SCIENCE FACULTY

NORTH MAHARASHTRA UNIVERSITY, JALGAON

QUESTION BANK

FOR

F. Y. B. Sc.

PHYSICS

(With effect from June, 2007)

Board of Studies in Physics, North Maharashtra University Jalgaon.

Board of Studies in Physics, in its meeting held on 5th Nov. 2007, has unanimously accepted the question bank prepared by subcommittees appointed by board as per its earlier resolution. Following members were present.

1. Prof. Dr. R. S. Patil (Chairman)
2. Prof. S. A. Patil
3. Prof. Dr. L. A. Patil
4. Prof. Dr. P. P. Patil
5. Prof. S. Y. Mahajan
6. Prof. S. S. Sonawane
7. Prin. Dr. S. T. Pawar
8. Prof. Dr. S. K. Disawal
9. Prof. M. C. Patil

As per one of the resolution of meeting of BOS (Physics) dated 6th Aug. 2007, the following pattern of question paper is finalized.

Pattern of Question Paper

Time : Three Hours Total Marks: 80

Note: ALL questions are compulsory.

Q. 1	Objective type (Answer any eight out of ten)	16
Q. 2	Short answer type (Answer any four out of six)	16
Q. 3	Short answer type (Answer any four out of six)	16
Q. 4	a) Long answer type (Answer any two out of four)	12
	b) Short answer type (Compulsory)	04
Q. 5	Short answer type (Answer any four out of six)	16

Structure of question bank

(Question type and Mark wise distribution)

Course Title	Question Type			Total Marks
	Objective Type (2 Marks)	Short Answer (4 Marks)	Long Answer (4 Marks)	
Physics Paper I Section I : Mechanics and Properties of matter Section II : Heat and Thermodynamics	178	202	72	1496
Physics Paper II Section I : Electricity and Magnetism Section II : Applied Physics	225	294	81	2112

Subcommittees appointed for preparation of question bank

Physics Paper I **Section I : Mechanics and Properties of matter**	**Physics Paper I** **Section II : Heat and Thermodynamics**
Dr. S. K. Disawal (Convener), Jalgaon	Prof. S. S. Sonawane (Convener), Sakri
Dr. R. M. Shewale (Member), Dhule	Dr. D. V. Ahire (Member), Dhule
Dr. I. J. Patil (Member), Shahada	Prof. S. B. Patil (Member), Dhule
Prof. S. M. Patil (Member), Pachora	Prof. P. Z. Zambre, (Member), Dondaicha
Dr. H. K. Mahajan (Member), Dhule	Prof. S. J. Baviskar (Member),
Prof. V. R. Khadase (Member), Jalgaon	Prof. M. B. Ekhande (Member), Pimpalner
Prof. R. H. Bari (Member), Jamner	Prof. A. A. Patil (Member), Shirpur
Physics Paper I I **Section I : Electricity and Magnetism**	**Physics Paper I I** **Section II : Applied Physics**
Prof. M. C. Patil (Convener), Faizpur	Prof. S. R. Wagh (Convener), Chopada
Prof. N. W. Khodake (Member), Amalner	Prin. Dr. S. T. Pawar (Member), Raver
Prof. P. B. Ahirrao (Member), Dondaicha	Prof. D. R. Patil (Member), Parola
Prof. P. D. Patil (Member), Erandol	Prof. H. B. Gajare (Member), Jalgaon
Prof. S. U. Patil (Member), Raver	Prof. A. Y. Sonawane (Member), Nandurbar
Prof. L. T. Shimpi (Member), Chalisgaon	Prof. H. M. Patil (Member), Nandurbar
Prof. S. C. Chaudhari (Member), Faizpur	Prof. V. B. Suryawanshi (Member), Raver

QUESTION BANK

PHYSICS PAPER I

SECTION I: MECHANICS AND PROPERTIES OF MATTER

SECTION II: HEAT AND THERMODYNAMICS

PHYSICS PAPER I

SECTION I: MECHANICS AND PROPERTIES OF MATTER

Objective Type (2-Mark)

CHAPTER: - 01 PENDULUM

1. What is compound pendulum? Write the expression for its period.
2. Define centre of suspension and centre of oscillation.
3. What is torsional pendulum?
4. What is of Bifilar pendulum?
5. What do you meant by "Equivalent simple pendulum"?.
6. A circular disc is provided at its rim show that for small oscillations its time period is given by

$$T = 2\pi\left(\sqrt{\frac{3R}{2g}}\right)$$

7. What is compound pendulum? Write differential equation of angular SHM.
8. State the condition for maximum time period of a compound pendulum.
9. State the condition for minimum time period of a compound pendulum.
10. What is Bifilar suspension?
11. Draw neat-labeled diagram of Bifilar pendulum with parallel threads.
12. Write the expression for period of Bifilar pendulum with parallel threads. State meaning of each symbol.
13. Write the expression for centre of gravity of Bifilar pendulum with parallel threads. State meaning of each symbol.
14. The bar or cylinder used in Bifilar pendulum executes simple harmonic motion. Justify.
15. Draw neat-labeled diagram of Kater's pendulum.
16. Stating the meaning of each symbol write the equation for the 'g' of Kater's pendulum.

CHAPTER: - 02 MOTION UNDER CENTRAL FORCE FIELD.

1. State Newton's law of gravitation.
2. Define constant of gravitation. State its SI and CGS unit.
3. Define a) Gravitational potential, b) Gravitational field.

4. State any two Kepler's laws of planetary motion.
5. Calculate the mass of the earth from the following data
   g = 9.8 m/s^2, G= 6.67 X 10^{-11} MKS unit, R= 6.38 X 10^6 m.
6. Obtain an expression for gravitational potential due to a uniform solid state sphere at a point outside the sphere.
7. Define constant of gravitation. State its dimensions.
8. State the value of radial and transverse component of acceleration.
9. Using an expression for gravitational potential obtain an expression for gravitational field in case of spherical shell at a point outside the shell.
10. Using an expression for gravitational potential obtain an expression for gravitational field in case of spherical shell at a point inside the shell.
11. Using an expression for gravitational potential obtain an expression for gravitational field in case of solid sphere at a point inside the sphere.
12. A satellite revolves round a planet in an elliptical orbit. Its maximum and minimum distances from the planet are 1.5 X 10^{-7} m and 0.7 X 10^7 m respectively. If the speed of the satellite at the longest point be 5 X 10^3 m/s, calculate the speed at nearest point.
13. Assuming the earth's orbit around the sun to be a circular, calculate the angular velocity of the earth about the sun.
14. Assuming the earth's orbit around the sun to be a circular, what is its average linear speed. (Given R = 1.5 X 10^{-11} m).
15. Assuming the earth's orbit around the sun to be a circular, what is its centripetal acceleration (Given R = 1.5 X 10^{-11} m).
16. Explain the term gravitational potential.
17. Explain the term gravitational field.
18. If G = 6.6 X 10^{-11} Nm^2/kg. What is the force between two small spheres weighing 2 kg each placed 30 cm apart.
19. No work is done in moving an object from one point to another on the surface of a spherical shell. Explain.

CHAPTER: - 03 ELASTICITY

1. What is meant by Elasticity?
2. Distinguish between elastic body and plastic body
3. Define elasticity. Give its examples.

4. Define plasticity. Give its examples
5. Define Bulk Modulus. State its S.I units and dimensions.
6. Define Young's Modulus. State its S.I units and dimensions.
7. Define modulus of rigidity. State its S.I units and dimensions.
8. Define extensibility and compressibility of a material.
9. What do you understand by term "Geometrical moment of inertia"?
10. State the relation connecting the three Elastic constants.
11. Define Bending moment of a beam.
12. Define axis of bending and neutral axis.
13. State the expression for depression of cantilever when the load is fixed at the center. State the expression if the bar is rectangular.
14. State the expression for depression of cantilever when the load is fixed at the center. State the expression if the bar is circular.
15. What is cantilever? State the expression for the depression of free loaded end neglecting weight of cantilever.
16. Define Poisson's ratio. What is its limit?
17. State the relation between Young's modulus Y, Rigidity modulus n and Poisson's ratio σ.
18. Steel is more elastic than rubber. Justify.
19. Whether it is possible to have a material with negative value of Poisson's ratio? Justify.

CHAPTER: - 04 SURFACE TENSION

1. Define cohesive force & adhesive force.
2. Define range of molecular attraction & sphere of influence.
3. Define surface tension in terms of surface energy.
4. Obtain the dimension of surface tension & state its S.I. unit.
5. What do you know about the angle of contact of liquid, which wets glass & does not wet glass?
6. What does the statement mean that the surface tension of water is 72 dynes per cm?
7. Why needle floats on water surface? Explain.
8. Rise of liquid in a capillary tube is effect of surface tension: Comments.
9. Why is mercury depressed in capillary tube?
10. Define angle of contact. When is it acute?

11. What is the effect of temperature on surface tension?
12. What is the effect of impurity on surface tension?
13. Why is there a difference of pressure on the two sides of a curved surface of a liquid?
14. Why raindrops are spherical?
15. Define radius of curvature of films.
16. State the various factors that affect the surface tension of liquid.
17. State different applications of surface tension.
18. Define surface tension & surface energy.
19. Draw diagrams to illustrate acute and obtuse angle of contact.
20. Why is the pressure from one side of a curved film larger than that of other?
21. Explain why the liquid meniscus is plane, concave or convex for different liquids in contact with glass?
22. Why the blotting paper is able to absorb ink but an ordinary paper is not?
23. What happens when two drops of liquids merge to form a single drop?
24. What is the angle of contact for a liquid, which partially wet the solid? Give example.
25. What is the angle of contact for a liquid, which does not wet solid? Give example.

CHAPTER: - 05 FLUID DYNAMICS

1. What is meant by rate of flow?
2. Explain streamline flow.
3. Explain turbulent flow.
4. State the equation of continuity.
5. Explain the kinetic energy of liquid in motion.
6. Explain potential energy of liquid in motion.
7. Explain pressure energy of liquid in motion.
8. State Bernoulli's theorem.
9. What are pressure head & velocity head?
10. What is Venturimeter?
11. State the applications of Venturimeter.
12. Give the application of Bernoulli's theorem.
13. Draw neat-labeled diagram of Venturimeter.
14. What is Pitot tube?

CHAPTER: - 06 **VISCOSITY**

1. Explain the term velocity gradient.
2. What is the meant by viscosity? State the dimensions of coefficient of viscosity.
3. Explain the term coefficient of viscosity.
4. State the factors on which the force of viscosity depends.
5. The layer of castor oil 3mm thick move with the speed of 3cm/sec. What is velocity gradient?
6. Define coefficient of viscosity? State its S.I units.
7. What do you understand by viscosity of liquid & viscous force?
8. In what way is viscosity similar to friction?
9. In what respect does viscous force differ from the force of friction?.
10. Define Poise.
11. Obtain the dimension of coefficient of viscosity? State its S.I unit.
12. Discuss the effect of temperature on viscosity of liquid.
13. Discuss the effect of pressure on viscosity of liquid.
14. What due you understand by viscous fluid?
15. Discuss the effect of temperature on viscosity of liquid.
16. Why an increase in temperature generally results in a decrease in viscosity?.
17. Why Poiseuille's formula fails in case of tubes of wide bores?
18. Discuss the effect of pressure on viscosity of liquid.

Short Answer Type (4-Mark)

CHAPTER:-01. PENDULUM

1 Obtain an expression for period of compound pendulum.

2 How the torsional pendulum is used to compare the moment of inertia of two bodies? Explain.

3 Derive an expression for rigidity modulus by torsional oscillations.

4 Describe Kater's pendulum.

5 If the periods of a Kater's pendulum in the erect and inverted positions are equal , prove that the distance between the knife edges is equal to the length of the simple equivalent pendulum.

6 A disc of 10 cm radius and 2 kg mass is suspended in horizontal plane by a vertical wire attached to its center. If the diameter of wire is 1.5 cm and periods of torsional oscillation of disc is 10 sec find rigidity of material of wire.

7 The period of torsional oscillation with a disc suspended from a wire was 2 sec, when uniform ring of mass 0.2 kg and radius 5 cm was placed on disc, the period changed to 3 sec. Find the moment of inertia of the disc about the wire as axis.

8 A heavy uniform rod of length 90 cm swings in a vertical plane about a horizontal axis passing through its one end. Calculate the position at which a concentrated mass may be placed so that of swing remains unaltered.

9 A body of mass 600 gm oscillates about a horizontal axis at distance 45 cm from its center of mass. If the length of pendulum is 50 cm., find the moment of inertia of body about the axis of suspension.

10 Distinguish between simple pendulum and compound pendulum.

11 Show that periodic time of compound pendulum is minimum when the length of compound pendulum equals it's radius of gyration about a horizontal axis passing through its centre of gravity.

12 Derive the differential equation of angular SHM in case of compound pendulum.

13 A uniform circular disc of diameter 20 cm vibrates about a horizontal axis perpendicular to its plane and at a distance of 5 cm from the centre. Calculate the period of oscillation and the length of an equivalent simple pendulum.

14 A uniform square lamina of side 24 cm oscillates in a vertical plane about a horizontal axis perpendicular to the plane of the lamina and within its boundary.

Calculate i.) the minimum time period of oscillation, and ii.) the locus of the point of suspension about which the time period is minimum.

15 Prove that there are four points collinear with the centre of gravity of a compound pendulum about which its times of oscillations are equal, hence obtain the length of an equivalent simple pendulum.

16 A uniform bar of length 96 cm oscillates like a compound pendulum about the horizontal axis, passing through its end. Calculate the period of oscillations and positions of point about it will oscillate with the same period.

17 The length between the knife edges of a Kater's pendulum is 89.26 cm, while the times of oscillations about the two edges are 1.92 sec and 1.933 sec respectively. The centre of gravity of the pendulum is about 54.4 cm from one edge. What is the value of 'g'?

18 In case of compound pendulum, show that centers of suspension and oscillation are reversible (or interchangeable).

19 The centers of suspension and oscillation of a compound pendulum are reciprocal to each other. Justify.

20 Show that the Bifilar pendulum executes simple harmonic motion.

21 A uniform circular rod with a radius of 2 cm oscillates when suspended from a point on its axis at a distance of 4 cm from one end. If the length of the rod is 1m, find the point or points from which if suspended, the periodic time would remain unaltered.

22 Obtain the differential equation in case of Bifilar pendulum.

23 Using the differential equation in case of Bifilar pendulum, derive an expression for its period.

24 A torsional pendulum consists of a solid circular disc of mass 1 kg and radius 10 cm suspended horizontally from a rigid support by means of a metal wire of length 1.5 m and radius 1 mm, with its axis of rotation coinciding with the wire. If the periodic time of the torsional oscillations is 2 sec., calculate the rigidity modulus of the material of the wire.

CHAPTER: - 02 MOTION UNDER CENTRAL FORCE FIELD.

1. Define gravitational field and gravitational potential. Obtain expression for gravitational potential.
2. Obtain an expression for gravitational potential and field due to a uniform sphere at a point outside the sphere.

3. If G = 6.66 X 10^{-9} CGS units and radius of earth R = 6.36 X 10^{8} cm, find the density of the earth.
4. Show that the gravitational potential at the centre of a solid sphere is three and half time the potential at the surface.
5. Assuming the earth's orbit around the sun to be a circle, calculate angular velocity of the earth about the sun. What is the average linear speed and centripetal acceleration w.r.t the sun? Orbital radius of earth = 1.5 X 10^{11} m.
6. Obtain an expression for gravitational potential and field due to a uniform sphere at a point inside the sphere.
7. Obtain an expression for gravitational potential at a point inside the spherical shell.
8. State the Kepler's laws of planetary motion.
9. If the distance of the planet Jupitor from the sun is 5.2 times that of the earth, find the period of Jupitor's revolution around the circle.
10. What do you understand by radial and transverse acceleration?
11. Given G = 6.7 X 10^{-8} C.G.S. units, the radius of the earth = 6.4 X 10^{8} cm and its mean density 5.5 gm / cm^3. Calculate the acceleration due to gravity at the earth's surface.
12. The radius of the earth is 6.37 X 10^{8} cm. Its mean density 5.5 gm/cm^3 and the gravitational constant 6.67 X 10^{-8} C.G.S. units. Calculate the earth's surface potential.
13. Calculate the gravitational self energy of the sun. Given: Mass of the sun = 2 X 10^{30} kg, Radius of the sun = 7 X 10^{8} m, G = 6.67 X 10^{-11} m^3/kgs^2.
14. Explain the terms gravitational potential and gravitational field.
15. If a frictionless hole is bored from the surface of the centre of the earth and small object dropped down it, with what velocity will it reach the centre? (g = 980 cm/s^2 and radius of the earth R = 6.37 X 10^{8}cm).
16. State and explain Newton's law of gravitation.
17. State Newton's law of gravitation. What is meant by gravitational constant? What are its dimensions?

CHAPTER: - 03 ELASTICITY

1. What is meant by elasticity? Differentiate the elastic body from plastic body?
2. Explain why only solid possess all the three constant of elasticity.
3. Define i)Young's modulus ii) Bulk Modulus

4. Define i) Modulus of rigidity ii) Poisson's ratio σ.
5. Define the terms i) Beam and ii) Bending moment.
6. Describe how the dimension of a beam is altered when the beam is bent.
7. Define the neutral surface, neutral axis, and plane of bending of a beam rigidity fixed horizontally at one end loaded at the other.
8. A force of 2 Kg-wt stretches steel wire having diameter 1mm and length 2 cm. Calculate increase in length of wire and strain ($Y=2 \times 10^{11}$ N/m^2).
9. A steel wire of length 1 m and diameter 0.2 mm is elongated by 1 mm due to weight of 3.14 Kg. Determine Young's modulus of steel wire.
10. Bulk modulus of water is 2.05×10^9 N/m^2. What change of pressure will compress a given quantity of water by 0.5 %?
11. A stress wire of 0.5 mm radius is bent to form a circle of 10 cm radius, What is the bending moment & maximum stress if $Y = 2 \times 10^{12}$ dyne/cm^2?
12. A steel rod of circular cross section of radius 1 cm is rigidly fixed at one end & a load of 8 kg is at the other end which is 100 cm from the fixed end calculate depression of end (Given: $Y = 20 \times 10^{11}$ dyne/cm^2).
13. A rectangular bar 20 mm in breath &10 mm in depth & 1 m in length is suspended at its end & load of 2 kg is applied at its midpoint. Calculate the depression if the Young's modulus of the material bar is 2×10^{11} N/m^2.
14. A bar 10 m long, 2 mm square in section supported horizontally at its end & looked at the middle is depressed 2 mm by a load of 50 gm. Calculate Young's modulus for the material.
15. A brass bar 1 cm square in cross section is supported on two knife edges 100 cm apart a load of 1 kg at the center of the bar depression that point by 2.51 mm. What is Young's modulus for brass?
16. A cylindrical rod of diameter 14 mm rest on two knife edges 0.8 m apart & a load of 1 kg is suspended from its mid point. Neglecting the weight of the rod calculate depression of the mid point, if Y for its material be 2.04×10^{11} N/m^2.
17. Calculate the bulk modulus of steel given that Young's modulus is equal to 2.4×10^{12} dyne/cm^2 and $n = 8.2 \times 10^{11}$ dyne/cm^2.
18. Show that the bending moment for a thin uniform bar of rectangular cross-section is $\frac{Ybd^3}{12R}$.

19. What due you understand by the term geometrical moment of inertia? Give its value for rectangular cross-section and circular cross-section.
20. What is bending moment? Show that the bending moment of a beam is $\frac{Yl_g}{R}$.
21. Show that the value of Poisson's ratio lies between -1 & + 1/2.
22. Explain the basic assumptions for the theory of bending.
23. Derive an expression for the depression of free loaded end of the cantilever neglecting the weight of the cantilever.
24. Establish the relation, $\frac{Y}{3K} = (1 - 2\sigma)$.
25. Establish the relation, $\frac{Y}{2n} = (1 + \sigma)$.
26. Poisson's ratio of a material is 0.379 and its rigidity modulus is 2.87 X 10^{11} dynes/cm^2. Calculate the Young's modulus of the material.
27. A copper wire 3 m long has a diameter of mm, when it is stretched by a weight of 10 kg, it is elongated by 3mm. Calculate the modulus of rigidity if Poisson's ratio for the wire is 0.26.
28. Young's modulus for steel is 20 X 10^{10} N/m^2 and its rigidity modulus is 8 X 10^{10} N/m^2. Calculate the Poisson's ratio for steel.
29. Calculate the Poisson's ratio and modulus of rigidity of crown glass given that Young's modulus and bulk modulus for crown glass are 7 X 10^{10} N/m^2 and 5 X 10^{10} N/m^2 respectively.
30. A bar of length 1 m and cross section 5 X 10^{-3} m^2 is supported at its two ends and loaded in the middle is 1.96 X 10^{-3} m when a load of 0.1 kg is placed. Calculate the Young's modulus of the material.
31. A uniform rod of length 1m is clamped horizontally at one end. Calculate the depression of the midpoint of the rod. The diameter of the rod is 0.02 m. (Given Y = 10^{10} N/m^2).

CHAPTER: - 04 SURFACE TENSION

1. Define the term angle of contact & surface tension.
2. State any four characteristics of angle of contact.
3. Write a short note on application of surface tension.
4. How molecular attraction forces give rise to surface tension? Explain.

5. Obtain the relation between surface tension & surface energy.
6. Explain the capillarity & angle of contact.
7. Show that the surface tension of a liquid is equal to the mechanical part of its surface energy.
8. Obtain the relation between the radius of a spherical drop of a liquid, the surface tension & pressure.
9. Obtain the relation between the radius of a spherical soap bubble of a liquid, the surface tension & pressure
10. Describe the method of determining the surface tension of a soap bubble. Deduce formula used.
11. The pressure of air in a soap bubble of 0.7 cm, diameter is 8 mm of water above the atmospheric pressure. Calculate the surface tension of the soap solution.
12. Eight droplets of mercury each of radius 1 mm coalesce into a single drop. Find the change in surface energy; surface tension of mercury is 0.465 J/m^2.
13. A soap bubble has a diameter 5mm, calculate the pressure inside it, if the atmospheric pressure is 10^5 N/m^2.(S.T.= 30x 10^{-3} N/m, $\theta = 0$).
14. The pressure inside a soap bubble of radius 1 cm balances a 1.4 mm column of oil of specific gravity 0.80. Calculate the surface tension of the soap solution.
15. Discuss the behavior of angle of contact at solid- liquid interface.
16. What do you understand by weightability and wet angle?
17. What do you understand by the angle of contact for a liquid, which partially wets to solid?.
18. What do you understand by the angle of contact for a liquid, which does not wet to solid?
19. Explain the various factors that affect the surface tension of a liquid.
20. Calculate the pressure inside a small air bubble of radius 0.1 mm situated just below the surface of water. (Take surface tension of water as 70 dynes/cm). Atmospheric pressure is 1.013 X 10^6 dyne/cm.
21. Following observations are taken in Jaeger's method.
    Radius of the jet opening = 0.1 cm,
    Density of manometric liquid = 0.7 gm/cm^3.
    The opening of the jet is 1 cm below the surface of water.
    Density of water = 1 gm/cm^3, level difference in manometer = 3.5 cm.

Find the surface tension of the water.

22. In a soap bubble of diameter 7 mm the pressure of air is 8mm of water column above the atmospheric pressure. What is the surface tension of the soap solution.
23. Determine the difference in air pressure between inside and outside of a soap bubble 8 mm in diameter (Given surface tension of soap solution = 2 N/m).
24. Calculate the radius of a soap bubble for which the internal pressure is 1000.8×10^3 dyne/cm^2. Surface tension of soap solution is 25 dyne/cm.
25. The radius of soap bubble is increased from 7 cm to 10 cm. What is the change in pressure (T = 30 dyne/cm).
26. In Jaeger's experiment a capillary tube of internal diameter 5×10^{-4} m dips 3×10^{-2} m inside water contained in a beaker. The difference in level of manometer when bubble is released is 0.09 m. Calculate the surface tension of water.
27. A soap bubble is slowly enlarged from a radius of 0.01 m to 0.1 m. Calculate the work done in the process. Surface tension of soap solution is 26×10^{-3} Nm^{-1}.
28. Why the surface tension of liquid decrease, with the increase in the temperature? Explain.
29. Hoe does the surface tension of liquid changes with soluble impurities added to the liquid? Discuss with examples.

CHAPTER: - 05 FLUID DYNAMICS

1. State & explain rate of flow.
2. Discus the equation of continuity?
3. Explain kinetic energy & potential energy of liquid in motion.
4. Explain potential energy & pressure energy of liquid in motion.
5. Explain kinetic energy & pressure energy of liquid in motion.
6. State the Bernoulli's equation? Explain the meaning of each term.
7. State Bernoulli's theorem? What are the conditions under which it is applicable?
8. What is Venturimeter? Derive the formula for the rate of flow of liquid in pipeline.
9. What is Pitot tube? Derive the expression for rate of flow of water through the pipe.
10. Distinguish between streamline flow & turbulent flow.
11. A railway engine is fitted with tube whose one end is inside a reservoir of water in between rails the other end of tube is 4 m above the surface of water in reservoir, calculate the speed with which the water rushes out of upper end if the engine is moving with speed of 108 km/hr.

12. A fire engine pumps water from a hydrant at rate of 10^3 liter/see. It ejects it from nozzle 5 m above surface of water in hydrant with a velocity of 10 m/s. Calculate the pressure difference between water at pump & nozzle.
13. A Venturimeter has pipe diameter of 0.2 m and throat 0.15 m. The levels of water column in two limbs differ by 0.1 m. Calculate the amount of water discharged through pipe in one hour (density of water $=10^3$ kg/m^3).
14. A Venturimeter connected to a pipeline indicates a pressure difference of 75 cm of water column. If the radii associated with the Venturimeter are 30 cm. and 10 cm., calculate the volume rate of flow per minute.
15. A Pitot tube is fixed in a water pipe line of diameter 16 cm. if the range of the instrument indicates a pressure difference of 5 cm. of water column, calculate the rate of flow through pipe.
16. Show that the pressure energy & potential energy can be converted one into the other.
17. Write a short note on dynamic lift and thrust on a rocket.
18. Water flows along a horizontal pipe of varying cross section. Find the difference in pressure between two points where the flow has speeds 35cm/s and 65 cm/s. Express your answer in cm of mercury column.
19. The diameter of the throat of a venturimeter is 4 cm. When it is inserted into a pipeline of diameter 10 cm, the pressure difference between the pipe and the throat is equal to 9 cm of water. Calculate the rate of flow.
20. A pitot tube is fixed on the wing of an aeroplane to measure the speed of an aeroplane. The tube contains a liquid of density 800 kg/m^3. The difference in level between the two limbs is 0.5 m. Density of air = 1.293 kg/m^3. Calculate the speed of an aeroplane.

CHAPTER: - 06 VISCOSITY

1. Discuss the effect of temperature & pressure on viscosity of liquids.
2. Explain in brief the mercury thread method for accurate determination of the radius of the capillary tube.
3. Water flow through a horizontal capillary tube of 1 mm internal diameter & length 70 cm under pressure of a column of water 30 cm in height. Find rate of flow of water through capillary tube.

4. Water is conveyed through of horizontal tube 0.08m in diameter & 4km in length at a rate of 20 liter per see Calculate the pressure difference required to maintain the flow.
5. A plate of metal 10^{-2} m^2 area rest one layer of castor oil $2*10^{-3}$ m thick where coefficient of viscosity is 1.55 Ns/m^2. Calculate horizontal force required to move the plate with a uniform speed of 3 $x10^{-2}$ m/s.
6. Write Poiseuille's equation for the flow of a liquid through a capillary tube. State the assumptions to be made in its derivation.
7. Prove that $v = \frac{p}{4l\eta}\left(r^2 - x^2\right)$ where the symbols have their usual meanings.
8. Define coefficient of viscosity. Describe the way in which the different layers of a liquid move when flowing through a capillary tube. What changes take place if the motion is increased?
9. In an experiment with Poiseuille's apparatus the following figures are obtained :

   Volume of water issuing per minute = 7.08 cm^3

   Head of water = 34.1 cm

   Length of the capillary tube = 56.45 cm

   Radius of the capillary tube = 0.0514 cm

   Find the coefficient of viscosity.
10. For liquid having streamline flow through capillary tube, find the velocity of liquid at a distance x from the axis of the tube.
11. Using an expression for the velocity of the liquid flowing through a capillary tube, obtain Poiseuille's equation for the liquid.
12. In an experiment with Poiseuille's apparatus the following observations were obtained: Volume of water flowing per minute = 6 cc,

    Pressure difference across the ends of a capillary tube = 30 cm of water.,

    Length of the tube = 50 cm,

    Radius of the capillary tube = 0.05 cm,

    Find the coefficient of viscosity of water
13. A liquid is steadily flowing at the rate 0.007855 cm^3 per sec through a uniform capillary tube of radius 0,5 mm. Find the velocity of the liquid at a point on the axis of the capillary tube.
14. Two tubes A and B of lengths 16 cm and 81 cm have radii 0.2 mm and 0.3 mm respectively. They are joined end to end. If a liquid enters A at a pressure of 86 cm

of mercury and leaves B at a pressure of 76 cm pf mercury, what will be the pressure at the junction of the tube?

15. Water flows through a horizontal capillary tube of 1 mm internal diameter and length 70 cm under pressure of a column of water 30 cm in height. Find the rate of flow of water through the capillary tube. Viscosity of water = 10^{-3} N-s/m^2.

Long Answer Type (6-Mark)

CHAPTER:-01 PENDULUM

1 What is compound pendulum? Obtain an expression for its periodic time. Obtain the length of an equivalent simple pendulum.

2 What is Kater's pendulum? Obtain an expression for acceleration due to gravity in terms of two nearly equal periods of oscillation about the two parallel knife edges.

3 Explain Bifilar pendulum. Obtain an expression for period of Bifilar Pendulum when the two suspension threads are parallel.

4 What is torsional pendulum? Derive an expression for rigidity modulus by torsional oscillation.

5 What is meant by simple equivalent pendulum? If the period of Kater's pendulum in the erect and inverted positions is equal, prove that the distance between the knife edges equal to the length of simple equivalent pendulum.

CHAPTER: - 02 MOTION UNDER CENTRAL FORCE FIELD.

1. Obtain an expression for gravitational potential at a point outside the spherical shell.
2. Obtain an expression for gravitational field at a point outside the spherical shell.
3. Derive the expression for the gravitational potential and gravitational field due to a uniform sphere at a point inside the sphere.
4. Obtain an expression for the radial component of acceleration and tangential component of acceleration.
5. Define the intensity of gravitational field and gravitation potential. Hence show that the intensity and potential at any point on the surface of earth are 'g' and 'gR' respectively assuming the earth to be a uniform sphere of radius R.

CHAPTER: - 03 ELASTICITY

1. Derive the relation between three types of elastic modulii Y, K, n.
2. Derive an expression for the bending moment of beam. Explain its cases.
3. What is cantilever? Derive an expression for the depression of free loaded end of the cantilever neglecting the weight of the cantilever.
4. Considering the weight of the cantilever derive an expression for the depression of free loaded end of the cantilever.

5. Derive an expression for depression of cantilever, when the load is fixed at the center. Discuss the cases: - 1) bar is rectangular 2) bar is circular.
6. Explain neutral surface & internal bending moment for a loaded beam at one end & fixed at other end.
7. Prove the relation, $\frac{9}{Y} = \frac{3}{n} + \frac{1}{K}$. Where the symbols have their usual meaning.

CHAPTER: - 04 SURFACE TENSION

1. Show that the excess pressure inside a soap bubble of radius r over the atmospheric pressure outside it is equal to 4T/ r, where T is S.T. of the soap solution. How the S.T of a bubble is determined?
2. Explain the formation of concave & convex surface of liquid on the basis of molecular theory.
3. Explain surface tension on the basis of molecular theory.
4. What is surface energy? Explain the relation between surface tension & surface energy.
5. With the help of molecular forces explain why the free surface of some liquids in contact with a solid is not horizontal?
6. Define surface tension, surface energy & angle of contact. Find the relation between them.
7. Derive an expression for the capillary rise in a tube. Show that it depends on the angle of contact.
8. Explain Jaeger's method of measuring the surface tension of a liquid.
9. Describe Jaeger's method of determining surface tension of a liquid.
10. Define surface tension. Show that the excess pressure acting on the curved surface of a curved membrane is given by $P = 2T(1/r_1 + 1/r_2)$, where r_1 & r_2 are radii of curvature & T is surface tension of membrane.
11. Calculate the amount of energy needed to break a drop of petrol of volume 10^{-6} m^3 into a 1000 million drops of equal size. Surface tension of petrol is 26 X 10^{-23} N/m.

CHAPTER: - 05 FLUID DYNAMICS

1. State & explain rate of flow of liquid. What is the equation of continuity?
2. With neat diagram describe a Venturimeter. Show how it is used to measure rate of flow of liquid in pipe. Derive the necessary formula.

3. Describe a Pitot tube and explain how it can be used to measure the rate of flow of liquid through a pipe. Derive the necessary expression.
4. State and prove Bernoulli's theorem.
5. Show that kinetic energy, potential energy and pressure energy possessed by a liquid are mutually convertible, one into the other.
6. Explain the types of energy possessed by a liquid on flow. Show that pressure energy and potential energy are convertible, one into the other.

CHAPTER: - 06 VISCOSITY

1. For liquid having streamline flow through capillary tube find the velocity of liquid at distance x from axis of tube.
2. Obtain Poiseuille's formula for rate of flow liquid through capillary tube.
3. Describe Poiseuille's method to determine coefficient of viscosity of a liquid.
4. Explain coefficient of viscosity? Describe a laboratory method to determine coefficient of viscosity of water.
5. Explain Poiseuille's method for determination of co-efficient of viscosity of a liquid.

PHYSICS PAPER –I

SECTION II: HEAT AND THERMODYNAMICS

Objective Type (2-Mark)

CHAPTER 01 : EQUATION OF STATE

1. What do you mean by an equation of state?
2. State the defects of van der Waals' equation.
3. State the conclusions obtained from Amagat's experiments.
4. What is a critical isothermal and critical point ?
5. State the law of corresponding states.
6. What is the advantage of the reduced equation of state over van der Waal's equation of state ?
7. What do you mean by border curve ?
8. Which are the two assumptions of the kinetic theory of gases that were modified by vander Waals' to derive his equation of state for real gases ?
9. What is the Boyle Temperature ?
10. Show that $T_B = (27/8)\, T_C$,where the symbols have their usual meanings.
11. What is meant by the critical temperature, critical pressure, and critical volume of a gas ?
12. For the liquefaction of a gas, the knowledge of its critical temperature is necessary . Why?

CHAPTER 02 : THERMODYNAMICS

1. Explain the term isothermal change
2. Explain the term adiabatic change.
3. What is indicator diagram
4. State zeroth law of thermodynamics.
5. What is thermal equilibrium of a system?
6. Explain the term Mechanical equilibrium of a system.
7. What is an internal energy of a system? Give one example.
8. Define reversible and irreversible process?

9. State first law of thermodynamics.
10. State two conditions for reversible process.
11. Give any two examples of reversible process.
12. Give any two examples of irreversible process.

CHAPTER 03: SECOND AND THIRD LAW OF THERMODYNAMICS

1. Define entropy. Give its SI unit.
2. Give Claussi's statement of second law of thermodynamics.
3. What do you mean by working substance.
4. Give the name of four parts of cornot's heat engine.
5. Draw the P-V diagram for cornot's cycle.
6. State the cornot's theorem
7. State second law of thermodynamics
8. Give the name of different strokes in otto engine.
9. Draw the indicator diagram for otto cycle.
10. Give the name of different strokes in Diesel engine
11. Draw the temperature- entropy diagram.
12. State third law of thermodynamics

CHAPTER 04 : APPLICATIONS OF THERMODYNAMICS

1. Explain enthalpy of a system.
2. Explain Gibb's function G.
3. Give physical significance of Gibb's function.
4. Explain in short Helmholtz's function.
5. Explain Joule-Thomson effect.
6. Explain variation of melting point with pressure.
7. Explain variation of boiling point with pressure.
8. Write first and second latent heat equation.
9. Give the physical significance of Helmholtz function.

CHAPTER 05: THERMOMETRY

1. How you define temperature.
2. What is natural law of heat flow.
3. On which principle thermometer works?

4. Write the relation between Celsius, Fahrenheit and Rankin scale of temperature.
5. What do you mean by sensitivity of thermometer.
6. Give the classification of thermometer.
7. Which device is used for resistance measurement of platinum resistance thermometer.
8. What do you mean by neutral temperature? On which factor it depends?
9. What is the basis of scale of temperature?
10. What is meant by thermometry?
11. Mention different types of thermometer?
12. State the principle of resistance thermometer and thermoelectric thermometer.
13. State the principle of vapor principle thermometer & radiation thermometer.
14. What is Seebeck effect?
15. What is Peltier effect?
16. State the principle of platinum resistance thermometer.
17. Give the merits of platinum resistance thermometer.
18. What is thermocouple?
19. State the advantages of thermoelectric thermometer.
20. Mention the drawbacks of thermoelectric thermometer.
21. What is pyrometry?
22. Mention the drawbacks of radiation pyrometer.

Short Answer Type (4-Mark)

CHAPTER 01 : EQUATION OF STATE

1. Explain the method to determine van der Waals' constants.
2. On the basis of van der Waals' equation ,show that the critical coefficient for any gas is 2.67 .
3. With the help of a neat diagram, describe how the critical pressure and temperature are experimentally determined.
4. Describe the method for the determination of the critical volume of a substance.
5. Calculate the van der Waals' constants a and b for helium if the critical temperature and critical pressure of helium are -268^oC and $2.3x10^5$ N/m respectively. Given : $R=8.31x10^3$ J/kmole^oK. (Ans. a = $3.16Nm^4$/kmole, b=$2.225x10^{-2}$ m^3/kmole)
6. The critical temperature and critical pressure of oxygen are -119^o C and 50 atmospheres respectively. Determine van der Waals' constants a and b for oxygen. Given:$R=8.31x10^3$ J/kmole^oK. (Ans. a=1.36510^5Nm^4/kmole, b=0.0316 m^3/kmole)
7. Find the critical temperature for helium from the following data : Given:$R=8.31x10^3$ J/kmole^oK,$a=3.44x10^3Nm^4$/kmole, b=0.0234 m^3/kmol (Ans. Tc=5.25^oK)
8. Calculate the constants of van der Waals' equation for nitrogen if its critical temperature is -146 ^oC and critical pressure is 33 atmospheres. ($R=8.3X10^3$ J/kmole^oK) (Ans: a=$1.4X10^5$ N m^4 /kmole, b=0.039 m^3 /kmole.)
9. Calculate the critical temperature and critical pressure for nitrogen. van der Waals' constants a and b for nitrogen are $2.72x10^{-3}$, $1.73x10^{-3}$ respectively, where pressure is expressed in atmospheres and volume is expressed in terms of volume at N.T.P. (Ans: Pc=33.66 atmos, Tc=126.9^oK)

CHAPTER 02 : THERMODYNAMICS

1. The temperature of one mole of a perfect gas undergoing an adiabatic expansion fall from 300^0 K to 200^0 K. Calculate the work done by the gas.
2. State and explain zeroth law of thermodynamics.

3. Explain the term a) Adiabatic change b) Isothermal change
4. Derive an expression for work done in an adiabatic expansion of gas.
5. State and explain the first law of thermodynamics.
6. Derive an expression for work done in an isothermal expansion of gas.
7. Distinguish between reversible process and irreversible process.
8. Explain the term thermodynamic state of system.
9. What is thermal equilibrium? Explain thermal equilibrium of the system with its surroundings.
10. Explain the concept of an internal energy of the system.
11. Explain giving one example, what do you understand by an Irreversible Process.
12. Explain an internal energy as a state function.
13. One mole of Van-der waal's gas expands isothermally from V_1 to V_2. Show that the work done by the gas is expressed by $W= RT \ln (V_2 – b)/ (V_1 – b) +a(1/ V_2 - 1/ V_1)$.
14. A gas occupying 0.5 m^3 at pressure of 2.5 x 10^5 N/m^2 is compressed at constant temperature to a volume of 0.004 m^3 . Determine the final pressure of the gas and work done on the gas .
15. A gas occupying a volume of 6 m^3 at atmospheric pressure is suddenly compressed to one fifth of its volume. Calculate the work done on the gas (γ =1.4).
16. 0.5 mole of a perfect gas at 27^0 C is compressed isothermally to 100 times that of its initial pressure. Find the work done by the gas (R = 8.3 J/mole .deg) .
17. The temperature of one mole of a perfect gas undergoing on adiabatic expansion falls from 27^0 C to – 73^0 C. Calculate the work done by the gas (R = 8.3 J/mole .deg, γ =1.4).
18. An amount of 1 /2.303 mole of a perfect gas expands isothermally at 27 to 10 times that of the original volume . Find the work done (R = 8.3 J/mole .deg) .
19. Assuming the relation PV^{γ} = constant for an adiabatic change prove the relations
    a) $TV^{\gamma-1}$ = constant
    b) $T^{\gamma} P^{\gamma-1}$ = constant

CHAPTER 03: SECOND AND THIRD LAW OF THERMODYNAMICS

1. State the second law of thermodynamics in terms of entropy.
2. With the help of an example show that the entropy always increases in natural process.
3. Show how the dissipation of entropy in the universe is related to the increase in entropy.
4. Draw the temperature-entropy diag. for Carnot's cycle and hence find the efficiency of the Carnot's cycle.
5. "Second law of thermodynamics is a universal law of nature". Explain with the help of two examples.
6. Obtain an expression for the maximum efficiency of an Otto engine.
7. Give the difference between Otto engine and Diesel engine.
8. Draw indicator diagram for the Diesel cycle and hence obtain an expression for its efficiency.
9. Calculate the change in entropy when 100gm of water at 10^0c is converted into ice at 10^0c. Assume that the specific heat of ice and water is same (Latent heat of ice = 80cal/g)
10. Find the change in entropy when 100gm of steam at 100^0c is converted into ice at 0^0c. (Latent heat of fusion of ice = 80cal/g, Latent heat of steam = 540cal/g)
11. Calculate the change in entropy when 40gm of water at 7^0c is heated to 67^0c.
12. Calculate the increase in entropy when 200gm of ice at 0^0c is converted into water at the same temp. (Latent heat of ice = 80cal/g)
13. Calculate the efficiency of Carnot's engine operating between 300^0c and 100^0c
14. A Carnot engine have an efficiency of 60% with its sink at 27^0c. Calculate the temperature of the source.
15. A Carnot engine have an efficiency of 30% with its sink at 27^0c.What should be the change in the temp. of its source if the engine is to have an efficiency of 50%.
16. Calculate the efficiency of an otto engine in which the working substance is adiabatically compressed to one sixth of its initial volume in each cycle. Assume the engine to operate on the otto cycle (γ=1.4).

CHAPTER 04 : APPLICATIONS OF THERMODYNAMICS

1. Explain the term internal energy 'U'. Show that the internal energy U is function of temperature only.

2. Define the enthalpy H. Show that $C_p = \left(\frac{\partial H}{\partial T}\right)_H$
3. Explain Helmholtz function F and prove that F remains constant during isothermal and isochoric process.
4. Discuss the effect of pressure on the boiling point and melting point.
5. Calculate the increase in boiling point of water at 100^0C, when the pressure is increased by one percent of atmospheric pressure (1 atm = 1.013×10^5N/m^2). The latent heat of vaporization at 100^0C is 540^0kcal/kg. The specific volume of water is 1.00×10^{-3}m^3/kg and that of vapour is 1676×10^{-3}m^3/kg. J = 4200 joules/kcal.
6. Calculate the temperature inside a pressure cooker when the pressure of steam inside is 1.5 kg/cm^2. The latent heat of vaporization of water at 100^0C is 540 kcal/gm and the specific volume of steam is 1600 cm^3/gm.
7. Specific heats of water and saturated stream at 100^0C are 1.013 and -1.040 cal/gm0^0K respectively and latent heat at that temperature is 540 cal/gm. Calculate the change in latent heat per degree increase in temperature.
8. Calculate the pressure required to make water freeze at -1^0C. Change of specific volume when 1g of water freezes into ice is 0.091cm^3. (J = 4.2×10^7 ergs/cal; 1 atmosphere = 10^6 dynes/cm^2; Latent heat of ice = 80 cal/g).
9. At what temperature will water boil, if the pressure is increased by 0.2 atmosphere. (Latent heat of steam = 540 cal/g; J = 4.2×10^7 erg/cal, specific volume of steam = 1671cm^3) .

CHAPTER 05: THERMODMETRY

1. On which principle electrical resistance thermometer measures the temperature?
2. Why platinum resistance thermometer is preferred for the measurement of temp?
3. Define thermocouple and draw schematic diag. for the same.
4. On which principle radiation pyrometer works? Which are the types of radiation pyrometer you studied?
5. Mention the demerits of radiation pyrometer.
6. Define temp. coefficient of resistance. What do you mean by PTC & NTC.
7. Calculate the temperature coefficient of temp.α, if the resistance of platinum wire at 0^0c is 8.4ohm and 9.2 ohm at 100^0c.

8. If platinum temperature corresponding to 75^0c on the gas scale is 65^0c. What is the platinum scale? Temperature corresponding to 212.5^0c on the gas scale?
9. Describe seebeck effect.
10. Describe the working of thermoelectric thermometer. Draw the cct. diag.
11. Describe the platinum resistance thermometer. Explain how it is used to measure unknown temp.
12. Describe Callender & Griffiths bridge for accurate measurement of resistance. How true temp. deduced from measured platinum temperature.
13. The resistance of platinum wire o a platinum resistance thermometer at ice point is 50ohm and at steam point is 5.93ohm When platinum wire is heated in bath its resistance is found to 5.795ohm. Calculate the unknown temperature.

Long Answer Type (6-Mark)

CHAPTER 01 : EQUATION OF STATE

1. Describe Andrew's experiments on CO_2 .
2. Describe Amagat's experiments on H_2 ,N_2 , and CO_2 and discuss his results.
3. Derive van der Waals' equation of state from considerations of finite size of molecules and the intermolecular forces.
4. Starting from van der Waals' equation, derive the reduced equation of state for a gas.
5. What are critical constants? Obtain an expression for the critical constants of a gas in terms of the constants of van der Waals' equation.
6. Show how van der Walls' equation of state can explain the results of Andrew's experiments.

CHAPTER 02: THERMODYNAMICS

1. Show that the work done by a gas during reversible cyclic process is equal to the area enclosed by the cycle on an indicator diagram
2. Discuss how zeroth law of thermodynamics explain the concept of temperature.
3. Define internal energy of the system. Show that it is a state function
4. Explain thermodynamic equilibrium of the system with its surroundings
5. Obtain the relation between the volume and the pressure of the perfect gas undergoing adiabatic change.

CHAPTER 03: SECOND AND THIRD LAW OF THERMODYNAMICS

1. Prove that the entropy of the universe is remains constant in a reversible cyclic process while it increases in an irreversible cycle.
2. A liquid of mass m and specific heat c at temperature T_1 is mixed with an equal mass of the same liquid at temp.T_2. Prove that the entropy of the system increases by

   $$2mc\log_e[(T1+T_2)/ (2\sqrt{T_1T_2})]$$

3. Explain the Temperature-Entropy diag.
4. Describe different parts of Carnot's engine.
5. Explain the working of Carnot's engine. Draw an indicator diagram to represent the different operations in the carnot's engine. Calculate the work performed during the

cycle of operation and hence obtain an expression for the efficiency of Carnot's engine.

6. Draw the indicator diagram for the Otto cycle and interpret the various parts.
7. Explain Diesel cycle with the help of diag.
8. Explain Carnot's heat engine.
9. What is carnot's cycle and obtain efficiency of carnot's cycle.
10. Draw the P-V diagram for carnot's cycle and explain the four operations.

CHAPTER 04: APPLICATIONS OF THERMODYNAMICS

1. Explain enthalpy of a system. Prove that enthalpy in throttling process remains constant.
2. Derive Maxwell's thermodynamic relation between pressure volume, temperature and entropy of a homogeneous system.
3. Derive the first latent heat equation in the form

$$\frac{\partial P}{\partial T} = \frac{LJ}{T(V2-V1)}$$

4. Obtain second latent heat equation.
5. What is Joule – Thomson effect? Describe Joule-Thomson porous plug experiment.

CHAPTER 05: THERMOMETRY

1. In case of platinum resistance thermometer,
   Find the relation

$$t = \frac{R_t - R_0}{R_{100} - R_0} \times 100$$

2. Describe the construction of platinum resistance thermometer with neat schematic diagram.
3. Explain in brief Callender and Griffithc bridge.
4. Describe in brief the measurement of temperature using thermoelectric thermocouple.
5. Explain with neat schematic diagram the optical pyrometer.
6. Describe working of platinum resistance thermometer? Explain Callender and Griffiths bridge for accurate measurement of resistance.
7. What is thermocouple? Describe construction and working of radiation pyrometer with neat diagram.

QUESTION BANK

PHYSICS PAPER II

SECTION I - ELECTRICITY AND MAGNETISM

SECTION II - APPLIED PHYSICS

PHYSICS PAPER II

SECTION I - ELECTRICITY AND MAGNETISM

Objective Type (2-Mark)

CHAPTER: -1 CURRENT ELECTRICITY

1. State the Kirchhoff's current law.
2. State the Kirchhoff's voltage law.
3. Define current density vector; and give its SI unit.
4. State the Thevenin's theorem.
5. State the Norton's theorem.
6. State maximum Power transfer theorem.
7. Define electric power and give it's unit.
8. State Joule's law of heating effect.
9. Define resistivity and conductivity.
10. Define i) watt and ii) kilowatt-hour.
11. Under what condition power transfer from source to the load is maximum? At that time what is the efficiency of the source.
12. Define the terms i) short circuit current ii) open circuit voltage.
13. Give the symbols of battery and current source.
14. State Ohms law and give it's mathematical form.
15. Give the sign convention used for current and voltage while studying Kirchhoff's laws.
16. Define current and voltage. Give its SI units.
17. Give the microscopic form of the Ohms law. What does each symbol indicate?
18. Explain the Kirchhoff's voltage law on the basis of law of conservation of energy.
19. Explain how the Kirchhoff's current law follow from law of conservation of charges.
20. Give the relation between resistance of a conductor with its length, cross sectional area and resistivity and give the unit of each quantity.
21. What is basic difference between macroscopic and microscopic properties of material?
22. On which factors the resistance of a conductor depends?

23. Define conductor and insulator on the basis of electrical conductivity. Give its examples.
24. What is the basic requirement of a material to be a good conductor? What is the relation between directions of conventional current and direction of (motion of) flow of electrons in a conductor?
25. Define i) ohm ii) joule
26. Obtain the relation between kilowatt-hour and joules.

CHAPTER 2:- ELECTRICAL CIRCUITS D.C.

1. Draw a circuit diagram for growth of current in L-R circuit.
2. Draw a circuit diagram for growth of current the charge of acondenser through resistanse.
3. Define time constant in the growth of current in L-R circuit.
4. Define time constant for decay of current in L-R circuit.
5. Define time constant for growth of charge in R-C circuit.
6. Define time constant for decay of charge in R-C circuit.
7. Draw the curves representing the growth and decay of current in the inductive circuit.
8. Draw the curves representing the growth and decay of charge in the R-C circuit.
9. The S.I. unit of inductance is ….

   a.ohm b.henry

   c.farad d.volt
10. The S.I. unit of capacitance is ….

    a.ampere b.henry

    c.farad d.volt
11. The time constant of inductive circuit is ….

    a.R/L b.R.t

    c. L.t d.L/R
12. The time constant of R-C circuit is ….

    a.R/C b.RC

    c.C/R d.None of these

13. Charged condencer of capacity $5\mu f$ is first charged and then dischargd through a resistace of 0.1 mega ohm. What is the time in which the chrge will decrease 36.8% of its initial value.
14. State the relation between charge and time during the growth of charge in an R-C circuit.

CHAPTER 3:- DIELECTRIC MATERIALS

1 What is a dielectric material?

2 Define dielectric constant K.

3 State different macroscopic dielectric parameters and explain any one in brief.

4 Experimental value for K for hydrogen is

a) 1.00026 b) 1.00260

c) 1.00016 d) 1.00062

5 Dielectric constant is also defined as

a) $K = U_O / U_d$ b) $K = U_d / U_O$

b) $K = U_O / V_O$ d) none of above

6 Dielectric constant is expressed as

a) $K = C/ C_O$ b) $K = C_O / C$

b) $K = C/ V_O$ d) none of above

7 When dielectric material is placed between capacitor, capacitance of capacitor

a) Always increases b) always decreases

c) Remains constant d) none of above

8 In, which circumstances the induced dipole moment, is known as point charges

a) Magnitude of Pi < magnitude of P b) Magnitude of Pi < magnitude of Pu

c) Magnitude of Pi = magnitude of P d) none of above

9 Define internal electric field Ei

10 Internal electric field is also called as

a) Lorentz field b) Newton field

c) Maxwell field d) None of above

11 According to Lorentz , the internal field Ei is

a) $Ei = [(K+2)/3] E$ b) a) $Ei = [(K+3)/2] E$

c) a) $Ei = [(K+3)/3] E$ d) none of above

12 Concept of polarizability introduce

a) Clausis –Mosotti b) Clausis

c) Mosotti d) none of above

13 In induced dipole moment $Pi = \alpha_i E_i$, α_I is called as

a)Ionic Polarizabilities b) Electronics Polarizabilities

c) dipole Polarizabilities d) none of above

14 Give the example of non-polar dielectric type I material

15 Give the example of non-polar dielectric type II material

16 If p is the dielectric dipole moment of the microscopic unit , the potential energy of the dipole in electric field E_i will be

a) $-p E_i \cos\theta$ b) $-p E_i \sin\theta$

c) $-p E_i D\cos\theta$ d) none of above

17 In non-polar dielectric I polarization of microscopic unit is caused by

a) Electronics Polarizabilities b) Ionic Polarizabilities

c) Electronics & Ionic Polarizabilities d) none of above

18 In non-polar dielectric type II polarization of microscopic unit is caused by

a) Electronics & Ionic polarizabilities b) Ionic polarizabilities

c) Electronics polarizabilities d) none of above

19 When non-polar dielectric I materials are subjected to an electric field E , induced dipole moment is equal to

a) $Pi = \alpha_e E_i$ b) $Pi = \alpha_e D_i$

c) $Pi = \beta_e E_i$ d) $Pi = \beta_e D_i$

20 Total polarizability of the microscopic unit for non-polar dielectric I is

a) $\alpha = \alpha_e$ b) $\alpha = \alpha_e + \alpha_i$

c) $\alpha = \alpha_e + \beta_i$ d) $\alpha = \beta_e + \alpha_i$

21 Total polarizability of the microscopic unit for non-polar dielectric II is

a) $\alpha = \alpha_e + \alpha_i$ b) $\alpha = \alpha_e$

c) $\alpha = \alpha_e + \beta_i$ d) $\alpha = \beta_e + \alpha_i$

22 Displacement current is zero when

a) For steady value of field b) Changing value of field

c) When field is removing d) none of above

23 Which break down is an intrinsic break down

a) Avalanche breakdown b) Thermal break down

c) Electrochemical Breakdown d) Discharge breakdown

24 An ideal dielectric material should have

a) Infinite resistance b) Finite resistance

c) Zero resistance d) none of above

25 Electrical strength of dielectric material is expressed in terms of

a) Voltage per unit thickness b) Voltage per unit area

c) Current per unit thickness d) none of above

26 Dielectric material has very high resistance at

a) Low applied electric field b) High applied electric field

c) Medium applied electric field d) none of above

27 In crystalline solid the microscopic unit is

a) Cell of the crystal b) molecules of a solid

c) Atom of solid c) none of above

28 In H_2O, which side of molecule somewhat positive

a) Hydrogen b) Oxygen

c) Hydrogen & Oxygen d) none of above

29 Define electrical dipole moment & states its MKS & CGS unit

CHAPTER 4:- MAGNETIC PROPERTIES OF MATERIAL

1. Magnetic susceptibility has dimensions of---

   a) Wb-m b) dimensionless c) Wb/m^2 d) Amp/m

2. The units of magnetic permeability are---

   a) H/m b) Wb/m^2 c) A/m d) none of these

3. Magnetic induction B and magnetic field intensity H are related by---

   a) $B = \mu_0 + \mu_0 H$ b) $B = \mu_0 \mu_r H$

   c) $B = \mu_0 H^2$ d) $B = \mu_0 + H$

4. Which one of the following material does not have permanent magnetic diploes?

   a) ferromagnetic b) antiferromagnetic

   c) paramagnetic d) diamagnetic

5. The susceptibility of the paramagnetic substance is—

   a) very large b) small and +ve c) zero d) –ve

6. When substance is placed in a magnetic field, its ability to get magnetized depends upon its---

   a) permeability b) susceptibility

   c) magnetic viscosity d) none of these

7. Platinum has permeability greater than unity and a small positive susceptibility, it must be---

   a) paramagnetic b) diamagnetic

   c) ferromagnetic d) none of these

8. Diamagnetic substances are attracted by magnetic field. The attraction is---

   a) very strong b) weak c) zero d) –ve

9. The effect of inserting iron core within the current carrying coil is to---

   a) weaken the field b) change the direction of field

   c) strengthen the field d)concentrate the magnetic lines in the centre

10. At Curie temperature the spontaneous magnetization for the ferromagnetic material is---

    a) zero b) infinite c) remains same d) none of these

11. Magnetic materials which can be readily magnetized in either direction are called---

    a) Hard magnetic materials
    b) Soft magnetic materials
    c) Low hysteresis materials
    d) High hysteresis materials

12. The magnetic dipole moment is the product of current in the loop and---

    a) flux enclosed by loop
    b) square of area enclosed by current loop
    c) area enclosed by current loop
    d) none of these

13. Relative permeability of a medium is the permeability relative to that of---

    a) water b) vacuum c) iron d) none

14. Magnetic susceptibility χ equals---
    a) dipole moment per unit volume
    b) torque per unit area
    c) magnetization per unit magnetic field intensity
    d) none of these
15. Hard magnetic materials are used entirely for their---
    a) ability to repel the magnetic fields
    b) ability to retain the magnetic fields
    c) ability to change the magnetic fields
    d) a and c
16. The groups of atomic magnets formed due to interaction are called as –
    a) domains b) resistances c) inductances d) None of these
17. Hysteresis loop is a plot of ---
    a) M Vs. H b) B Vs. H c) M Vs. B d) both a & b
18. An example of diamagnetic material is—
    a) Nickel b) silicon c) aluminum d) sodium.

19. An example of paramagnetic material is—
    a) chromium b) benzene c) magnesium d) gold
20. An example of ferromagnetic material is—
    a) cerium b) oxygen c) nickel d) tungsten
21. Give the important applications of soft magnetic materials.
22. Give the important applications of hard magnetic materials.
23. What are soft magnetic materials?
24. What are hard magnetic materials?
25. What are antiferromagnetic materials? Give example.
26. What are ferrimagnetic materials? Give example.
27. What is Curie – Weiss law?
28. Give the relation between magnetic susceptibility, magnetization and magnetic field with the physical meaning of symbols.
29. Define intensity of magnetization.
30. Define magnetic intensity.

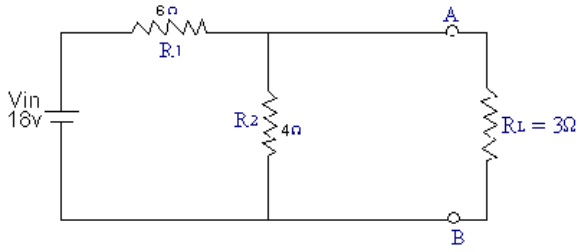
CHAPTER 5:- ELECTROMAGNETIC INDUCTION

1. State faraday's laws of electromagnetic induction.
2. What is electromagnetic induction? State Lenz law of electromagnetic induction.
3. Define self-induction and mutual induction.
4. State the expression for energy stored in an inductor.
5. Define the SI unit of self-induction.
6. Define the SI unit of mutual induction.
7. Define the step up and step down transformer.
8. What is ideal transformer?
9. Define efficiency of transformer.
10. State different losses in transformer.
11. State the principle of the transformer.
12. State the types of transformer.
13. Draw the symbol of the transformer.
14. Distinguish between self and mutual induction.
15. Distinguish between the step up and step own transformer.
16. Explain the iron losses in transformer.
17. State the relation between turns ratio with current ratio.
18. State the relation between turns ratio with voltage ratio.
19. State the relation between turns ratio with current and voltage ratio.
20. Why self induced emf is called as back emf also.
21. For a transformer the turns ratio is 1:2.If 120 volt is applied to the primary, find the voltage at the secondary.
22. Calculate the coefficient of the self-induction of a coil of 100 turns with air core. If a current of 2 ampere produces a magnetic flux of 0.0001weber through the coil.
23. An ideal transformer gives 6 volts output with 220 volts input. Find its turns ratio? If the current in the secondary is 22A,what is the current in primary?
24. What is copper losses in the practical transformer.

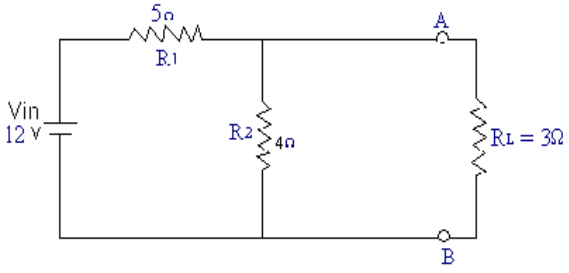
Short Answer Type (4-Mark)

CHAPTER: -1 CURRENT ELECTRICITY

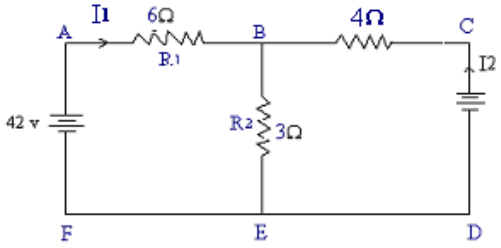
1. Define current density vector; what is it's SI unit? Show how current density is related to current in a conducting wire.
2. Starting from macroscopic form of Ohms law, derive it's microscopic form.
3. Establish the relation $J=\sigma E$ where the symbols have their usual meanings.
4. State and explain the Kirchhoff's laws for an electrical network.
5. The efficiency of the source under maximum transfer condition is 50 % explain. Hence State maximum Power transfer theorem.
6. Explain the terms, i) Electric power, ii) Electrical energy Give their units
7. State and explain the Joule's law of heating.
8. Give the statements of i) Thevenin's theorem and ii) Norton's theorem.
9. State i) maximum Power transfer theorem ii) Kirchhoff's voltage law.
10. Explain the loop current analysis of Maxwell's cyclic current analysis of electrical network by suitable example.
11. Find out the current passing through RL = 3Ω using Thevenin's theorem.



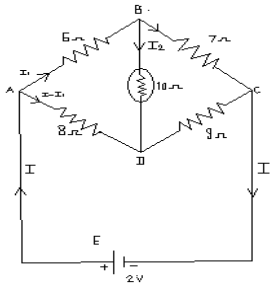
12. Using Norton's theorem find out the current passing through load resistance RL.



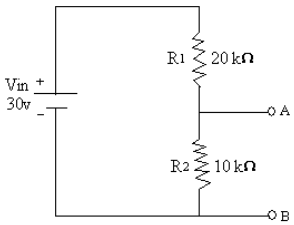
13. Using loop analysis find the values of I1 , I1 and the current passing through the branch BE



14. In a Wheastone's network ABCD, the resistances in the four arm a AB, BC, CD and DA are 6,7,9,8 ohms respectively. A cell of emf 2v is connected between points A and C while a galvanometer of resistance 10 Ω is connected between the points B and D.Calculate the current in galvanometer.

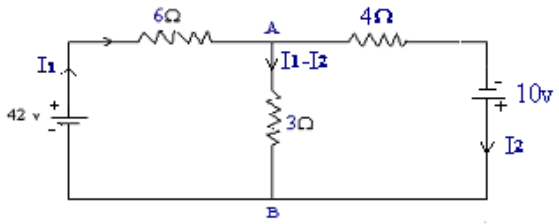


15. Obtain the Thevenin's and Norton's equivalent circuits of the network given below.



16. A lamp is rate at250v, 100W, what is the resistance of the lamp? What current does it takes? What will be the cost of using the lamp for 100 hours, if the B.O.T. unit cost 30 paise per unit?
17. An electric kettle contains an immersion heater rated at 2kW.How long will it take to raise the temperature of 1 liter of water from 15 to 100 degree centigrade, assuming that 90 % of the energy liberated is given to water? (J=4.2 joule/cal)
18. An electric heater having a coil of resistance 1050 ohm and carrying a current of 2 ampere is immersed in 5 liter of water at 20 degree centigrade. How long will it take for water to boil?

19. An electric heater having a coil of 1000 watt was used one hour per day, an electric iron of 1500 watt was used for half hour per day, 4 bulbs of 60 watt ware used for hours per day, a micro oven of 2000 was used for 1 hour per day, a television of 100 watt was used for 5 hour per day. Calculate the bill for the month of Feb. 2008 at the rate of 40 paise for first 30 units then Rs 2 for 31 to 100 units and Rs 3 for 101 to 300 units.
20. Calculate the loop current **I1** and **I2** and then calculate the voltage drop across **3Ω** resister in the given network.



21. State and explain ohm's law .from it define the resistance and give unit.
22. Give the different steps involved in Thevenizing a circuit network.
23. Give the different steps involved in Nortonizing a circuit network.
24. State the difference between Thevenin and Norton theorem.
25. State the sign convention used for current in KCL and potential difference in KVL
26. What do you mean by i)node ii)loop, in a circuit.
27. What do you mean by electrical energy cosumed and give its unit.How you can calculate the number of unit.
28. Define i)1 watt , ii) current density J
29. State Joules law.Give its mathematical form and unit of electric work and heat.
30. Obtain an expression for efficiency of a electric circuit when maximum power is transfer to the load.
31. Write a short note on current density.

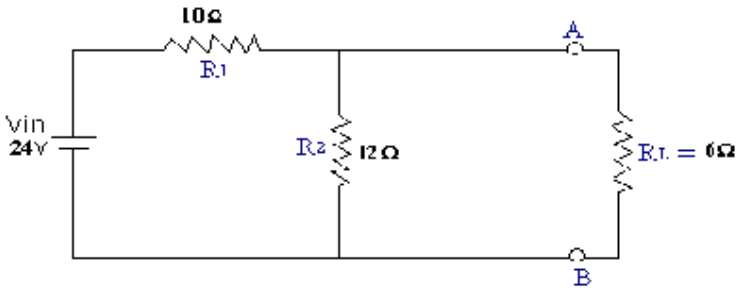
32. State KVL and give the sign convention used for potential difference in the circuit.

33. State and explain KCL, give the sign convention used for current.

34. State Kirchhoff's voltage laws.How it can be explained on the basis of law of conservation Of energy.

35. What do you mean by electric power? Obtain its expression in different forms hence give the different units of electric power.

36. Find the value of current through RL using Norton's theorem.



CHAPTER 2:- ELECTRICAL CIRCUITS D.C.

1. Obtain an expression for the growth of current in a circuit containing an inductance, a resistance and a steady emf connected in series.

2. Obtain an expression for decay of current in LR circuit.

3. Discuss the growth of charge on a condenser in series with a resistance.

4. Obtain an expression for the discharge of condenser through a resistance

5. Draw a circuit representing growth of current of LR circuit .Define the time constant of LR circuit

6. Draw a circuit representing decay of current of LR circuit . Define the time constant of LR circuit

7. Draw a circuit representing growth of current of RC circuit .Define the time constant of RC circuit

8. Draw a circuit representing decay of current of RC circuit . Define the time constant of RC circuit

9. Draw and explain circuit diagram for decay of current in LR circuit.

10. Draw and explain circuit diagram for growth of current in LR circuit

11. Draw and explain circuit diagram for charge of condenser through the resistance.

12. Draw and explain circuit diagram for discharge of condenser through the resistance.

13. An inductive circuit of resistance 20Ω and inductance10 henry in connected in series with supply 100 volt. Find the value of current at the end of a) half a second and b) one second , after the in switched ON.

14. An inductive circuit contais resistance 200Ω and inductance at 50 henry connected in series to an emf 100 volt. If the source is switched Off , what will be the current at the end of a) one fourth of a second, and b) half a second

15. A potential difference of 10 volt is applied to the coil at 10 ohm and at inductance of 1 henry.what is the current after 1/10 second?

16. Calculate the value of the current at the end of 0.2 second after an emf of 20 volt is applied accros the coil of inductance 1H and a resistance 20 ohm.

17. An inductive circuit containing resistance 100Ω and inductance at 25 henry connected in series to an emf 100 volt. If the source is switched Off , what will be the current at the end of a.1/4 second b. 1/2 second

18. A condenser at 4 μf is first charged and the discharge through a resistance of 0.2 megaohm . Calculate the time ion which a charge will decrease to 36.8% of the initial value.

19. The fully charged condenser at capacity 1 μf is discharge through a resistance of 2 megaohm a) Calculate the time taken by charge to fall 36.8% of its initial value.

b) How long will it take for the charge to fall to half of its initial value.

20. A capacitor of 10 μf is chagred to a potential of 100volts is connected to aseries resistance of 1000000 ohm What is the initial value of current?In what time the potential will fall to 50 volt?

CHAPTER 3:- DIELECTRIC MATERIALS

1. Explain the term
   a) Pure dielectric b) lossy dielectric
2. What result was be obtained from Faraday's two identical capacitor

   experiment , one field with dielectric material & other is empty
3. Explain the difference between bound charges & free charges.
4. Explain microscopic unit with suitable example.
5. Defined electrical dipole moment of a microscopic unit of a dielectric for continuous distribution & discrete charge distribution
6. Define non-polar dielectric? Give the examples of non-polar dielectric materials
7. Distinguish between polar dielectric material & non-polar dielectric material
8. Define polar dielectric? Give the examples of polar dielectric materials
9. Define polarizability. For symmetrical unit cell state the unit for polarazability
10. Define electronic polarizability with example .
11. With a neat diagram explain ionic polarizability
12. Define non-polar dielectric type -I
13. Define non-polar dielectric type -II
14. Explain in brief non-polar dielectric type-I with suitable example
15. Explain in brief non-polar dielectric II with suitable example
16. Distinguish between para-electric & ferro-electric materials.
17. Explain the term induced dipole moment?
18. What is meant by displacement current
19. Give a reason why polar molecules have permanent electrical dipole
20. In absence of external electric field, average dipole moment of the dielectric material is zero. Comment.

21. When slab of a dielectric material is subjected to an electric field, the net dipole moment is increased. Comment.
22. Explain the term dielectric breakdown.
23. Write a note on insulation resistance.
24. Define volume insulation resistance. On what factors volume insulation resistance depends?
25. Insulation resistance is affected by change in temperature. Comment.
26. Write a note on electrical strength of dielectric
27. Find the thickness of air act as dielectric in capacitor when we apply a potential difference of 3 mega volts. Given dielectric strength of air is 3×10^6V/m
28. find the thickness of polystyrene act as dielectric in capacitor when we apply a potential difference of 20 mega volts. Given dielectric strength of polystyrene is 20×10^4 V/m.
29. What is the function of insulating dielectric material?
30. What is the function of common dielectric material?
31. Give the application of dielectric material
32. State the unit of permittivity and permeability of free space
33. Match the following

Dielectric	Dielectric constant
Air	2.25
Paraffin	1.00059
Pure water	3.5
Paper	80

34. Write a note on dielectric loss of a material.

CHAPTER 4:- MAGNETIC PROPERTIES OF MATERIAL

1. What is magnetism? Explain the origin of magnetism.
2. What are magnetic materials? Classify magnetic materials. Give one example of each class.
3. What are magnetic parameters? Explain the concept of magnetic susceptibility (χ) and permeability (μ).
4. What are magnetic parameters? Explain magnetization (M) and magnetic Induction (B).

5. What is magnetic moment of atom? Explain the concept of Bohr magneton.
6. What is Internal molecular field? How it is responsible to magnetize the magnetic materials?
7. Distinguish between the characteristics of diamagnetic and paramagnetic materials. Give example of each.
8. Distinguish between the characteristics of diamagnetic and ferromagnetic materials. Give example of each.
9. Distinguish between the characteristics of ferromagnetic and paramagnetic materials. Give example of each.
10. Distinguish between the characteristics of ferromagnetic and antiferromagnetic materials. Give example of each.
11. Describe briefly diamagnetism and paramagnetism.
12. Describe briefly diamagnetism and ferromagnetism.
13. Describe briefly ferromagnetism and antiferromagnetism.
14. Describe briefly paramagnetism and ferromagnetism.
15. Explain effect of temperature on Diamagnetic, paramagnetic and ferromagnetic materials.
16. Explain the domain characteristic of ferromagnetic materials.
17. What are magnetization curves? Explain residual magnetization, and coercive force.
18. What is meant by hysteresis? How it is use to characterize magnetic materials?
19. Write short note on ferrites.
20. Write short note on antiferromagnetism.
21. How could you select the materials for constitution of permanent magnet and transformer core?
22. What are soft magnetic materials? Mention example and their uses.
23. What are hard magnetic materials? Mention example and their uses.
24. Give the relation between magnetic susceptibility, magnetization and magnetic field with the physical meaning of symbols.
25. Compare the properties of diamagnetic and paramagnetic materials.

CHAPTER 5:- ELECTROMAGNETIC INDUCTION

1. Obtain the expression for self induced emf and hence define its SI unit.
2. Obtain the expression for mutual induced emf.And hence define its SI unit.

3. State the relation of magnitude of self induced emf and obtain the expression for energy stored in an inductor.
4. State the principle and types of transformer.
5. Define the electromagnetic induction. State Faraday's laws of electromagnetic induction.
6. What is the coefficient of the self-induction? Hence calculate the coefficient of the self-induction of a coil of 100 turns with air core. If a current of 2 ampere produces a magnetic flux of 0.0001weber through the coil.
7. What must be the primary current so that a flux of 0.08 weber is developed in the secondary? if the mutual inductance is 100 mH if this current reduces by 50% in 10 milli second. What voltage is induced across the secondary?
8. A step up transformer works on 220 volt and gives a current of 2 A to an external resister. The turn ratio between primary and secondary coil is 2:25.Assuming 100% efficiency, find the secondary voltage and primary current.
9. State the relation between turns ratio with current ratio. For a transformer the turns ratio is 1 to 2.5.If 120 volt is applied to the primary, find the voltage at the secondary.
10. State the relation between turns ratio with voltage ratio. For a transformer the turns ratio is 1:2.If 120 volt is applied to the primary, find the voltage at the secondary.
11. A step up transformer works on 220 volt and gives a current of 1 A to an external resister. The turn ratio between primary and secondary coil is 2:25.Assuming 100% efficiency, find the secondary voltage and primary current.
12. A step down transformer connected to the mains supply of 240 V is used to operate a12 V, 36 W lamp. Neglecting power losses, find the turns ratio and the current in primary?
13. Write a note on iron losses in the practical transformer.
14. State different losses in transformer. Hense explain the losses in the practical transformer due to flux leakage.
15. Obtain the expression for energy stored in an inductor.
16. Write a note on self-induction.
17. Write a note on mutual induction.
18. A step up transformer operates on 200 V line. The turn ratio between primary and secondary coil is 1:20.if transformer supplies a current of.5 ampere to a load

connected across the secondary, calculate the secondary voltage, and primary current. Assuming that there are no power losses.

19. Write a note on transformer.
20. If a current I is passing through a coil, obtain the expression for energy stored in the coil.
21. Explain in brief the construction and working of transformer.
22. Explain in brief the losses in the practical transformer.
23. Define coefficient of self-induction and coefficient of mutual induction.
24. State the S.I. unit of coefficient of self-induction and coefficient of mutual induction
25. State different losses in transformer. Hense explain the iron losses in the practical transformer.
26. State the relation between turns ratio with current and voltage ratio. State different losses in transformer.

Long Answer Type (6-Mark)

CHAPTER: -1 CURRENT ELECTRICITY

1. State and explain the Joule's law of heating due to an electric current. Hence explain the term watt and kilowatt-hour.
2. State maximum Power transfer theorem and derive the necessary condition.
3. State and explain the Thevenin's theorem with suitable example.
4. State and explain the Norton's theorem with suitable example.
5. State the Thevenin's theorem. Give the different steps to Thevenise the circuit; take suitable example.
6. State the Norton's theorem. Give the different steps to Nortonize the circuit; take suitable example.
7. State the Ohms law. Define resistivity, conductivity. Give their SI units. Obtain the microscopic form of Ohm's law from its macroscopic form

CHAPTER 2:- ELECTRICAL CIRCUITS D.C.

1. Discuss the grouth of current in a circuit containing an inductance,a resistance and steady emf connected in series.Define time constant of thiscircuit.
2. .Obtain an expression for the growth at charge on a condenser in series with a resistance. Define the time constant of this circuit
3. Obtain an expression for decay of current in LR circuit. Define the time constant of this circuit.
4. Discuss the discharge of condenser through a resistance. Define the time constant of this circuit.

CHAPTER 3:- DIELECTRIC MATERIALS

1. Prove that
   $E_0 / Ed = K = U_0 / U_d$
   Where E_0 field inside the plate without dielectric E_d field inside the plate with dielectric
2. Define displacement vector. Derived the relation between displacement vector & electric field between plates.

3. Define polarization vector (P) and write a relation between polarization vector & area A
4. Explain in brief polarization vector (P).
5. Show that

   $$\varepsilon = \varepsilon_0 + x_e$$

   Where ε = dielectric permittivity of the dielectric material and

   x_e = electrical susceptibility
6. Prove that the net dipole moment of the microscopic unit in presence of static electric field.

   $P = Pu + Pi$
7. Explain in brief internal electric field Ei
8. What are the different kinds of dielectric material? Explain non-polar dielectric material
9. Prove Clausius –Mosotti equation?
10. prove that

    $$\frac{k-1}{K+2} \cdot \frac{M}{d} = \frac{N\alpha}{3\varepsilon_O}$$
11. What are the different types of polarizability. With a neat diagram explain electronic polarizability
12. State and explain basic requirements and characteristics of insulating material
13. State and explain basic requirements and characteristics of common dielectric material
14. Write a note on Appropriate value of dielectric constant and Appropriate value of dielectric strength
15. Explain the term magnetic
    a) Magnetic susceptibility
    b) Magnetic permeability

CHAPTER 4:- MAGNETIC PROPERTIES OF MATERIAL

1. What are ferromagnetic materials? Discuss the spontaneous magnetization of ferromagnetic materials with domain.

2. What are soft and hard magnetic materials? Discuss essential characteristics. Mention their examples and their uses.
3. Distinguish between Diamagnetic, paramagnetic and ferromagnetic materials. Comment on temperature variation of magnetic susceptibility of all types of materials.
4. Give an account of internal magnetic field theory in ferromagnetism. On the basis of this how will you explain hysteresis and Curie point.
5. Discuss diamagnetism and paramagnetism. Give example of each class.
6. Obtain the relation $B = \mu_0 (H + M)$, where symbols have their usual meanings.

CHAPTER 5:- ELECTROMAGNETIC INDUCTION

1. Describe the construction and working of transformer.
2. Distinguish the various power losses in a transformer. How are they minimized?
3. Explain the self-induction and the mutual induction.
4. Obtain the relation between turns ratio with current and voltage ratio.
5. A step up transformer works on 220 volt and gives a current of 2 A to an external resister. The turn ratio between primary and secondary coil is 2:25.Assuming 100% efficiency, find the secondary voltage, primary current and power delivered.
6. Explain the self-induction? A step up transformer works on 220 volt and gives a current of 2 A to an external resister. The turn ratio between primary and secondary coil is 2:25.Assuming 100% efficiency, find the secondary voltage.
7. State the self-induction and the mutual induction? An ideal transformer gives 6volts output with 220 volts input. Find its turns ratio? If the current in the secondary is 22A, determine the current in primary?

PHYSICS PAPER-II

SECTION II: APPLIED PHYSICS

Objective Type (2-Mark)

CHAPTER 1:- INTRODUCTION TO MATERIALS

1. Give any four properties of material.
2. Define conductivity of material
3. Define receptivity of material.
4. Give any four properties of metal
5. What is nano material?
6. Define dielectric strength of material.
7. Give any four optical properties of material.
8. What is mean by phosphorescence?
9. Give any four examples of Alloys.
10. Give any four applications of Alloys.
11. What is mean by Refractories?
12. Give the properties of ceramics
13. Give any four general properties of Glass
14. Define ” polymers”
15. What is mean by degree of polymerisation?
16. Give the properties of polymers
17. Give the structure of polymers
18. Give the examples of fluorescence
19. Give the classification of materials
20. What is mean by clay product?

CHAPTER 2:- ELECTROMAGNETIC RADIATION IN COMMUNICATION

1. Give the classification of electromagnetic spectrum.
2. Which layer plays an important role in radio and telecommunication? Give the range of this layer from earth surface.

3. What are radio waves? What is the use of radio waves?
4. For TV signal ground wave propagation cannot be used. Comment
5. State different types of radio waves propagation.
6. What are space waves?
7. What is range of space wave?
8. How many satellites are necessary to cover all the surface of the earth? Justify
9. What is the drawback of geostationary satellite?
10. What are different orbits used for satellite communication?
11. Write any two drawback of satellite moving in elliptical orbit?
12. What is ground wave propagation?
13. What is the range of frequencies of the space wave propagation?
14. Sketch the orbits used for satellite communication.
15. What is the advantage of geostationary satellite?
16. What is transponder?
17. Why uplink and down link frequencies are separated?
18. What is function of transponder?
19. What are the uplink and down link frequencies?
20. Give the classification of different layers of the atmosphere.

CHAPTER 3:- FIBRE OPTICS

1. Which requirements are must be satisfied by the material for the preparation of optical fibre?
2. Distinguish between glass fibre and plastic fibre
3. Define acceptance angle and acceptance cone
4. Define critical angle and numerical aperture
5. What are the different types of optical fibre?
6. What is monomode step-index fibres?
7. What is a multimode step-index fibre?
8. What is graded index fibres?

9. Draw neat labeled diagram of step-index fibres and graded index optical fibre.
10. What is difference between step-index fibers and graded index optical fibres
11. What are the advantages of multimode step-index fibre over monomode step-index fibres?
12. Draw the neat-labeled diagram of refractive index profile and ray transmission in single mode step index fibre.
13. Draw the neat-labeled diagram of refractive index profile and ray transmission in multi mode step index fiber.
14. Draw the neat-labeled diagram optical fibre and ray transmission in single mode step index fibre.
15. Draw the neat-labeled ray diagram of optical fibre showing the various rays and angles.
16. Why different cable designs are required for each type of application?
17. Compare the step index fibre and graded index optical fibres on the basis of refractive indices
18. What are the advantages of single mode fibre?
19. What are the losses in optical fibre?
20. An optical fibre in air has numerical aperture of 0.4. Determine the acceptance angle.

CHAPTER 4:- SOLAR ENERGY

1. How much power is available on earth surface from the sun?
2. The power available on earth surface from the sun is

   a) $1.1x10^{11}$Mw b) $1.8x10^{11}$kw

   c) $1.8x10^{11}$Mw d)$1.1x10^{11}$kw

3. The non renewable source is

   a) Solar energy b) wind energy

   c) fossil fuels d) tidal energy

4. The renewable source of energy is

a) Solar energy b) nuclear power

c) fossil fuels d) non of above

5. The per capita energy consumption of India is

a) 8000kwh b) 800kwh

c) 150kwh d) 15kwh

6. State the per capita energy consumption of U.S.A. and India
7. What is maximum solar radiation flux density in hottest region on earth surface.
8. The air mass(M) just above the earth's atmosphere is

a)0 b)1

c)2 d)∞

9. 9) The visual light radiation spectrum (λ) lies in the range

a) $\lambda<10^{-8}\mu m$ b) $\lambda=10^{8}\mu m$

c) $2x10^{-2}\mu m<\lambda<0.38\mu m$ d) $0.38\mu m<\lambda<0.78\mu m$

10. Define air mass
11. Define solar constant
12. What is solar energy?
13. Write the name of the instruments used for the measurement of solar radiation.
14. What is pyrometer?
15. Define beam radiation and diffuse radiation
16. What are advantages of solar energy?
17. What is the function of mirror in a box type solar cooker?
18. State the principle of photovoltaic conversion.
19. Draw a neat labeled diagram of liquid flat plate collector.
20. What is solar thermal power?
21. What are the limitations of solar energy?

CHAPTER 5:- INTRODUCTION TO BIOELECTRICITY

1. Who found out the idea of electricity, when and by which animal?

2. What is the central computer of the body and state the function of it in body?
3. What is the function of nerve cell?
4. Give the different types of cells in the body.
5. What is mean by semipermiable membrane?
6. Give the chemical composition of semipermiable membrane.
7. What is the role of semipermiable membrane in electric conduction?
8. Define the terms resting potential and local depolarization.
9. Define the term action potential and absolute refractory period
10. What is mean by excitable cell and which cells are excitable in the body.
11. Which are the principal ions present in the body fluid for electric impulse conduction.
12. Define the terms polarization, depolarization and Repolarization.
13. Define the term depolarization of a cell and draw the ionic movement associated with depolarization
14. Gives the numerical values of membrane potential of various cells.
15. Define the terms propagation rate and nerve conduction rate.
16. Discuss the electrical behavior of neuron.
17. What is neuron?
18. Differentiate the terms myelinated and unmyelinated nerve.
19. Give the factors, which affects the speed of propagation of action potential.
20. Why the conduction speed in myelinated fibre is faster than unmyelinated fibre?
21. What is the advantage of myelinated nerve to that of unmyelinated nerve for propagation in axon?

Short Answer Type (4-Mark)

CHAPTER 1:- INTRODUCTION TO MATERIALS

1. Explain thermoplastic and thermosetting Polymers
2. Define metals? Give the characteristics of metals.
3. Explain metallic bonding and conductivity of metals.
4. Write a short note on Alloys.
5. Write a short note on Glasses
6. Explain temperature diagram of glasses
7. Write a short note on carbon-nano tubes.
8. Explain Fullerences in nano-material.
9. A wire has resistivity $7.28 \times 10^{-7} \Omega m$.what length of wire of diameter 0.2mm should be taken to form a coil of resistance 5 Ω
10. Explain glass transition temperature in brief.
11. Write a short note on nano materials
12. Explain the resistivity and conductivity of materials
13. Give the uses of metals and uses of alloys
14. Give the types of glasses and their uses
15. Explain addition Polymerisation in detail
16. Explain types of Glasses
17. Write a short note on Phases of materials
18. Write a short note on Polymers.
19. Explain Fluorescence and Phosphorescence.
20. Give the properties and uses of Glasses
21. Give the properties and uses of ceramics
22. Enlist the applications of ceramics
23. What is Alloys? Explain the purpose for which alloying is carried out.
24. Give the introduction of nanomaterial.
25. Enlist the characteristics of metal.
26. Write a short note on metallic bonding and conductivity of metals

27. What is the difference between metals and ceramic
28. What is the difference between metals and polymers
29. Give the difference between polymers and ceramic
30. Write a short on Fullerences.

CHAPTER 2:- ELECTROMAGNETIC RADIATION IN COMMUNICATION

1. What are the Characteristics of electromagnetic waves
2. Explain the transverse nature of electromagnetic waves
3. Enlist electromagnetic spectrum with frequency range.
4. With suitable diagram explain sky wave propagation.
5. With suitable diagram explain space wave propagation.
6. Explain what is the difference between sky wave propagation and space wave propagation.
7. Explain the principle of satellite communication.
8. What are the uses of satellite communication?
9. What are the advantages of satellite communication?
10. Write note on geostationary satellite.
11. With neat diagram explain in brief the orbits used for satellite communication.
12. Write a note on propagation of radio waves.
13. Write a note on electromagnetic spectrum.
14. Give the classification of waves and explain each in brief.
15. Write a note on satellite communication.
16. What is space wave propagation? Show that d= $\sqrt{2Rh}$
17. Explain in brief what are the different types of satellites used for communication depending on orbits used.
18. Write a note on ionosphere.
19. Write a note on electromagnetic waves.
20. What are the different types of propagations? Explain any one in short.
21. Write a note on remote sensing.

22. What are the drawbacks of elliptical orbit used for satellite communication?
23. Enlist the characteristics of electromagnetic waves.
24. Write a note on propagation of radio waves
25. With neat diagram explain ionosphere.
26. What is geostationary satellite? Explain in brief.
27. Explain the importance of geostationary satellite.
28. What are ground waves? Explain ground wave propagation.
29. What are space waves? Describe space wave propagation.
30. Explain in brief (a) microwaves (b) radio waves
31. What are the drawbacks of geostationary satellite? How these drawbacks are overcome?

CHAPTER 3:- FIBRE OPTICS

1. Define acceptance angle, acceptance cone, critical angle and numerical aperture
2. Explain in brief the different losses in optical fibre.
3. Write a short note on total internal reflection.
4. What are different types of optical fibre? Explain the monomode step-index fibres
5. What are different types of optical fibre? Explain the multimode step-index fibres
6. What are different types of optical fibre? Explain the multimode graded-index fibres.
7. What are different types of optical fibre? Explain any one of them
8. Draw the index profile diagram for step index fibre and graded index optical fibre and explain in short
9. Distinguish between monomode step-index fibres and multimode step-index fibre
10. What are the advantages of graded index fibres over step index fibres?
11. Write a short note on plastic optical fibre
12. Write a short note on glass optical fibre
13. With a schematic diagram explain the fibre fabrication process.
14. Explain the principle and working of optical fibre.
15. Write a short note on optical fibre bundles.

16. Explain fibre cable structure with neat diagram.
17. Calculate the numerical aperture and acceptance angle of an optical fibre from following data, refractive index of core = 1.55 refractive index of cladding =1.5
18. Compute numerical aperture, acceptance angle and critical angle of fibre having core refractive index 1.5 and cladding refractive index 1.45
19. Calculate refractive index of core and cladding material of a fibre having numerical aperture 0.22
20. What are the applications of optical fibre?
21. What are the losses in optical fibre?
22. What are the requirements for selecting material for optical fibre?
23. Explain in short the 'plastic optical fibre'
24. Explain in short the 'glass optical fibre'
25. With a suitable diagram explain the fibre fabrication process.
26. Explain in short the 'fibre optical cable'
27. Explain in short the 'optical fibre bundles'
28. With a suitable diagram explain the fibre cable structure
29. Write a short note on fibre optic cables
30. Write a short note on multimode step index fibres

CHAPTER 4:- SOLAR ENERGY

1. Define a)solar energy b)wind energy c)hydrothermal energy d)tidal energy
2. Write a short note on solar energy and wind energy
3. Write a short note on hydrothermal energy and tidal energy
4. What are conventional and non-conventional sources of energy?
5. What are renewable and non-renewable sources of energy?
6. Explain in brief the reasons for energy crises.
7. What are the advantages and limitations of solar energy?
8. What are the advantages of renewable energy sources?
9. What are the limitations renewable energy sources?

10. Explain the terms beam radiation and diffuse radiation
11. Solar energy is the best option of energy. Comment
12. Why solar energy is the best energy source?
13. Write a short note on solar air heater?
14. How liquid flat plate collector can be used as solar air heater?
15. Suggest the modification in liquid flat plate collector to convert it into solar air heater.
16. Write a short note on a) Geothermal energy b) Biomass energy
17. Write a short note on a) Wave energy b) Water power
18. With neat diagram explain the working of box type solar cooker.
19. Write a short note on box type solar cooker
20. State the factors attenuating beam radiation.
21. Explain the parameters responsible for attenuation of solar radiation.
22. Find the air mass when the sun is at an zenith angle of 60^0
23. Find the air mass when the zenith angle is 90^0
24. Explain the working of solar cell
25. Explain the spectral distribution of solar radiation.
26. What are alternate sources of energy?
27. Explain the working of solar water heater.
28. Explain with neat diagram natural circular water heating system.
29. How Pyranometer is used for measurement of diffuse radiation?
30. Explain the principle of solar cell in short
31. Explain the principle photovoltaic conversion in short
32. Explain the liquid flat plate collector

CHAPTER 5:- INTRODUCTION TO BIOELECTRICITY

1. Explain the concept electricity observed in the living system with example.
2. Discuss with example electricity observed in the cell of living system.

3. Discuss with example, how the electrical activity is indeed in relation to body function.
4. What is origin of Bioelectricity.
5. Explain the terms resting potential, local depolarization and action potential.
6. What is mean by compound action potential ? Give the examples of compound action potentials.
7. Discuss origin of different compound action potential.
8. Summarized the phenomena of sodium and potassium ions transport across the semipermiable membrane.
9. Explain the terms resting potential and action potential.
10. Explain the process of polarization and depolarization in the cell.
11. Explain the process of depolarization and Repolarization in the cell.
12. State and explain Nernst equation.
13. State the Nernst equation and show that for univalent ion at temperature 27^0c the potential across the membrane is given by,

    $$E=59 \log_{10} Co/Ci$$

14. Calculated the action potential generated by Na^+ ions, if the ratio of inner concentration of ions to outer concentration of ions is 1:8· 8. Given: R=8·315 x 10^7 erg/mol/^{o}k, F=96500 coulomb, Z= +1 and T=25^0c .
15. What is conduction velocity?
16. Describe the structure of nerve cell.
17. Describe the structure of neuron.
18. Sketch and labeled the diagram of neuron and explain the function of axon.
19. Define the terms synapse, dendrites, axon, myelinated sheath and nodes of ranviers.
20. Describe the Electron microscopic structure of nerve fibres.
21. Describe a typical nerve cell.
22. Describe how the nerve impulse is travel along the nerve fibre.
23. What are the events which occurs when the nerve carry electrical signal?

24. What are the events which occurs when the axon carry electrical signal?
25. How a single K^+ ion can be represented by an equivalent electrical circuit, explain.
26. Describe the capacitive property of the membrane.
27. Draw the equivalent circuit of membrane and explain of each component.
28. A typical value of membrane capacitance for a nerve cell is 10^{-6} F/cm^2 of membrane area with resting potential 70mV. Calculate the total number of charge stored in membrane capacitance.
29. Calculated the action potential generated by Cl^- ions, if the inner concentration of ions is 52 mM and outer concentration of ions is 560 mM Given: R=8·315 x 10^7 erg/mol/^{o}k

    F=96500 coulomb, Z= +1 and T=25^0c.
30. Calculated the action potential generated by K^+ ions, if the inner concentration of ions is 400 mM and outer concentration of ions is 20 mM.

    Given: R=8·315 x 10^7 erg/mol/^{o}k, F=96500 coulomb, Z= +1 and T=25^0c

Long Answer Type (6-Mark)

CHAPTER 1:- INTRODUCTION TO MATERIALS

1. Explain in detail electrical properties of material.
2. Explain in detail phases of materials
3. Explain in detail optical properties of material
4. Explain ceramic in detail with properties and application
5. Write a note on Nano-materials
6. Explain Alloys in detail with suitable examples
7. What is polymerisation? Explain the polymerisation process.
8. Define Polymer? What are the different groups of Polymers? Explain in short
9. Explain in detail the phase diagram of Glass.

CHAPTER 2:- ELECTROMAGNETIC RADIATION IN COMMUNICATION

1. Explain the space wave propagation and show that d= $\sqrt{2Rh}$
2. Explain in brief application of satellite communication.
3. With neat diagram explain remote sensing.
4. State the advantages of satellite communication.
5. Explain the types of propagation.
6. With neat diagram explain different layers of atmosphere.
7. Enlist electromagnetic spectrum with frequency range.

CHAPTER 3:- FIBRE OPTICS

1. Derive an expression for Numerical aperture.
2. Explain with neat diagram the principle of operation of optical fibre.
3. What are different types of optical fibre? Explain each type in short
4. Explain the glass fibres and plastic fibres.
5. Describe the concept of numerical aperture and obtain an expression for it
6. Explain fabrication of an optical fibre. What are the important materials used in optical fibres?
7. How fibres are drawn and coated? Explain with suitable diagram.
8. Explain the fibre cables.

CHAPTER 4:- SOLAR ENERGY

1. Explain the various types of renewable energy sources
2. Explain the principle and working of photovoltaic conversion.
3. Explain the terms a) absorption b) scattering
4. With a neat diagram explain the construction and working of pyranometer.
5. What is liquid flat plate collector? Explain with suitable diagram
6. Explain solar water heating system with systematic diagram
7. Describe box type solar cooker with systematic diagram.
8. What are the advantages and limitations of renewable sources of energy?

CHAPTER 5:- INTRODUCTION TO BIOELECTRICITY

1. Describe the transport of sodium and potassium ions across the cell in the body, hence explain action potential.
2. With suitable diagram explain the resting potential, local depolarization and action potential. Draw the waveform of the action potential.
3. What is neuron? Discuss the structure and function of neuron.
4. With the help of suitable diagram, describe the structure and function of Neuron.
5. What is axon? How axon acts as a cable?
6. What is axon? Explain with diagram how the electric signal is transfer from one nerve cell to another cell.
7. With suitable diagram, explain how axon propagates action potential.
8. Discuss how membrane is an equivalent circuit-containing resistor and capacitor.
9. Explain the membrane resistance and capacitance of the cell with the equivalent circuit diagram.
10. Explain Polarization, Depolarization, Repolarization and absolute refractory period of the cells.

BEST OF LUCK