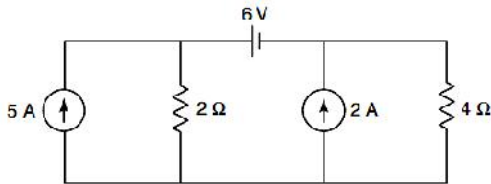
**PART-B**

Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )

Marks CO BL

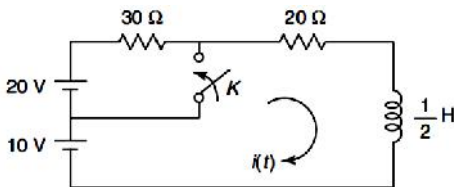
**UNIT-I**

2. a) Find the current in 2 ohm resistor of the Fig. shown below using Source Transformation



6M CO1 L3

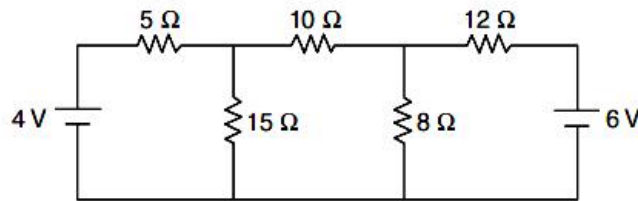
- b) For the given network, a steady state is reached with the switch K open. At t=0, the switch K is closed. Find the current i(t) for t > 0.,



6M CO1 L4

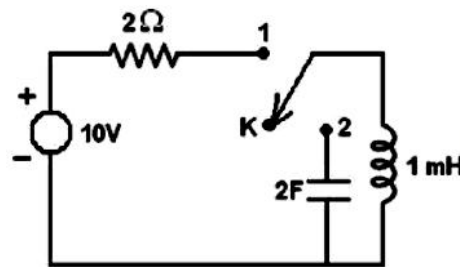
OR

3. a) Find the current through 8 ohm resistor in the circuit shown below using Mesh analysis



6M CO1 L4

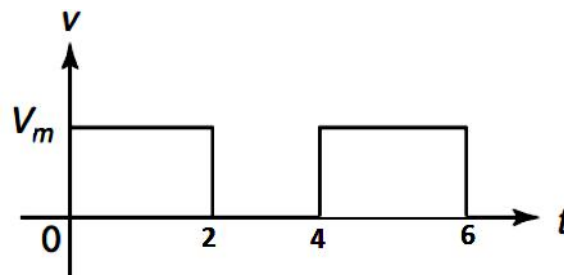
- b) For the circuit given in figure steady-state conditions are reached for the switch K in position '1'. At  $t = 0$ , the switch is changed to position 2. Use the time domain method to determine the current through the inductor for all  $t > 0$ .



6M CO1 L4

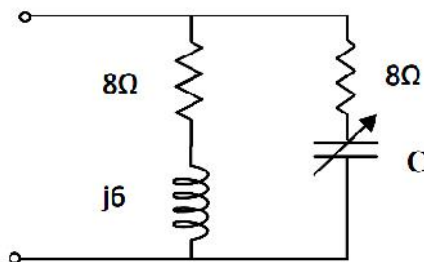
UNIT-II

4. a) Find the rms value of the voltage waveform of Figure shown below.



6M CO2 L3

- b) Find C which results in resonance in the circuit shown in Figure when  $\omega = 5000 \text{ rad/s}$ .



6M CO2 L3

OR

5. a) An RLC series circuit has a current which lags the applied voltage by  $45^\circ$ . The voltage across the inductance has a maximum value equal to twice the maximum value of voltage across the capacitor. Voltage across the inductance is  $300\sin(1000t)$  and  $R = 20 \text{ W}$ . Find the value of inductance and capacitance.

6M CO2 L3

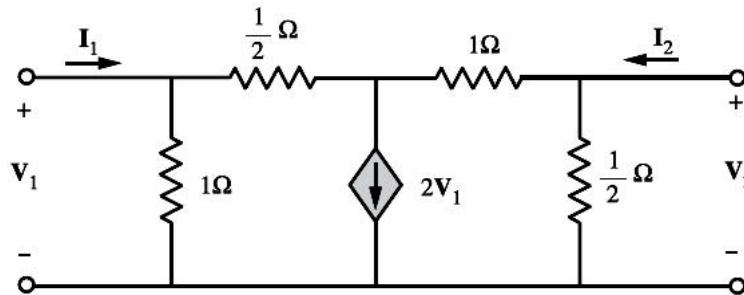
- b) A series RLC circuit is connected across a variable frequency supply and has  $R = 12$  ohms,  $L = 1$  mH and  $C = 1000$  PF. Calculate resonant frequency, Q factor and cut of frequencies.

6M CO2 L3

UNIT-III

6. a) Express  $h$  parameters in terms of admittance parameters for a generalized network.  
 b) Find the transmission parameters for the two-port network shown in Figure.

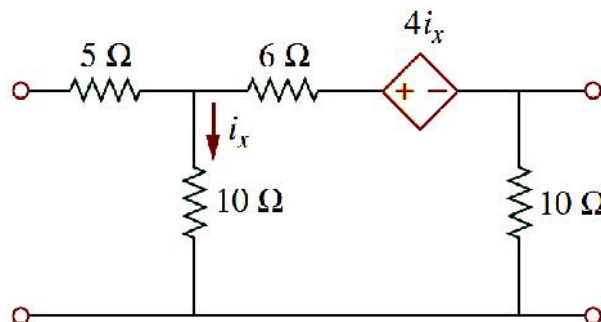
6M CO3 L2



6M CO3 L4

OR

7. a) Find the  $h$  parameters of the network in figure. Investigate whether the network is symmetrical and reciprocal.



6M CO3 L4

- b) The following measurements were made on a two-port resistive circuit: With port 1 open,  $V_2 = 15$  V,  $V_1 = 10$  V, and  $I_2 = 30$  A; with port 1 short-circuited,  $V_2 = 10$  V,  $I_2 = 4$  and  $I_1 = -5$  A. Calculate the  $z$  parameters.

6M CO3 L3

UNIT-IV

8. a) Explain the significance of back EMF of a DC motor. Derive the torque equation of a DC motor.  
 b) A 4-pole, 220V shunt motor has 540 lap-wound conductors. It takes 32 A from the supply mains and develops output power of 5.595 kW. The field winding takes 1 A. The armature resistance is 0.09 and the flux per pole is 30mWb. Calculate (i) the speed and (ii) the torque developed in N-m.

6M CO4 L2

6M CO4 L3

OR

9. a) Draw and explain the speed-torque characteristics DC shunt motor. Write the applications of it. 6M CO4 L2
- b) A 250 volt DC shunt motor has armature resistance of 0.25ohm, on load it takes an armature current of 50 A and runs at 750 rpm. If the flux of motor is reduced by 10% without changing the load torque, find the new speed of the motor. 6M CO4 L3

<b>UNIT-V</b>
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10. a) Discuss the effect of variations of frequency and voltage on iron loss. How will you minimize the hysteresis and eddy current loss that occur in a transformer? 6M CO5 L2
- b) A 100kVA, 2000/200V, 50Hz single phase transformer has an impedance drop of 10% and resistance drop of 5%. Calculate the (i) regulation at full load 0.8pf lagging and (ii) value of pf at which regulation is zero. 6M CO5 L3

OR

11. a) Derive an expression of rotor frequency in terms of main supply frequency and slip. 6M CO5 L2
- b) A 3-phase, Slip-ring, induction motor with star-connected rotor has an induced e.m.f of 120 Volts between slip-rings at standstill with normal voltage applied to the stator. The rotor winding has a resistance per phase of 0.3 Ohm and standstill leakage reactance per phase of 1.5 Ohm. 6M CO5 L3

\*\*\* End \*\*\*

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<b>R-20</b>
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**Code: 20A222T**

I B.Tech. II Semester Supplementary Examinations December 2023

**Fundamentals of Electronic Devices and Circuits**

(Electrical and Electronics Engineering)

Max. Marks: 70

Time: 3 Hours

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- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. In Part-A, each question carries **Two marks**.  
3. Answer **ALL** the questions in **Part-A** and **Part-B**

**PART-A**

(Compulsory question )

- |  |    |    |
|--|----|----|
| 1. Answer ALL the following short answer questions ( 5 X 2 = 10M ) | CO | BL |
| a) What is meant by Diffusion Current in a Semi-conductor?         | 1  | L2 |
| b) Draw the Common collector configuration circuit                 | 2  | L1 |
| c) What are the h-parameters                                       | 3  | L2 |
| d) What is the Pinchoff voltage in JFET                            | 4  | L1 |
| e) Mention any two applications of Tunnel Diode                    | 5  | L2 |

**PART-B**

Answer *five* questions by choosing one question from each unit ( 5 x 12 = 60 Marks )

Marks CO BL

**UNIT-I**

- |  |    |     |    |
|--|----|-----|----|
| 2. a) Discuss PN diode VI characteristics with neat sketch                           | 6M | CO1 | L2 |
| b) With circuit and necessary waveforms explain the operation of centered tapped FWR | 6M | CO1 | L2 |

**OR**

- |  |    |     |    |
|--|----|-----|----|
| 3. a) Explain about different Clamping circuits                        | 6M | CO1 | L2 |
| b) With simple circuit explain how Zener diode will act as a regulator | 6M | CO1 | L3 |

**UNIT-II**

- |  |    |     |    |
|--|----|-----|----|
| 4. a) Explain BJT Common Base configuration, with a neat diagram. Explain the common base input and output characteristics with necessary graphs | 8M | CO2 | L2 |
| b) Compare CE, CB and CC transistor configurations. Which is widely used? and why?   | 4M | CO2 | L3 |

**OR**

- |   |    |     |    |
|---|----|-----|----|
| 5. a) Draw the neat diagram of Self bias circuit. | 4M | CO2 | L1 |
|---|----|-----|----|

- b) An NPN transistor with  $\beta=50$  is used in a common emitter circuit with  $V_{CC} = 10V$ ,  $R_C = 2 K$ . The bias is obtained by connecting a  $100K$  resistance from collector to base. Assume  $V_{BE} = 0.7V$ . Find

(i) the quiescent point and (ii) the stability factor S 8M CO2 L3

**UNIT-III**

6. a) Explain how the transistor acts as an amplifier 5M CO3 L2  
 b) Analyze a single stage transistor amplifier using h-parameters 7M CO3 L4

**OR**

7. a) Draw the circuit diagram of CE amplifier with emitter resistance and obtain its equivalent hybrid model and derive expressions for  $A_I, R_I$  and  $A_V$ . Use approximate analysis 7M CO3 L3  
 b) Explain about the classification of Amplifiers 5M CO3 L2

**UNIT-IV**

8. a) Explain the drain characteristics of JFET 6M CO4 L2  
 b) Discuss self biasing of JFET 6M CO4 L3

**OR**

9. a) Differentiate between FET and MOSFET 4M CO4 L3  
 b) With neat structure explain the principle of operation of depletion MOSFET 8M CO4 L2

**UNIT-V**

10. a) Explain the V-I characteristics and the features of Tunnel diode 6M CO5 L2  
 b) Explain the working principle of LED with its characteristics 6M CO5 L2

**OR**

11. a) Draw the two transistor version of an SCR and explain its firing characteristics with this circuit 7M CO5 L3  
 b) Explain about Wide band gap devices and write the applications of SiC 5M CO5 L2

\*\*\* End \*\*\*



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<b>R-20</b>
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**Code: 20AC23T**

I B.Tech. II Semester Supplementary Examinations December 2023

**Chemistry**

(Common to EEE, ECE, and AI&ML )

Max. Marks: 70

Time: 3 Hours

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- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. In Part-A, each question carries **Two marks**.  
3. Answer **ALL** the questions in **Part-A** and **Part-B**

**PART-A**

(Compulsory question)

- |  |     |    |
|--|-----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO  | BL |
| a) Define electrolytic cell. Give any two examples.              | CO1 | L1 |
| b) What are primary batteries? Give two examples.                | CO2 | L1 |
| c) What are stereospecific polymers? Give examples.              | CO3 | L1 |
| d) Define electromagnetic spectrum.                              | CO4 | L1 |
| e) What are molecular switches? Give two examples.               | CO5 | L1 |

**PART-B**

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

**UNIT-I**

- |  |    |     |    |
|--|----|-----|----|
| 2. a) Describe the construction and working of a Calomel electrode with neat sketch. | 6M | CO1 | L2 |
| b) Distinguish between electrochemical cell and electrolytic cell.                   | 6M | CO1 | L2 |

**OR**

- |   |    |     |    |
|---|----|-----|----|
| 3. a) Discuss about polymer membrane electrode and give its significance. | 6M | CO1 | L4 |
| b) Discuss briefly about solid state ion-selective electrodes.            | 6M | CO1 | L4 |

**UNIT-II**

- |  |     |     |    |
|--|-----|-----|----|
| 4. Discuss about the chemical composition and the respective cell reactions involved in Zinc- air battery. Give its challenges and applications. | 12M | CO2 | L4 |
|--|-----|-----|----|

**OR**

- |  |     |     |    |
|--|-----|-----|----|
| 5. Describe the working principle and construction of propane -oxygen fuel cell with neat sketch. Give its applications. | 12M | CO2 | L2 |
|--|-----|-----|----|

**UNIT-III**

- |  |     |     |    |
|--|-----|-----|----|
| 6. Discuss about the detailed preparation, properties, and applications of Bakelite. | 12M | CO3 | L2 |
|--|-----|-----|----|

OR

7. a) Discuss about coordination addition polymerization (Ziegler-Natta Catalysis) with suitable example. 6M CO3 L4
- b) Give the preparation and applications of the following polymers. i) Nylon-6 ii) Buna-S 6M CO3 L2

UNIT-IV
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8. a) Discuss about the principle and working of a gas chromatography with suitable example. 6M CO4 L4
- b) Describe the working principle and applications of UV-Visible spectroscopy. 6M CO4 L2

OR

9. Write short note on
- i) pH metry
- ii) Potentiometry
- iii) Conductometry 12M CO4 L2

UNIT-V
--------

10. a) What are artificial molecular machines? Explain with suitable examples. 6M CO5 L2
- b) Discuss about an autonomous light-powered molecular motor. 6M CO5 L4

OR

11. a) Discuss about the systems based on Catenanes 6M CO5 L4
- b) Discuss about the acid-base controlled molecular shuttle. 6M CO5 L4

\*\*\* End \*\*\*

Hall Ticket Number :

**R-20**

**Code: 20AC25T**

I B.Tech. II Semester Supplementary Examinations December 2023

## **Communicative English**

(Common to EEE, ECE and AI&ML)

Max. Marks: 70

Time: 3 Hours

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- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. In Part-A, each question carries **Two marks**.  
3. Answer **ALL** the questions in **Part-A** and **Part-B**

### **PART-A**

(Compulsory question)

1. Answer **ALL** the following short answer questions ( 5 X 2 = 10M )
- |   | CO  | BL |
|---|-----|----|
| a) What is Hazlitt's reason when he sends his son to school?                                      | CO1 | L2 |
| b) Which lines are repeated in the poem "The Brook"? What do they mean?                           | CO1 | L2 |
| c) What are the two dynasties mentioned in the story "The Death Trap"?                            | CO1 | L2 |
| d) Explain the attitude of Yunus' mother towards the poor and the needy.                          | CO1 | L2 |
| e) What are the two characteristics of modern language usages that are despised by George Orwell? | CO1 | L2 |

### **PART-B**

Answer **five** questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

#### **UNIT-I**

2. Do you think that the pieces of advice given by William Hazlitt are still relevant? If yes, explain their relevance. 12M CO3 L4

**OR**

3. a) Change the following statements into questions.
- Students are learning their lessons.
  - The tiger mauled the deer.
  - He has spent a lot of time working on his computer.
  - We won accolades for our performance.
  - The dog was playing with a bone.
  - We have been going to college for three years.
- 6M CO3 L3
- b) Identify the parts of speech for the underlined words in the following sentences.
- I ran fast but I missed the train.
  - Barrowed garments never fit well.
  - He is afraid of fireworks.
- 6M CO3 L3

#### **UNIT-II**

4. Develop the following hints into a well - constructed paragraph:  
Regular exercise – benefits both physically and mentally – improves health – running, swimming and cycling strengthen us – plays crucial role in weight management – burns calories – builds muscle mass – reduces symptoms of stress – releases endorphins – contributes to sense of happiness – cures insomnia – long-term benefits – contributes to healthier life style. 12M CO2 L4

OR

5. Describe the brook's journey before it flows through Phillip's farm. 12M CO2 L4

## UNIT-III

6. Justify the title of Saki's play "The Death Trap". 12M CO3 L4

OR

7. a) Rearrange the following jumbled sentences below so as to have a well-written paragraph.

- i. We should make sure we get this right.
- ii. Second, it is crucial that a startup has a great team.
- iii. Many people may be able to spin out great ideas but it is essential to have clarity on who would pay for our product and why.
- iv. Finally, let's not forget about the funds. Money is the key factor because without it we can't run a business.
- v. The success of a startup depends upon a committed, capable and experienced team.
- vi. To sum up, a good product is the foundation on which we can form a successful business using the funds procured from various sources.
- vii. Firstly, it is important to have a viable product.

7M CO4 L3

b) Put the verbs in brackets in the correct form.

- i. I \_\_\_\_\_ never \_\_\_\_\_ skiing. (try)
- ii. Patel \_\_\_\_\_ that historians have misinterpreted the period. (say)
- iii. Sohail \_\_\_\_\_ the silver medal in the sprint last year. (win)
- iv. Dad can't answer the phone right now; he \_\_\_\_\_ (drive)
- v. If I \_\_\_\_\_ early this morning, I would not have missed the bus. (wake up)

5M CO3 L3

## UNIT-IV

8. How did the Grameen Bank help the impoverished women of Bangladesh? 12M CO4 L4

OR

9. Prepare an analytical essay on the topic, "The Impact of Social Media in the Society." 12M CO4 L4

## UNIT-V

10. Correct the following sentences:

- a) He climbed across the wall and ran until the main road.
- b) Padma congratulated Tenzin for his promotion.
- c) We must try harder to stop these people from destroying the nature.
- d) Working in the lab for hours, my feet began to hurt.
- e) One of my friend is coming today.
- f) The people of the district are happy. Because a Medical College will be set up here in a year.
- g) When I will arrive at the airport, I will call you.
- h) Let us discuss about tomorrow's programme.
- i) She returned back home and collapsed on the bed late at night.
- j) I have gone out yesterday.
- k) Though the machine was new, but it did not work.
- l) The bag was very heavy that I could not carry it.

12M CO3 L3

OR

11. What do Orwell's five examples have in common? 12M CO2 L4

\*\*\* End \*\*\*