SECTION A (50 Marks)

*Compulsory: Attempt **all** questions.*

Question 1.

(a) ***Direction: For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there are more than one circled, NO score will be awarded.*** **[25]**

i. A glass of wine was tilted as shown in the figure, but it did not topple over. Where is its centre of gravity?

A 1
B 2
C 3
D 4

ii. Which one of the following is **NOT** a factor affecting the pressure exerted on a body by a fluid?

A depth of the fluid
B density of the fluid
C volume of the fluid
D acceleration due to gravity

iii. One joule is equal to

A 10^4 erg.
B 10^5 erg.
C 10^6 erg.
D 10^7 erg.

iv. The expression for Ohm's law is

A $I = \frac{Q}{t}$.
B V = IR.
C I = VR.
D R = IV.

v. Sonam has installed a burglar alarm in his home. The alarm is set off by using

A ultraviolet rays.
B infrared rays.
C gamma rays.
D x-rays.

vi. The explosion caused when massive stars collapse under their own gravity is called

A supernova.
B proto planets.
C big crunch.
D dark nebula.

(The information below is to be used to answer question number vii.)

Pedalling of bicycle Opening of bottle cap Turning of key in a lock Opening and closing of water tap

vii. Which one of the following is **TRUE** in the above activities?

A The forces are unequal.
B It produces moment of couple.
C Resultant force is equal to zero.
D Two forces are acting in a straight line.

viii. What causes the balloon to rise?

A change in pressure
B difference in air density
C transmission of pressure
D acceleration due to gravity

ix. There is no work done in a person standing with a bucket of water because

A there is no displacement.
B displacement is along the force.
C displacement is against the gravity.
D displacement is in opposite direction to the force.

x. Which of the following is **TRUE** about resistivity of a conductor?

A It does not depend upon temperature.
B It does not depend upon the nature of the material.
C It does not depend upon the shape of the material.
D It does not depend upon resistance of the material.

xi. Mr. Dorji in Thimphu is able to talk with his father in Trashigang using a mobile service. Such communication is made possible due to

A radiowaves.
B microwaves.
C infrared radiations.
D ultraviolet radiations.

xii. Which of the following values would be used to calculate weight?

I mass of the Earth
II mass of the object
III radius of the Earth
IV acceleration due to gravity

A I only
B I and II
C II and IV
D III and IV

xiii. Miss Dema applies a force of 10N at the handle of a wrench that is 15cm from the fulcrum. The moment of force will be

A 1·5 Nm.
B 10·15 Nm.
C 25 Nm.
D 150 Nm.

xiv. An ice cube of density 900 kg/m^3 and volume $0{\cdot}5m^3$ falls into a bucket of water. Calculate its buoyant force. Take the value of g = 10 ms^{-2}.

A 45 N
B 450 N
C 1800 N
D 4500 N

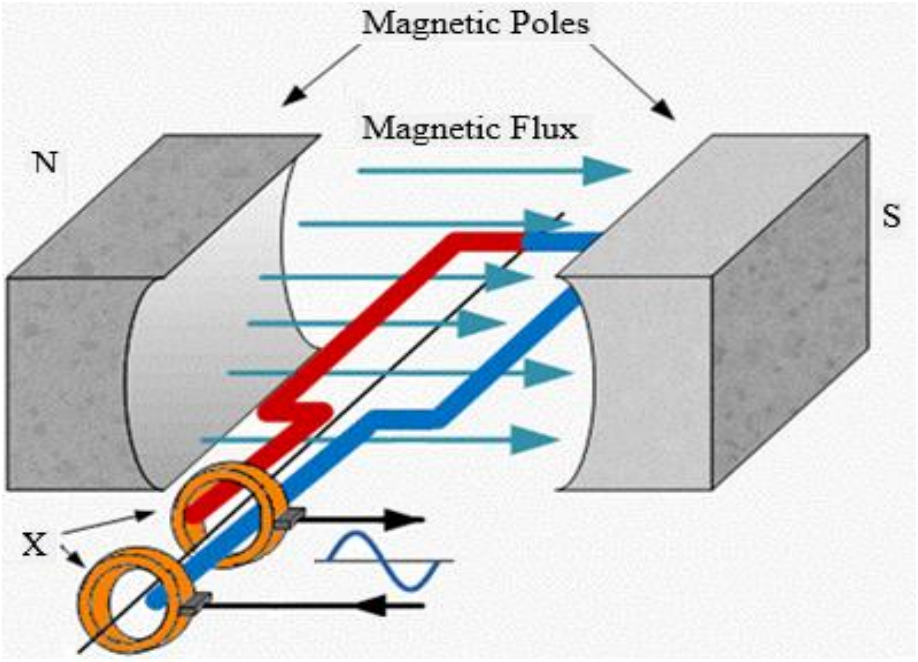
xv. The table below shows the mass and velocity of different types of ball.

Types of ball	Mass	Velocity
tennis ball	0·3 kg	75m/s
football	0·5 kg	50 m/s
volley ball	0·4 kg	55 m/s
basket ball	0·6 kg	45 m/s

Which ball possesses maximum kinetic energy?

A football
B tennis ball
C volley ball
D basket ball

xvi. The diagram below is an a.c generator.



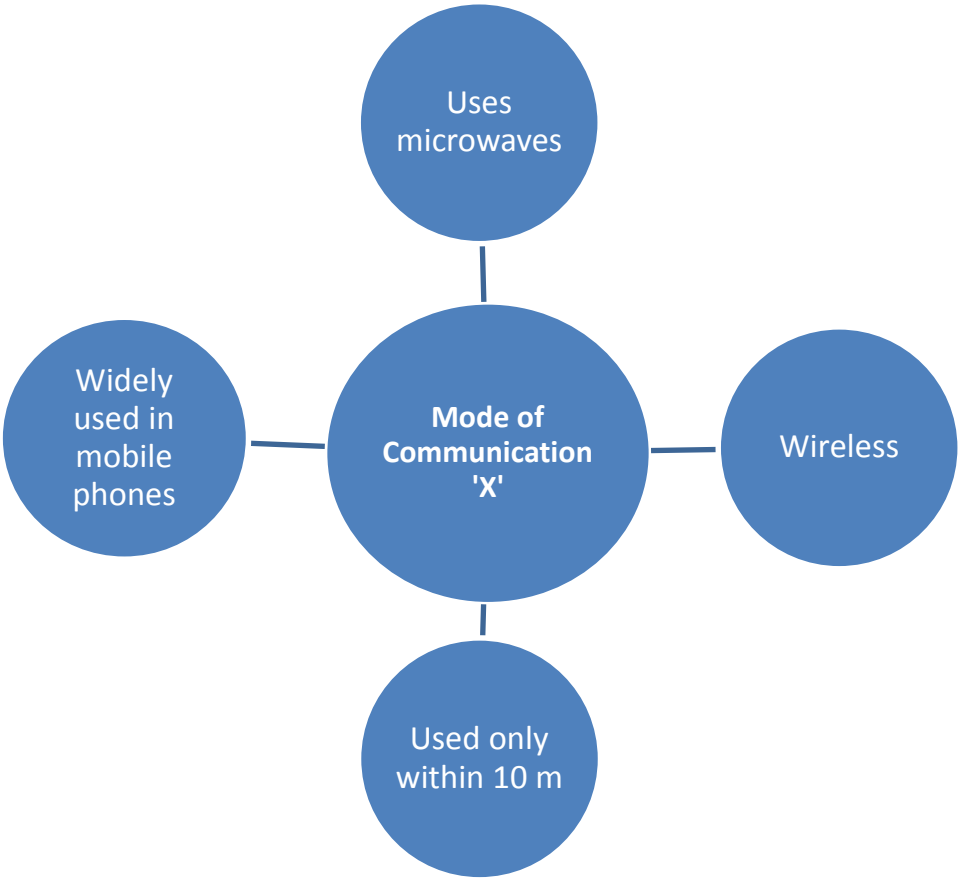
Name the part labelled X.

A brushes
B armature
C slip rings
D split rings

xvii. Hydraulic machines are used in excavators because they

A multiply work.
B are user friendly.
C decrease the speed.
D act as force multipliers.

xviii.



What is 'X'?

A Wi-fi
B Zigbee
C Bluetooth
D Broad band

xix. The correct time line for the formation of the Solar System is

A	Big bang →	Universe →	Stars →	Solar system.
B	Stars →	Universe →	Big bang →	Solar system.
C	Universe →	Big bang →	Stars →	Solar system.
D	Stars →	Big bang →	Universe →	Solar system.

xx. Electrical appliances like rice cookers and hair dryers have wires with

A low resistance and high melting point.
B high resistance and low melting point.
C low resistance and low melting point.
D high resistance and high melting point.

xxi. The constant maximum velocity reached by a falling body under the attraction of gravity is known as

A final velocity.
B initial velocity.
C terminal velocity.
D instantaneous velocity.

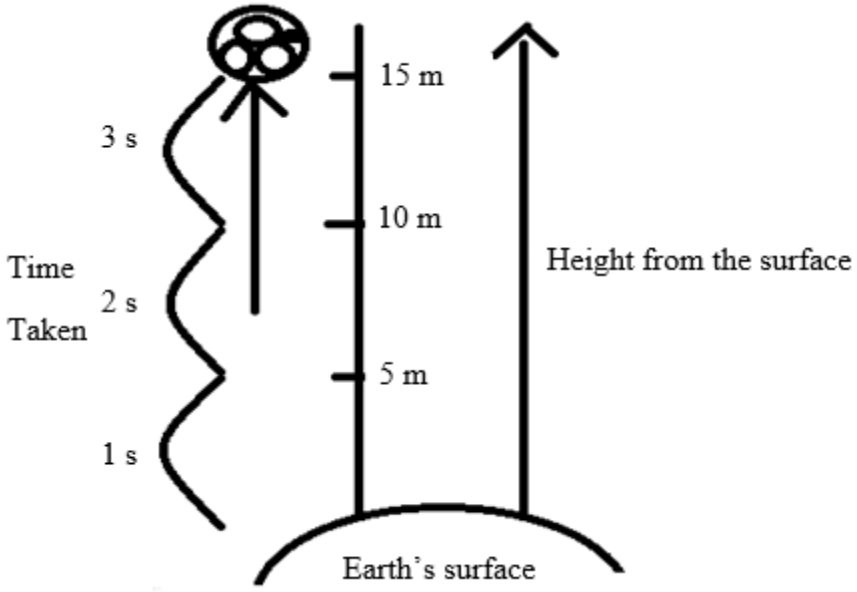
xxii. The statement that best describes gamma rays is they

A lie beyond the red end of the visible light.
B are used to locate fractures in the body.
C have lowest frequency and highest wavelength.
D have highest frequency and lowest wavelength

xxiii. The galaxy we live in is called the

A Earth.
B Universe.
C Milky Way.
D Solar System

(Use the diagram to answer the Question xxiv.)



xxiv. Identify the resistive force responsible in the above phenomenon.

A gravitational force
B electrical force
C magnetic force
D tension force.

xxv. The secondary current in a transformer can be decreased by

A increasing the number of turns in primary coil.
B decreasing the number of turns in primary coil.
C decreasing the number of turns in secondary coil.
D increasing the number of turns in secondary coil.

b. **Match each item under Column A with the most appropriate item in Column B. Rewrite the correct matching pairs in the space provided.** **[5]**

Column A	**Column B**
1. Deals with the system in equilibrium	a. F x V
2. Power of a machine	b. radiowaves
3. Potential difference in an open circuit	c. microwaves
4. Longest electromagnetic waves	d. emf
5. Spectral signature	e. terminal voltage
	f. $\frac{F}{V}$
	g. statics
	h. biomarkers

1.
2.
3.
4.
5.

c. **Fill in the blanks by writing the most suitable word(s).** **[5]**

i. The force that accelerates a falling body is a force of

_____.

ii. A blunt knife exerts _____ pressure than a sharp knife.

iii. The amount of work done in taking the body to the required position measures

_____ energy.

iv. The voltage loss due to internal resistance in a circuit is called

_____.

v. Law of universal gravitation describes the relationship between gravitational

force, _____ and distance.

d. **Correct and rewrite the following statements by changing only the underlined words.** **[5]**

i. The drag force is <u>less than</u> the driving force when the body is at terminal velocity.
ii. The disadvantage of using <u>solar energy</u> is that it releases greenhouse gases trapped in the core of the Earth.
iii. Presence of free electrons in <u>insulators</u> help them to conduct electricity.
iv. Electromagnetic waves are <u>longitudinal</u> in nature.
v. Most planets travel in <u>perfect circular</u> orbit around the sun.

i.
ii.
iii.
iv.
v.

e. **Answer the following questions.**

i. State the principle of moments. **[1]**

ii. Which law supports the hydraulic machines? **[1]**

iii. A body builder lifts a dumb bell of mass 30kg to a height of 2m in 3 seconds. How many times does he need to lift the same dumb bell at a constant speed to develop a power of 1960 watt? **[2]**

iv. What is the S.I. unit of universal gravitational constant? **[1]**

v. What is the best way to reduce energy loss from our home? **[1]**

vi. Write down any **TWO** factors affecting resistance of a conductor? **[2]**

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vii. Cosmologists have postulated the two endings to the universe. What are they? **[2]**

SECTION: B [50 marks]

*Attempt **ANY FIVE** questions*

Question 2.

a) Wind energy should be used to generate more power in our country. Do you agree or disagree? Support your answer with **TWO** reasons. **[2]**

b) A seesaw in a children's park is 6m long which is pivoted at its centre. A child with a weight of 200 N sits at the end of the seesaw on the right side. Where should her friend of weight 300N sit to balance the seesaw? **[2]**

c) Iron pestle is preferred over a wooden pestle of the same size to grind peppers in a mortar. Give reasons. **[2]**

d) i. What is Cosmic Microwave Background? **[1]**

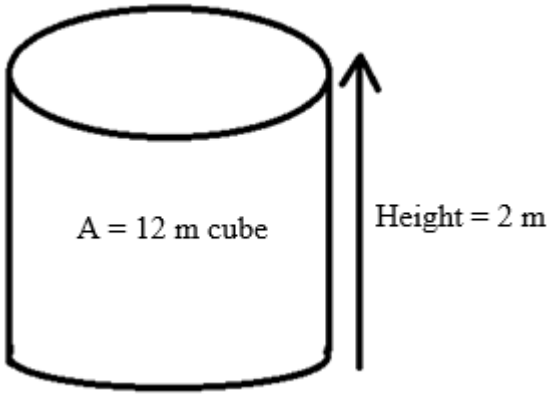
ii. Write any **ONE** property of Cosmic Microwave Background. **[1]**

e) Define work done and state its S.I. unit. **[2]**

Question 3.

a) Is it better to replace copper wire with aluminium wire for household electrification? Explain your answer. **[2]**

b) A barrel of mass 20,000kg lies on the ground. What is the pressure exerted on the surface? (Take g = 10 m/s^2) **[2]**

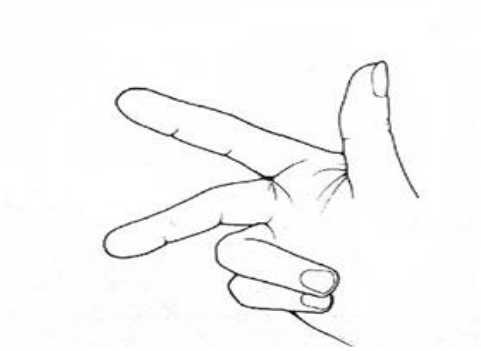


c) Write **TWO** differences between stable and unstable equilibrium. **[2]**

d) i. Define energy. **[1]**

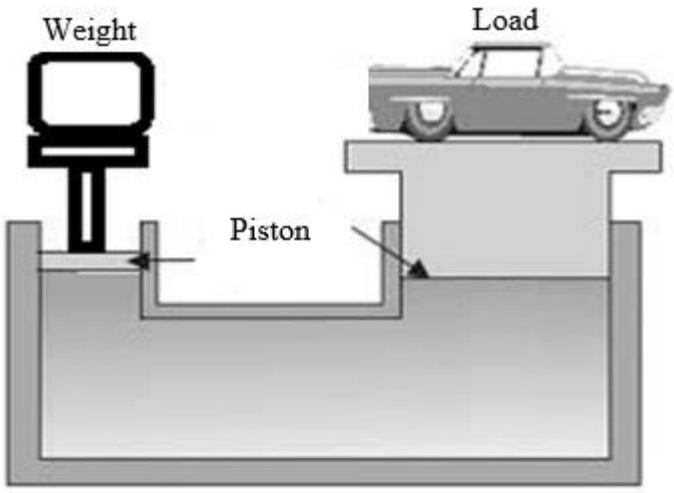
ii. State energy conversion in an a.c. generator. **[1]**

e) Name and explain the rule illustrated by the figure below. **[2]**



Question 4.

a) The diagram below shows the set-up to study hydraulic principle by placing different weights on the small piston.



The table below shows the result of this experiment.

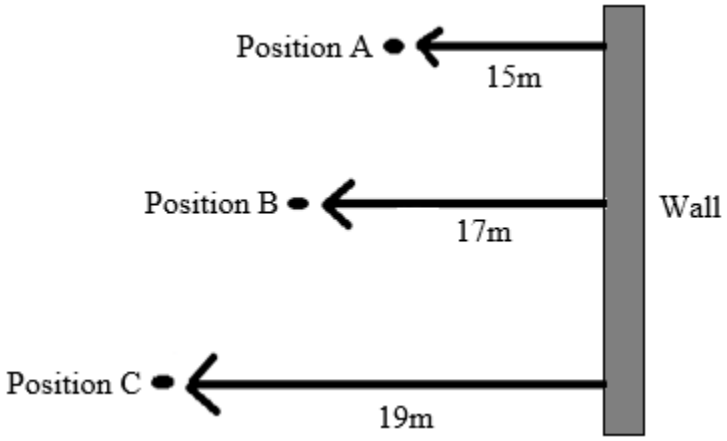
Weight (N)	4	8	10	18
Load (N)	6	12	15	27

i) What is the relationship between weight and load? **[1]**

ii) How can you lift a much heavier load by placing smaller weight on the small piston? **[1]**

b) A fully loaded elevator has a to tal mass of 200kg. If it rises 24 floors of 10m height each in 15 seconds, calculate the potential energy of the elevator. [g = 9·8 m/s^2] **[2]**

c) The figure given below shows a man blowing a whistle at different distances from the wall.



i. In which position will echo be heard at the earliest? **[1]**

ii. Which property of sound is discussed in the above figure? **[1]**

d) Why do you prefer LED bulbs to ordinary bulbs? **[2]**

e) How would you use the phenomenon of cosmological redshift to explain that the universe is expanding? **[2]**

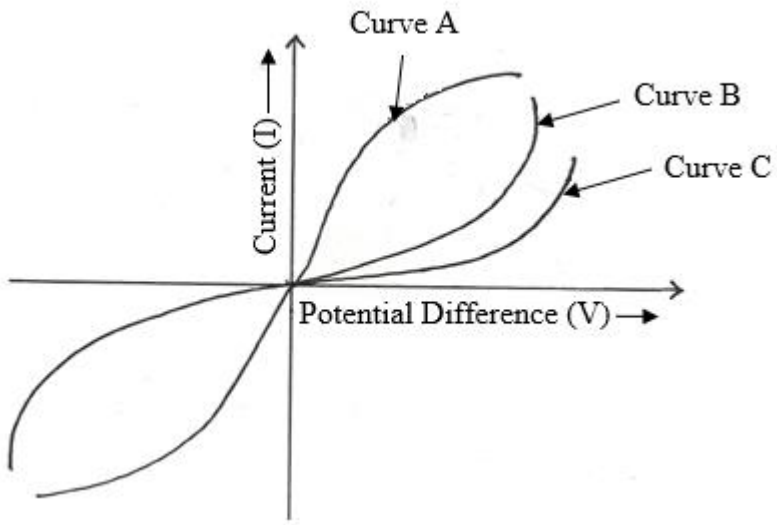
Question 5.

a) What do you understand by analogue signal and digital signal? **[2]**

Analogue signal	Digital signal

b) Explain the law of conservation of energy. **[1]**

c)



From the given diagram above, identify the curve representing I-V graph for a diode. Which evidence supports your identification? **[2]**

d) What are the **TWO** conditions for equilibrium? **[2]**

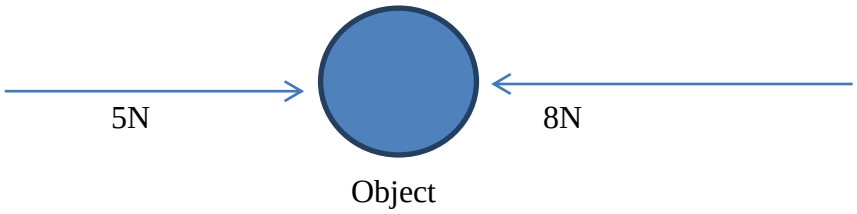
e) i. A water boiler has a resistance of 88Ω. How much current is drawn when a voltage of 220V is applied to it? **[1½]**

ii. A transformer steps down 220V to 44V. If the number of turns in the primary coil is 60 turns, what is the number of turns in the secondary coil? **[1½]**

Question 6.

a) Write down any **TWO** roles of gravity in the universe. **[2]**

b) Resultant force = 3N



From the above figure, state the following:

i. In which direction will the object move? **[1]**

ii. The definition of resultant force based on the above illustration. **[1]**

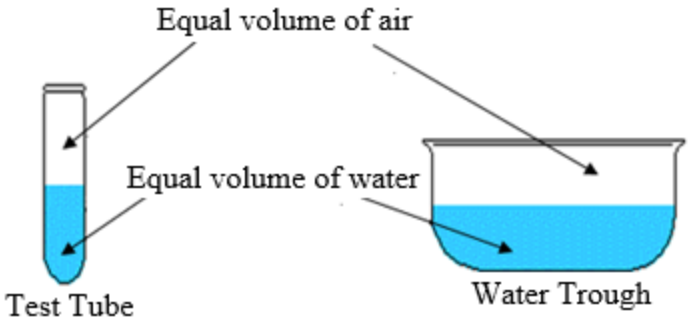
c) Explain why any practical machine is not 100% efficient. **[2]**

d) Arrange the following electromagnetic waves in increasing order of their frequencies. **[2]**

Ultraviolet radiation, Infrared radiation, Microwaves, X-rays

e) An electric blender with the resistance of 50Ω is connected to the voltage supply of 230V. Calculate the power. **[2]**

Question 7.



a) From the given figure, draw a conclusion about the pressure exerted on its surface of water. Support your conclusion with a reason. **[2]**

b) i. Use the information given below to illustrate the moment of a couple. **[1]**

Force = 20N **Perpendicular distance = 5m**

ii. Calculate the moment produced. **[1]**

c) How does the diffraction of radio waves help to broadcast radio and television programs? **[2]**

d) Write down the advantages of optical fibre over copper cables in telecommunication. **[2]**

e) Calculate the radius of the planet Mars whose acceleration due to gravity is g = 3.71m/s^2 and mass, m = 6.43 x 10^{23} kg. [G = 6.67 x 10^{-11} Nm^2kg^{-2}]. **[2]**

Rough work

Rough work

Rough work

Rough work