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**DEPARTMENT OF PHYSICS**  
**VSEMESTERQUESTIONBANK**

**SUBJECT: OPTICS (CORE-5)**

Subject Code: BPH51

Subject Handled by: Mrs. K. RAMYA

**UNIT - I (GEOMETRICAL OPTICS)**

**Two Marks**

1. Define spherical aberration.
2. What do you mean the chromatic aberration?
3. Define circle of least.
4. Define coma.
5. Write short note on astigmatism
6. Define aplanatic lens.
7. Draw a diagram which can show axial chromatic aberration.
8. Write merits and demerits of Ramsden's eyepiece
9. Write merits and demerits of Huygen's eyepiece

**Five marks**

1. Explain the defects astigmatism and coma.
2. Explain what is the meant by chromatic aberration in lenses.
3. Derive the condition for the achromatism of two thin lenses separated by a distance.
4. What is a spherical aberration and how does it affect the definition of the image formed by a lens?
5. (i) Define aberration in lenses.  
(ii) Explain longitudinal and lateral spherical aberration in lens with neat diagram.
6. (i) How spherical aberration can be removed by using a Plano convex lens?  
(ii) Distinguish between chromatic and monochromatic aberrations?
7. (i) What are the types and subtypes of aberrations?  
(ii) With neat ray diagram explain spherical aberration in lens.
8. What is coma? How is it eliminated?
9. Give the methods to reduce spherical aberration.
10. Define spherical aberration. How it can be reduce?
11. An achromatic doublet of focal length 20cm is to be formed out of a combination of crown and flint glasses. The radius of curvature of the faces in contact is 15cm. Calculate the radius of curvature of the

other faces, given the dispersive powers of the crown and flint glasses as 0.02 and 0.04 and their respective refractive indices are 1.52 and 1.65

### Ten Marks

1. Explain how chromatic aberration may be removed in the case of a combination of two lenses of the same material? Is such a combination of lenses truly achromatic?
2. What do you mean by spherical and chromatic aberration of a lens? Explain how they are caused. How would you correct for chromatic aberration in the case of a lens system in contact?
3. . Explain the defects astigmatism and coma and curvature. Explain how they may be minimized.
4. Obtain an expression for the longitudinal chromatic aberration of lens. A system of lenses consists of two thin convex lenses separated by a finite distance on a common axis. Derive the conditions under which the systems is free from chromatic and spherical aberrations.
5. Briefly explain spherical and chromatic aberrations in optical images? What is an achromatic lens system and how is it obtained in practice? Obtain conditions for achromatism with two thin lenses (a) when they are in contact and (b) when they are separated.
6. What is chromatism aberration? Derive the condition for achromatism in an achromatic doublet. Discuss the validity of the conditions for the choice of the lenses.
7. Distinguish between lateral and longitudinal spherical aberration. Mention two methods for minimizing spherical aberration.

### UNIT - II (INTERFERENCE)

### Two Marks

1. Define interference. Explain thin film
2. Explain thin film
3. What is meant by an air wedge?
4. Write salient features of interference pattern
5. Define coherent source.
6. Define monochromatic source.
7. Which was the suitable source for interference
8. Write any two uses of air wedge,
9. How you can determine thickness of a thin wire
10. Define Fizeau fringes
11. Define fringe width
12. What are the features of interference pattern?
13. Explain: fringes of equal thickness.
14. Write applications of air wedge.
15. Write applications of Michelson interferometer.
16. Define Interferometer
17. Draw Michelson interferometer.
18. Write the principal of Michelson interferometer.
19. Define Refractrometer with two examples.
20. Draw well labeled diagram of Rayleigh interferometer.

### Five marks

1. Write note on thin film.
2. How will you find the wavelength of monochromatic light by using Michelson's interferometer?
3. Write principle and construction of Michelson interferometer
4. Describe Jamin's Refractometer
5. Describe Rayleigh Refractometer
6. Determine the refractive index of gases.
7. Determine angle of a air wedge.
8. Calculate the thickness of the spacer by using air wedge.
9. Explain the variable thickness film experimental arrangement with schematic diagram.
10. Explain the salient features of interference pattern.
11. Write any one applications of Michelson interferometer
12. Determine the wavelength of a monochromatic source by using Michelson interferometer.
13. Derive an expression for the difference in the two wave length of two waves.
14. What will happen if a transparent thin sheet is introduce in the path of the interfering beams?

### Ten marks

1. Describe air wedge experiment with neat diagram.
2. Determine the thickness of the spacer by air wedge experiment.
3. Determine fringe width which occurs in air wedge.
4. Describe the working of a Michelson interferometer. State the condition for obtaining white light fringes. Show owth necessary theory how this interferometer can be used to measure wavelength of light.
5. Describe a Michelson interferometer. How can it be used for measuring the wavelength of monochromatic light?
6. Describe Michelson Interferometer and explain the formation of fringes in it.
7. (i) Describe Michelson Interferometer with neat diagram  
(ii) How it is used to find difference between two close wavelengths?
8. (i) Explain the formation of circular fringes in Michelson Interferometer.  
(ii) Describe how you will Michelson Interferometer to determine the difference between two wavelengths very close to each other.
9. Describe Jamin's Refractometer
10. Describe Rayleigh Refractometer

### UNIT - III (DIFFRACTION)

### Two Marks

1. What are the condition to form Fresnel diffraction
2. Define Fresnel diffraction
3. What are the condition to form Fraunhoffer diffraction
4. Define Fraunhoffer diffraction
5. What are difference between Fresnel diffraction and Fraunhoffer diffraction?
6. Define diffraction
7. Write any two differences between interference and diffraction
8. What is the plane diffraction grating?

9. Define Resolving power
10. Define grating element.
11. Define Airy's disc.
12. What is the Rayleigh's limit of resolution?

### Five Marks

1. Describe diffraction at a circular aperture.
2. Describe diffraction pattern due to a straight edge.
3. Differentiate interference and diffraction.
4. Write detail note on plane diffraction grating.
5. Determine the wavelength in the case of normal incidence at a plane transmission grating.
6. Write note on absent spectra with a diffraction grating.
7. Write note on missing orders with a diffraction grating.
8. Write note on Overlapping spectra with a diffraction grating.
9. Determine the wavelength of spectral line by using the transmission grating.
10. Drive an expression for principal maxima of the  $n^{\text{th}}$  order wavelength in the case of oblique incidence.
11. Write note on Rayleigh's criterion. Drive the equation for resolving power of Prism.
12. Drive the equation for resolving power of Microscope
13. Drive the equation for resolving power of Telescope
14. Drive the equation for resolving power of grating.

### Ten Marks

1. Discuss Fresnel diffraction at a circular aperture.
2. Describe with necessary theory of the Fresnel's class diffraction due to straight edge.
3. Define diffraction phenomenon of light. What are its type?
4. Discuss plane transmission grating.
5. Determine the wavelength of spectral line in the case of normal incident method by using the transmission grating.
6. Discuss the difference between difference Fresnel diffraction and Fraunhofer diffraction with neat diagram which is explained it.
7. (i) What is plane diffraction grating? (ii) Discuss its theory for normal incident of light (iii) Describe in detail how plane transmission grating is used determine the wavelength of light.
8. Drive the equation for resolving power of (i) Microscope (ii) Prism.
9. Drive the equation for resolving power of (i) Telescope (ii) Prism.
10. Drive the equation for resolving power of Telescope and what are the relation between magnifying and resolving power of a Telescope?

## UNIT - IV(POLARIZATION)

### Two Marks

1. Define longitudinal waves
2. Define transverse waves.
3. Define polarization
4. Define polarized light.
5. Define Brewster's angle.
6. State Brewster's law.
7. Explain double refraction
8. Write short note on Polaroid's.
9. Define optical activity.
10. What is meant H- sheet?
11. What is electro optic effect?
12. What is magneto optic effect?
13. What are the uses of Kerr cell?
14. What is meant by dichroism?
15. Define o- ray
16. Define e-ray.

#### Five Marks

1. Write note on double refraction
2. Write note on optical activity.
3. Determine the specific rotation.
4. Define and explain the polarization.
5. State and explain Brewster's law.
6. What is meant by double refraction? Explain it.
7. What is dichroism? Explain it
8. Explain the production of plane polarized light.
9. Explain the production of circularly polarized light
10. Explain the production of elliptically polarized light.
11. Explain Kerr effect
12. Discuss Faraday effect

#### Ten Marks

1. Explain double refraction and Huygen's explanation of double refraction.
2. Explain the production of (i) Plane polarized light. (ii) Circularly polarized light (iii) Elliptically polarized light.
3. Explain (i) Kerr effect (ii) Faraday effect
4. Explain how circularly polarized and elliptically polarized light are produced and detected?
5. Describe the construction and working of a Laurent's half shade polarimeter.
6. Discuss Fresnel's explanation of optical activity.

#### UNIT - V(FIBRE OPTICS)

## Two Marks

1. Define Fibre optics.
2. What is an Optical fibre?
3. Define Acceptance angle
4. Define Acceptance cone.
5. Define numerical aperture
6. What is the principle involved in optical fibre?
7. Classify the fibre on the basis of refractive index.
8. Classify the fibre on the basis of modes
9. Classify the fibre on the basis of materials
10. Define Step index fibre
11. Define GRIN fibre
12. Define SMF
13. Define MMF
14. Draw structure of optical fibre.
15. What are the advantages of fibre optics?
16. What are the disadvantages of fibre optics?
17. Define attenuation
18. Draw block diagram of optical communication system.
19. Calculate the angle of acceptance of a given optical fibre, if the refractive indices of the core and cladding are respectively 1.553 and 1.489
20. Write short note on classification of the fibre on the basis of materials.
21. Explain : LAN
22. Explain: Long-haul communication.
23. List out the fibre optic sensor.
24. Define glass fibres.
25. Define Plastic fibre.
26. Define PCS fibres.

## Five Marks

1. Write note on optical fibre
2. Deduce an expression for acceptance angle of an optical fibre.
3. Explain: (i) Glass fibres (ii) Plastic fibres (iii) PCS fibres.
4. What is meant by acceptance angle? Show for an optical fibre? Show how it is related to numerical aperture.
5. Derive an expression for angle of acceptance of fibre in terms of refractive index of the core and cladding of an optical of an optical fibre. What is meant by acceptance cone?
6. What do you understand by the terms acceptance angle and acceptance cone?
7. Explain: (i) Acceptance angle (ii) Numerical aperture.
8. Drive an expression for acceptance angle and numerical aperture for step index fibre with diagram.
9. Drive an expression for numerical aperture of a step index fibre.
10. Explain (i) Step index fibre (ii) GRIN fibre
11. Explain (i) Step index single mode fibre (ii) Step index multi-mode fibre (ii) Grin multi-mode fibre.
12. Difference between the step-index fibre and graded-index fibre

13. Compare a single mode step index fibre with a multimode step index fibre.
14. A step index fibre with  $n_1=1.48$  &  $n_2=1.46$  , find (i) the numerical aperture  
(ii) The relative refractive index difference, and the acceptance angle.

### Ten Marks

1. Write detail note on optical fibre with neat diagram
2. Classify the fibre on the basis of (i) Refractive index (ii) Modes (iii) Materials. With proper diagram and explain it.
3. Discuss the advantages and disadvantages of optical fibres over conventional communication transmission media.
4. Explain optical communication through block diagram. For long distance communication whether (i) Mono-mode or Multimode and (ii) Step index or graded index fibre, which are preferable and why?
5. Discuss any one application of an optical fibre as a sensor.
6. Explain with the basic principle, construction and working of any one type of optical fibre sensor.
7. Draw the Block diagram of optical communication, list the main components of optical communication system. Describe the basic optical communication system.

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**SUBJECT: ATOMIC PHYSICS AND SPECTROSCOPY (CORE-6)**

**SUBJECT CODE: BPH52**

**Subject Handled by: Mrs. K. RAMYA**

**UNIT: 1(DISCHARGE PHENOMENON THROUGH GASES)**

### Two Marks

1. Define positive rays
2. Define canal rays
3. What are the properties of canal rays
4. Draw experimental arrangement of Thomson's parabola method.
5. What are the limitations of parabola method?
6. What are the limitations of Aston's mass spectrograph?
7. Draw experimental arrangement of Aston's mass spectrograph.
8. Draw experimental arrangement of Dempster's mass spectrograph.
9. What are the uses of mass spectrograph?
10. Draw experimental arrangement of Dunnington's method.
11. Define specific charge of an electron.
12. How you can determine specific charge of an electron.



13. If an electron moving in a magnetic field what will happen to path of the electron?

**Five marks**

1. Explain the Thomson's method for positive ray analysis.
2. Explain how Thomson's parabola method is helpful to determine the mass of the positive ion.
3. Describe the construction of Aston's mass spectrograph with necessary theory.
4. Show how Aston's mass spectrograph can be used in the detection of isotopes.
5. Explain how  $e/m$  of an electron is obtained by Dunnington's method.
6. Describe the construction of Dempster's mass spectrograph.
7. Explain moving of a charge in transverse electric field.
8. Explain moving of a charge in magnetic field.

**Ten marks**

1. Explain (i) The Thomson's method for positive ray analysis. (ii) How Thomson's parabola method is helpful to determine the mass of the positive ion.
2. Explain moving of a charge in transverse electric field and magnetic field.
3. Describe the construction of Aston's mass spectrograph with necessary theory. Show how it can be used in the detection of isotopes.
4. With a neat diagram and necessary theory explain how  $e/m$  of an electron is obtained by Dunnington's method.
5. Describe the construction, working and theory of Dempster's mass spectrograph.

**UNIT - II (ATOMIC STRUCTURE)**

**Two Marks**

1. Write two distinct features of the vector atom model
2. Define spatial quantization.
3. Define principle quantum number
4. Define orbital quantum number
5. Define the spin quantum number.
6. Define total angular momentum quantum number.
7. Define magnetic orbital quantum number.
8. Define magnetic spin quantum number
9. Define magnetic total angular momentum quantum number.
10. State about coupling schemes.
11. What are the application of spatial quantization?
12. State Pauli's exclusion principle.
13. How periodic table formed.
14. Give detail about any two groups in periodic table.
15. What is the principle of periodic table?
16. Define spectral terms.
17. Define spectral notation.
18. Define selection rules.
19. Write about intensity rules.
20. Write about interval rules.



21. Draw energy level diagram for fine structure of alkali spectra.
22. What is Bohr magnetron?

#### Five Marks

1. Explain the various quantum numbers associated with vector atom model.
2. Write note on L-S and j-j coupling.
3. Explain the periodic classification of elements.
4. What is Bohr magnetron? Calculate its value. What is its physical significance? Is magnetic moment quantized?
5. Explain fine structure of alkali spectra.
6. Write note on optical spectra.
7. Write note on selection rules.
8. Write note on spectrum of Helium.
9. Explain fine structure of sodium D line.

#### Ten marks

1. Describe vector atom model and explain different quantum numbers associated with it.
2. Give an account of different quantum numbers required to specify the state of electron in an atom. Describe Pauli's exclusion principle and use it to find distribution of electrons in different shells.
3. State and explain Pauli's exclusion principle. How is it used to explain the classification of elements according to periodic table?
4. Explain fine structure of sodium D line and fine structure of alkali spectra.
5. Explain (i) spectral terms (ii) Spectral notation (iii) Selection rules (iv) Intensity rule (v) interval rule.
6. Describe Stern- Gerlac experiment for the existence of space quantization.

### UNIT-III (IONIZATION POTENTIAL AND SPLITTING OF ENERGY LEVELS )

#### Two Marks

1. Define excitation potential
2. Define ionization potential
3. State Zeeman effect
4. State Larmor's theorem
5. Define Lande's G factor
6. What is anomalous Zeeman Effect?
7. State stark effect.
8. Draw experimental arrangement of Davis and Goucher's method.
9. Define critical potential

#### Five Marks

1. Explain normal Zeeman effect
2. Explain anomalous Zeeman Effect.
3. Which factor play role between normal Zeeman Effect and anomalous Zeeman Effect?
4. Derive an expression for the Zeeman shift.

5. Explain Paschen – back effect
6. State and explain Stark effect.
7. Give theoretical explanation for anomalous Zeeman Effect.

#### Tem marks

1. What is Zeeman Effect? Describe the quantum mechanical explanation of normal Zeeman Effect.
2. Derive an expression for Lande's g factor and explain the anomalous Zeeman effect of sodium doublet lines  $D_1$  and  $D_2$  with its help
3. Explain (i) Paschen – back effect (ii) Stark effect
4. Explain (i) normal Zeeman Effect (ii) anomalous Zeeman Effect.
5. Explain (i) Excitation potential (ii) ionization potential.
6. Describe with necessary theory Davis and Goucher's method of determining the critical potentials of a gas.

### UNIT -I V (INFRARED AND RAMAN SPECTROSCOPY)

#### Two Marks

1. Write short note on diatomic molecule
2. Define simple harmonic oscillation
3. Define infra-red spectra
4. Draw the block diagram of an absorption spectrometer
5. State quantum theory of Raman effect
6. What are the cases arise in quantum theory of Raman Effect?
7. What are the characteristics of Raman lines?
8. Draw schematic diagram of Raman spectrometer.
9. Write short note on IR spectra.
10. What are the advantages of Raman Spectrometer?
11. Write short note on triatomic molecule.

#### Five marks

1. Determine the energy of a diatomic molecule
2. Write the difference between Raman and IR spectra.
3. Write experimental study of Raman effect
4. Explain IR spectra.
5. Write note on triatomic molecule.
6. What are the techniques of an absorption spectrometer and explain its instrumentation.
7. Write short note on Raman spectrometer.
8. Give the quantum theory of Raman Effect.
9. Give the classical theory of Raman Effect.
10. Discuss vibrational Raman spectra of diatomic molecules.
11. Discuss linear molecules.
12. Discuss Components of Raman spectrum.
13. Explain working of Raman spectrometer with neat diagram.

#### Ten Marks

1. Discuss how a vibrating diatomic molecule considers as a harmonic oscillator.
2. Explain vibration-rotation spectrum of carbon monoxide.
3. Explain diatomic rotator. Give theory of the origin of the vibration- rotation spectrum of a molecule.
4. Give experimental study of Raman Effect with quantum and classical theory of Raman Effect.
5. Discuss vibrational Raman spectra of diatomic molecules and pure rotational Raman spectra.

## UNIT - V(LASER PHYSICS)

### Two Marks

1. What is population inversion?
2. Write expansion : (i) LASER (i) MASER
3. What is pumping?
4. What are the different type of pumping?
5. What are the methods of achieving population inversion?
6. What is doped insulator laser?
7. What are the different type of laser?
8. Give any two examples for solid state laser.
9. Write any two application of laser in industry.
10. Write applications of laser in Medical.
11. Write applications of laser in communications.

### Five marks

1. Write note on population inversion. Explain why laser action cannot occur without population inversion between atomic levels.
2. Explain pumping.
3. Write the rate equation for three level laser system.
4. Describe the working of solid state Ruby laser
5. Discuss the four –level (pumping) scheme for laser action.
6. What do you understand by an optical resonant cavity? Explain.
7. Explain threshold condition.
8. Write note on Q-Factor.
9. Explain pumping power

### Ten marks

1. Discuss the working, construction and applications of Nd: YAG lasers with neat labeled diagram.
2. Draw the electronic energy levels diagram showing the output wavelength and frequency of Ruby and Nd: YAG
3. Discuss spiking  $U^{3+}$  in  $CaF_2$  Laser.
4. Write applications of lasers in the following fields (i) Industry (ii) Medical (iii) Communication.
5. Explain (1) Resonators (2) Vibrational modes of resonators (3) Open Resonators (4) Control resonators.
6. Explain (1) Q-Factor (2) Losses in the cavity (3) Threshold condition.

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**SUBJECT: BASIC ELECTRONICS (CORE-7)**

**SUBJECTcode: BPH53**

**Subject Handled by: DR. Mrs. N.MYTHILI**

**UNIT: 1(SEMICONDUCTOR THEORY DEVICES AND CHARACTERISTICS)**

**TWO MARKS**

1. Define forbidden energy gap
2. What is intrinsic semiconductor
3. Define extrinsic semiconductor
4. Define Fermi level
5. What is PN junction diode
6. Draw the symbolic representation of Zener diode
7. What is Zener diode
8. Define tunnel diode
9. Mention any three applications of tunnel diode
10. What is photo diode?
11. What is photo transistor?
12. Write the importance of phototransistors
13. What is JFET?
14. Mention the types of JFET
15. What are the uses of JFET
16. Define common emitter mode

**FIVE MARKS**

1. Describe the classification of solids in terms of Fermi energy
2. Give the carrier concentration of intrinsic semiconductor
3. Explain the carrier concentration of extrinsic semiconductor
4. Describe the effect of temperature on Fermi level
5. Write about tunnel diode
6. Describe photo-transistors
7. Write in detail about V-I characteristics of common source mode
8. Write about JFET as amplifier

**TEN MARKS**

1. Explain P-N junction formation and its properties
2. Describe V-I characteristics of P-N junction diode
3. Explain the operation, characteristics, and applications of photo diode.
4. Write in detail about zener diode
5. Describe JFET construction and working

## UNIT: 2(RECTIFIERS AND AMPLIFIERS)

### TWO MARKS

1. Define half wave rectifier
2. Define full wave rectifier
3. Define h-parameter
4. Importance of h-parameter
5. What is RC coupled amplifier?
6. Write the advantages of RC coupled amplifier
7. Mention few applications of RC coupled amplifier
8. What are the classifications of power amplifier?
9. Define class A amplifier
10. What is push pull amplifier
11. What are the disadvantages of push pull amplifier
12. Define Darlington amplifier
13. What are the characteristics of emitter follower?

### FIVE MARKS

1. Describe in detail about half wave rectifier
2. Derive an expression for the efficiency of half wave rectifier
3. Write in detail about the full wave rectifier
4. Derive an expression for the efficiency of full wave rectifier
5. Describe about bridge rectifier with necessary diagram
6. Explain about class A and class B amplifier
7. Define and explain the following terms as applied to power amplifier
  - a) Collector efficiency b) distortion c) power dissipation
8. Write about class B power amplifier in terms of ac load line
9. Describe the action of emitter follower with neat diagram
10. Describe about Darlington amplifier
11. How to measure the h-parameters of linear circuit

### TEN MARKS

1. Explain transistor rc coupled amplifier with special reference to frequency responses, advantages, disadvantages and applications.
2. Write in detail about class A power amplifier
3. Write the construction, working of push-pull amplifier with necessary diagrams with its disadvantages.
4. Derive the expression for i) voltage gain ii) input impedance iii) output impedance of emitter follower
5. Discuss the ac equivalent circuit for h-parameter and its analysis of amplifier using h-parameter
6. Derive the general form of i) input impedance ii) current gain iii) voltage gain in terms of h-parameter and the load

## UNIT: 3 (FEEDBACK OSCILLATORS)

### TWO MARKS

1. What is feedback amplifier?
2. Define positive feedback amplifier
3. What is negative feedback amplifier?
4. Define the frequency of oscillation
5. What is damped oscillation?
6. Define undamped oscillation
7. What is a tank circuit?

8. Define Barkhausen criterion
9. Define phase oscillation
10. What is crystal oscillator?
11. State any two difference between Hartley and Colpitt's oscillators
12. What is phase shift?
13. Define piezoelectric effect
14. What are quartz?
15. Define the frequency of a crystal

**FIVE MARKS**

1. Write in detail about Barkhausen criterion with graphical form
2. Describe the working frequency, advantage and disadvantages of phase oscillators with neat circuit diagram
3. Write about the working, frequency of Wien bridge oscillators
4. Explain about the crystal oscillator and pro's and con's

**TEN MARKS**

1. Write in neat diagram, explain the action of Hartley and Colpitt's oscillators
2. Describe the frequency, sustained oscillating conditions for Wein bridge and phase shift oscillators
3. Write a short note on i) Wein bridge oscillator, ii) Crystal oscillators iii) RC coupled amplifier

**UNIT: 4 (WAVE SHAPING CIRCUITS AND MULTIVIBRATORS)**

**TWO MARKS**

1. Define clipping circuits
2. Mention the applications of clipping circuits
3. What are the types of clipping circuits?
4. What is clamping circuit?
5. What is switching circuit?
6. Define integrating circuit
7. What is differential circuit?
8. Write any conditions for integrating circuits
9. What is multivibrators?
10. What are applications of multivibrators?
11. What are the types of multivibrators?
12. What is the difference between monostable and bistable multivibrators?
13. Draw the input and output waveforms of monostable multivibrator
14. Define Schmitt trigger
15. Write some of the applications of Schmitt trigger

**FIVE MARKS**

1. Describe the biased clipping operation with circuit diagrams
2. Describe in detail about multivibrator
3. Describe about bistable multivibrator with it circuit diagram
4. Write about the operation, working of Schmitt trigger

**TEN MARKS**

1. Write in detail about clipping circuits, types of clippers
2. Elaborate clamping circuit i) positive clamping ii) negative clamping
3. Write in detail about the integrating and differentiating circuits with its applications

**UNIT: 5 (RADIO COMMUNICATION AND TELEVISION)**

**TWO MARKS**

1. Define modulation
2. Write the types of modulation
3. What is amplitude modulation?
4. Define modulation factor
5. Write the importance of demodulation
6. Define demodulation
7. What are the advantages of FM modulation?
8. Define RADAR
9. Write any three applications of RADAR
10. Write the points to be noted in AM modulation
11. What is a receiver?
12. Define radiowaves
13. What is phase modulation?
14. What is a detector?
15. Draw the schematic diagram of transmission
16. Define carrier signal
17. What is audio signal?
18. Define the audible range of human ears

**FIVE MARKS**

1. What is modulation? Why modulation is necessary for communication system?
2. Describe the limitations of AM waves
3. Write in detail about FM modulation
4. Describe phase modulation
5. Write about AM and FM detectors
6. Describe FM discrimination
7. Write in detail about some of the applications of RADAR

**TEN MARKS**

1. Explain the general principles of radio broadcasting, transmission and reception
2. Describe in detail about amplitude modulation. Write about the analysis of AM waves
3. Describe in detail about AM and FM transmitter and receiver
4. Elaborate the construction, working of RADAR with neat diagram

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**SUBJECT: ASTROPHYSICS**

**SUBJECT CODE: BSPH55**

**Subject Handled by: DR.N.MYTHILI/DR.R.BHUVANESWARI**

**UNIT: 1**

**ASTRONOMICAL INSTRUMENTS**

**TWO MARKS**

17. What is a telescope?
18. Describe the types of telescope
19. Explain the principle of telescope



20. What is reflecting telescope?
21. Write the advantageous of reflecting telescope
22. Define radio telescope
23. What is astronomical unit? Explain its unit
24. Define photometry
25. Write the difference between photometry and spectrometry
26. Define image processing

**FIVE MARKS**

1. Write about optical telescope
2. Explain about astronomical spectrographs
3. Brief the principle and working of photographic photometry

**TEN MARKS**

1. Define the construction and working of reflecting telescope. Explain the advantages
2. Write in detail about construction, working of photoelectric spectrometer with neat diagram

**UNIT: 2  
SPACE**

**TWO MARKS**

1. Define Hubble's law
2. Write the importance of Hubble's law
3. What are galaxies?
4. Write the types of galaxies
5. What is elliptical galaxies?
6. Define milky way
7. What is a light year?
8. Define quasars

**FIVE MARKS**

1. Write about Hubble's law and its importance in astronomical understanding
2. Explain the concept of "expansion of univers"
3. Describe milky way and highlight it's importance
4. Explain about galaxy and it's cluster types

**TEN MARKS**

1. Write about Big bang theory in detail
2. Mention any three types of galaxies and its importance
3. Write the theory about the shape of the universe

**UNIT: 3  
STARS**

**TWO MARKS**

1. What is a star?
2. What is the relation between age and color of a star?
3. What is a red giant stars?
4. Define dwarf
5. What is a black hole?

6. Mention the properties of a black hole
7. Define supernovae
8. What is a zodiac?

FIVE MARKS

1. What are constellations? Explain the concept of constellation
2. How are Zodiac related to solar system? Write the importance of Zodiac

TEN MARKS

1. Write about the birth, color, age and life of stars in detail
2. Write about the formation and properties of black hole
3. Give a detail about i) red giant stars ii) Dwarf stars iii) neutron stars

#### UNIT: 4 SOLAR SYSTEM

TWO MARKS

1. What is solar system?
2. Define the sun.
3. Write the nuclear reaction taking place in the sun.
4. Define earth.
5. What is atmosphere?
6. Define the moon.
7. Define asteroids.
8. Define meteorites.
9. Define comets.
10. What is inner and outer planets?

FIVE MARKS

1. Write in details about the structure of the sun.
2. Compare the difference between the asteroids and meteorites.
3. How to determine the properties of the planets.
4. Define the sun spot and the flares.

TEN MARKS

1. How the astronomers studies the sun.
2. Describe in details about the structure of the earth.
3. Why earth planets is more suitable of place for living organism?
4. Write in detail about the moon and its atmosphere.

#### UNIT 5

#### SPACE DISTANCE, UNITS AND COORDINATES

TWO MARKS:

1. What is cislunar space?
2. What is translunar space?
3. Define inter planetary distance.
4. Calculate the distance between the sun and earth.
5. Define astronomical unit.
6. What is light year?
7. What is called as astronomical coordinates?

FIVE MARKS.

1. Compare the cislunar and translunar space.
2. How to calculate the interstellar space among the solar system.
3. Write in detail about the astronomical map.

TEN MARKS

1. Explain in detail about the five celestial coordinate system.
2. Why does the astronomer used to calculate the distance by light year, astronomical units?
3. Describe the inter galactic sphere in detail.

**SUBJECT: MATERIAL SCIENCE**

Subject code: BPH54B

Subject Handled by: DR.N.MYTHILI/DR.R.BHUVANESWARI

**UNIT: 1(MATERIAL SCIENCE)**

TWO MARKS

27. What are the classifications of materials?
28. What are the types of bonds?
29. Define ionic bond with example
30. What is covalent bond?
31. Define metallic bonds
32. What is non-polar molecule? Give an example
33. Define interatomic forces
34. What are the properties of dipole bonds?
35. What are the characteristics of metallic solids?

FIVE MARKS

36. Write in detail about the classification of materials
37. What are the properties of covalent bonds?
38. Compare the difference between ionic and covalent bonds
39. Describe the metallic bonds with its properties

TEN MARKS

40. Elaborate the ionic bond and explain some of its properties
41. Write in detail about covalent bond with an example
42. What are secondary bonds? Mention any two secondary bonds in detail
43. Explain the various types of bonding in crystal

**UNIT: 2(PHASE DIAGRAM AND TRANSFORMATION)**

TWO MARKS

1. What is the importance of Hume-Rother's rule
2. Define intermediate phase
3. What is phase diagram?
4. What is the necessity of phase diagram?
5. Define phases
6. What are solid solutions?
7. What is Gibb's phase rule?
8. Define lever rule
9. What is Eutectic system?

**FIVE MARKS**

1. Write about Hume Rothery's rule
2. What is a solid solution? Describe the types of solid solution
3. Write about Gibb's phase rule
4. Describe Lever rule with suitable example

**TEN MARKS**

1. Draw the phase diagram of Eutectic system and explain the mechanism of phase transformation
2. Elaborate the phase and phase diagram during Gibb's phase rule
3. Describe about equilibrium binary systems with suitable example.

**UNIT: 3(VACUUM AND OXIDATION)**

**TWO MARKS**

1. Define vacuum
2. Define the unit of vacuum
3. What are the methods to measure vacuum?
4. Write the applications of thermal conductivity gauge
5. Write the principle of penning gauge
6. Define oxidation and give an example
7. What is reduction? Give an example

**FIVE MARKS**

1. Elaborate the history of vacuum technology
2. Describe the kinetic aspects of gases
3. Explain the applications of vacuum
4. Define oxidation. Explain about oxidation resistant material with an example

**TEN MARKS**

1. Write in detail about the production and measurement of vacuum with necessary diagram
2. Describe the construction, working of thermal conductivity gauges
3. Explain about the working of penning gauge with neat diagram. Mention the importance of penning gauge

**UNIT: 4(NON-DESTRUCTIVE TESTING)**

**Two marks**

1. What is meant by NDT?
2. Write the advantages of NDT.

3. What are the defects can be observed in a materials?
4. Define the visual inspection.
5. What is meant by liquid penetration testing?
6. Write the physical principle of magnetic particle testing.
7. What is eddy current?
8. Write the limitation of eddy currents.
9. Write the applications of radiography.
10. Write the limitations of radiography.

Five marks

1. Describe in detail about the liquid penetration method of testing.
2. Write a short brief on the visual testing method in details.
3. Write in detail of magnetic particle testing and its applications.
4. Explain only the instrumentation of eddy current testing.
5. Compare the different techniques methods of NDT.

Ten marks

1. Describe and explain in details about the types of defects in a materials.
2. Write the various methods non-destructive testing and explain in details about any two methods.
3. Explain in detail about the physics principles, advantages and disadvantages of visual inspection.
4. Explain in detail of radiography testing method and write its advantages and disadvantages.

#### **UNIT: 5(ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS)**

TWO MARKS

4. Define dielectric constant
5. Define polarization vector
6. Define electronic polarization
7. Define electric displacement vector 'D'
8. Define susceptibility
9. What is meant by dielectric breakdown?
10. What are dielectrics?
11. Define dielectric loss
12. Define dielectric strength
13. What are polar and non-polar dielectrics?
14. What is ferroelectricity?
15. What is the effect of frequency of ac electric field on polarization?
16. What are various sources by which power loss occurs in dielectrics?
17. Mention any two important properties of an insulating materials
18. Define magnetic induction
19. Define intensity of magnetization
20. Define magnetic field intensity and susceptibility
21. Write the relation between  $\mu$  and  $\chi$

FIVE MARKS

1. Explain the phenomena of electric /ionic polarization in detail
2. Distinguish between the polar and non-polar substances
3. Write down the equation for the total polarisability for polar substances
4. Describe the frequency and temperature effects on polarization
5. Distinguish between soft and hard magnetic materials

TEN MARKS

1. Explain the different types of polarization in dielectrics
2. Explain the various dielectric breakdown mechanism
3. Describe and explain ferroelectric material and its properties
4. What is piezoelectric effect? Describe the process to produce piezoelectric effect in quartz crystal. Mention its applications of piezoelectric materials?
5. Distinguish between dia, para, ferro and ferromagnetic materials. Mention its properties and applications.
6. Describe and explain the phenomenon of magnetostriction method.

\*\*\*\*\*ALL THE BEST\*\*\*\*\*

KCSAM.IN



**DEPARTMENT OF PHYSICS**  
**QUESTION BANK**  
**SUBJECT: ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM (CPH31)**  
**SUBJECT HANDLED BY: DR.N.MYTHILI**  
**SEM : III (ODD)**  
**UNIT: 1**  
**ELECTROSTATICS**

**TWO MARKS**

1. Define Coloumb's law
2. Define one Coloumb
3. What is an electric field?
4. Define electric potential
5. Define capacitance
6. Define Farad
7. State Gauss's law
8. What is electrostatics?

**FIVE MARKS**

1. Describe in detail about the electric field due to a uniformly charged sphere
2. State and prove Gauss's law in electrostatics
3. Describe capacitance of parallel plate capacitor
4. Derive the capacitance of parallel plate partially filled with dielectric
5. Write about energy stored in a charged capacitance
6. Describe the loss of energy on sharing of charges between two capacitors

**TEN MARKS**

1. Derive the expression for the electric field due to a uniformly cylindrical charge
2. Derive the expression for the electric potential due to a uniformly charge conducting sphere
3. Write the expression for the capacitance of spherical (outer and inner)capacitance
4. Derive the expression for capacitance of a cylindrical capacitance

**UNIT: 2**

**CURRENT ELECTRICITY AND THERMO ELECTRICITY**

**TWO MARKS**

1. Define the temperature coefficient of resistance



2. What is the principle of potentiometer?
3. Define ammeter
4. What is a voltmeter?
5. Define thermocouple
6. What are the two laws of thermo emf?
7. Define seeback effect
8. Define Peltier effect
9. Define Peltier coefficient
10. Write the difference between Peltier and Joule effect
11. What is Thomson effect?
12. Define Thomson coefficient
13. What is thermo electric power?

**FIVE MARKS**

1. Describe Peltier effect and the experiment to demonstrate the Peltier effect
2. Write about Thomson effect, Thomson coefficient and experiment to demonstrate of Thomson effect
3. Describe thermoelectric diagram and mention any three uses

**TEN MARKS**

1. Explain with necessary theory how a Carey Foster bridge may be used to compare two nearly equal resistances. Hence show how the specific resistance of the material of the wire can be determined.
2. Define “temperature coefficient of resistance”. How is it determined using the Carey-Foster Bridge?
3. Explain the theory of potentiometer. How will you use it to calibrate an ammeter and a voltmeter.
4. Explain the law’s of thermo emf and describe how to measure thermo emf
5. Write the expression for Peltier and Thomson coefficients or thermodynamics of thermocouple

**UNIT: 3**  
**ELECTROMAGNETIC INDUCTION**

**TWO MARKS**

1. What is electromagnetic induction?
2. Define Self induction
3. Define Mutual induction
4. Define Henry
5. A solenoid having an air core and 10 cm long has 100 turns and its area of cross section is 5 sq cm. Find the coefficient of Self inductance of the solenoid
6. Calculate the self-inductance of a solenoid having 1000 turns and length 1 m. The area of cross section is 7 cm<sup>2</sup> and the relative permeability of the core is 1000.
7. Define coefficient of coupling with expression
8. Draw the graph for the growth and decay of the current in LR circuit and explain
9. If the charge on a capacitor of capacitance 2μF in leaking through a high resistance of 100 megohms is reduced to half its maximum value. Calculate the time of leakage.

**FIVE MARKS**

1. Write the Faraday’s law of electromagnetic induction
2. Describe in detail about self-induction with necessary diagram

3. Derive the expression for self-induction of long solenoid
4. Describe in detail about the mutual inductance
5. Derive the expression for mutual inductance of long solenoid
6. Define coefficient of coupling and derive the expression for “k”
7. Derive the expressions for Faraday’s law in vector form
8. Derive the equation for decay of current in LR circuit with suitable graphical form
9. Write in detail about measurement of high resistance by leakage
10. An emf 10 volts is applied to a circuit having a resistance of 5 ohms and an inductance of 0.5 henry. Find the time required by the current to attain 63.2% of its final value. What is the time constant of the circuit?
11. An inductance of 500 mH and a resistance of 5 ohms are connected in series with an emf of 10 volts. Find the final current. If now the cell is removed and the two terminals are connected together, find the current after i) 0.05 sec ii) 0.2 sec.

#### TEN MARKS

1. Describe the experimental determination of self-inductance using Rayleigh’s method
2. Define mutual inductance and experimental determination of mutual inductance with neat diagram
3. Derive Helmholtz equation for the growth of current in circuit have inductance and resistance
4. Obtain the expression for the growth and decay of charge in a capacitor through resistance

### UNIT: 4 MAGNETISM

#### TWO MARKS

1. Define intensity of magnetism
2. Define magnetic induction
3. What is magnetization?
4. What is paramagnetic materials?
5. Define antiferromagnetic materials
6. What is ferrimagnet?
7. Write any three examples of ferromagnetic materials
8. Draw the difference between the spins of para, ferro and antiferro magnetic materials
9. What are the failures of Langevin’s theory?
10. Write the assumptions of Weiss theory of ferromagnetism
11. Define curie temperature
12. What is hysteresis?
13. Draw the hysteresis curve
14. Define coercivity
15. What is retentivity?
16. What are permanent magnets? given and example
17. What are ferrites?

#### FIVE MARKS

1. Write the relation between magnetic vectors B,H and M
2. Write about magnetic susceptibility
3. Derive the equations for magnetic permeability
4. Write about the energy loss due to magnetic hysteresis
5. Explain about the magnetic properties of iron and steel
6. Write about the choice of magnetic materials

7. A rod of magnetic material 0.5m in length has a coil of 200 turns wound over it uniformly. If a current of 2 ampere is sent through it. Calculate a) Magnetising field H b) intensity of magnetisation M c) magnetic induction B ( $\chi_m = 6 \times 10^{-3}$ )
8. An iron rod 0.2 m long. 10 mm in diameter and of relative permeability 1000 is placed inside a long solenoid wound with 300 turns/metre. If a current of 0.5 ampere is passed through the rod, find the magnetic moment of the rod.

**TEN MARKS**

1. Compare the properties of diamagnet, paramagnet and ferromagnet.
2. Give an account of Langevin's theory of i) diamagnetism ii) paramagnetism
3. What are ferromagnetic materials? How was Weiss able to explain the essential features of these materials by extending Langevin's theory of paramagnetism?
4. Describe the magnetometer method of tracing the hysteresis curve for a sample of iron in the form of a long thin rod
5. Describe the method of tracing of the hysteresis curve of a sample of iron in the form of an anchor ring
6. Show that the area of B-H loop denotes the energy dissipated per unit volume of the material during each magnetic cycle.
7. Define and explain the terms-Retentivity, coercivity, hysteresis and hysteresis loop

**UNIT: 5**  
**MAXWELL'S EQUATIONS & EMT**

**TWO MARKS**

1. Write the four basic laws of electricity and magnetism
2. What is electric displacement?
3. Define displacement current
4. Write the maxwell's equations for material media
5. Write the equations for speed of light
6. Define poynting vector
7. Write the equations for em waves in non-conducting media
8. Write the equation for total current density
9. Write the wave equation for em waves in free space
10. Discuss the relation between velocity of em waves and light

**FIVE MARKS**

1. Derive the equations for total current density
2. Write about displacement current and its magnitude
3. Comment on the concepts of displacement current
4. Define poynting vector and derive the expression for poynting vector

**TEN MARKS**

1. Give an account of Maxwell's equation in free space. Solve the equation to deduce the em wave equation and determine the velocity of light
2. Derive the expression for em waves in isotropic non-conducting media



**DEPARTMENT OF PHYSICS**  
**QUESTION BANK**  
**SUBJECT: ALLIED MATHEMATICS (CAMA15C)**  
**SUBJECT HANDLED BY: MRS.G.SIVSANKARI/MRS.K.VAISHNAVI**  
**SEM : III (ODD)**

**UNIT I**

1. Diminish the roots of the equation  $x^4 - 4x^3 - 7x^2 + 22x + 24 = 0$  by 1 and hence solve it.
2. Inverse the roots of the equation  $x^4 + 12x^3 - 7x^2 + 22x + 24 = 0$
3. Remove the second term from the  $x^3 - 6x^2 + 11x - 6 = 0$
4. Solve the equation  $x^3 - 3x^2 - 6x + 8 = 0$  if the roots are in A.P.
5. If  $\alpha, \beta$  and  $\gamma$  are roots of the equation  $x^3 - 5x^2 - 2x + 24 = 0$  find the value of  
i)  $\Sigma \alpha_2\beta$  ii)  $\Sigma \alpha^2$  iii)  $\Sigma \alpha^3$  iv)  $\Sigma \alpha^2\beta^2$
6. Solve the equation  $3x^3 - 26x^2 + 52x - 24 = 0$  if the roots are in G.P.
7. Remove the fractional coefficients from the equation  $x^3 - 1\sqrt{2}x^2 + 3\sqrt{2}x - 1 = 0$
8. Find the equation whose roots are reciprocals of the roots of  $x^4 - 5x^3 + 7x^2 + 3x - 7 = 0$
9. Find the equation whose roots are the roots of  $x^4 - 5x^3 + 7x^2 - 17x + 11 = 0$  each diminished by 4.
10. Find the equation whose roots are those of  $3x^3 - 2x^2 + x - 9 = 0$  each diminished by 5.
11. Remove the second term from equation  $x^4 - 8x^3 + x^2 - x + 3 = 0$
12. Remove the third term of equation  $x^4 - 4x^3 - 18x^2 - 3x + 2 = 0$ , hence obtain the transformed equation in case  $h = 3$ .
13. Transform the equation  $x^4 + 8x^3 + x - 5 = 0$  into one in which the second term is vanishing.
14. Solve the equation  $x^4 + 16x^3 + 83x^2 + 152x + 84 = 0$  by removing the second term.
15. Solve the biquadratic  $x^4 + 12x - 5 = 0$  by Descartes's method.

16. Solve  $x^4 - 8x^2 - 24x + 7 = 0$  by Descartes's method.
17. Obtain the relation between the roots and coefficients of general polynomial equation  $a^0x^n + a^1x^{n-1} + a^2x^{n-2} + \dots + a^{n-1}x + a^n = 0$ .
18. Solve the equation  $x^3 - 5x^2 - 16x + 80 = 0$  if the sum of two of its roots being equal to zero.
19. Solve the equation  $x^3 - 3x^2 + 4 = 0$  if the two of its roots are equal.
20. Solve the equation  $x^3 - 5x^2 - 2x + 24 = 0$  if the product of two of the roots is 12.
21. Solve the equation  $x^3 - 7x^2 + 36 = 0$  if one root is double of another.
22. Find the condition that the roots of the equation  $x^3 - px^2 + qx - r = 0$  are in A.P.
23. Find the condition that the cubic equation  $x^3 + px^2 + qx + r = 0$  should have two roots  $\alpha$  and  $\beta$  connected by the relation  $\alpha\beta + 1 = 0$
24. If  $\alpha$ ,  $\beta$  and  $\gamma$  are roots of the cubic equation  $x^3 + px^2 + qx + r = 0$  find the value of i)  $\Sigma \alpha^2\beta$   
ii)  $\Sigma \alpha^2$  iii)  $\Sigma \alpha^3$  iv)  $\Sigma \alpha^2\beta^2$
25. If  $\alpha$ ,  $\beta$  and  $\gamma$  are roots of the cubic equation  $x^3 + px^2 + qx + r = 0$  find the value of  $(\beta + \gamma)(\gamma + \alpha)(\alpha + \beta)$ .
26. If  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  are roots of biquadratic equation  $x^4 + px^3 + qx^2 + rx + s = 0$ , find the value of the following symmetric functions  
i)  $\Sigma \alpha^2\beta$  ii)  $\Sigma \alpha^2$  iii)  $\Sigma \alpha^3$
27. If  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  are roots of biquadratic equation  $x^4 + px^3 + qx^2 + rx + s = 0$ , find the value of the following symmetric functions i)  $\Sigma \alpha^2\beta\gamma$  ii)  $\Sigma \alpha^2\beta^2$  iii)  $\Sigma \alpha^4$
28. the equation whose roots are the reciprocals of the roots of  $x^4 - 3x^3 + 7x^2 + 5x - 2 = 0$ .
29. If sum and product of roots of a quadratic equation are 1 and  $-1$  respectively the required quadratic equation is?
30. Roots of equation  $x^3 - 3x^2 + 4 = 0$  are 2, 2,  $-1$ , so the roots of equation  $x^3 - 6x^2 + 32 = 0$  are?
31. Roots of equation  $x^2 + 2x + 1 = 0$  are  $-1$ ,  $-1$  so the roots of equation  $x^3 + 6x + 9 = 0$  are?
32. Roots of equation  $x^2 - 2x + 4 = 0$  are 2, 2 so the roots of equation  $4x^2 - 2x + 1 = 0$  are?

33. Find the 6<sup>th</sup> power of the roots  $x^3 - x^4 + 1 = 0$ .
34. Prove that  $x^4 - x^3 + 1 = 0$  has one negative root and 2 imaginary roots.
35. Solve  $x^4 + 2x^3 - 5x^2 + 6x + 2 = 0$  if  $1+i$  is a root.
36. Diminish the equation  $x^4 - 4x^3 - 7x^2 + 22x + 24 = 0$  by 1.
37. Find the value of  $\sum \alpha^2$  if  $x^3 - 6x^4 + 11x - 6 = 0$ .
38. Prove that  $x^7 - 4x^4 + 2x^3 - 1 = 0$  has at least 4 imaginary roots.
39. Solve  $x^4 + 2x^3 - 21x^2 - 22x + 40 = 0$  whose roots are in A.P.
40. Remove second term of the equation  $x^4 + 16x^3 + 83x^2 + 152x + 84 = 0$ .
41. If  $\alpha, \beta, \gamma$  are the roots of the equation then find the equation whose roots are  $\sum \alpha + \beta$ .
42. Solve  $x^4 + 2x^3 - 5x^2 - 6x + 2 = 0$  if  $1+\sqrt{-1}$  is one of the roots.
43.  $x^3 + 2x + 3 = 0$  has one negative root and two imaginary roots?.
44. Solve  $3x^6 + x^5 - 27x^4 + 27x^2 - x - 3 = 0$ .
45. Find the sixth power of  $x^4 - x^3 - 7x^2 + x + 6 = 0$ .
46. The equation  $x^4 + 4x^3 - 2x^2 - 12x + 9 = 0$  has two pairs of equal roots, find them.
47. Change the signs of the roots of the equation  $x^7 + 5x^5 - x^3 + x^2 + 7x + 3 = 0$
48. Transform the equation  $x^7 - 7x^6 - 3x^4 + 4x^2 - 3x - 2 = 0$  into another whose roots shall be equal in magnitude but opposite in sign to those of this equation.
49. Change of the equation  $3x^4 - 4x^3 + 4x^2 - 2x + 1 = 0$  into another the
50. coefficient of whose highest term will be unity.
51. State and prove Descartes rule.
52. Show that  $x^{10} + 10x^3 + x - 4 = 0$  has 8 imaginary roots.
53. Show that  $x^6 + 3x^2 - 5x + 1 = 0$  has at least 4 imaginary roots.
54. Show that  $x^4 + 2x^2 + 3x - 9 = 0$  has 1 positive root and 1 negative roots.
55. State Newtons formula.
56. Find the real root of the equation  $x^3 + 6x - 2 = 0$ .
57. Calculate the places of decimal the positive root of the equation  $x^3 + 24x - 50 = 0$ .
58. Evaluate  $\sqrt{12}$  to Newtons metur decimal places by Newtons method.
59. Find by Newtons method negative root of the equation  $x^3 - 21x + 35 = 0$  correct to three decimal places.
60. Find the roots of the equation  $x^3 - 5x + 3 = 0$  the roots lies between 1 & 2.
61. Calculate the places of decimal the positive root of the equation  $x^3 + 24x - 50 = 0$ . Using Horners Method.

## UNIT II

1. Define Symmetric and Skew Symmetric matrices.
 

1	2	3
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2. Verify that the matrix is symmetric or not  $\begin{pmatrix} 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$ .

3. Show that every square matrix can be uniquely expressed as the sum of the symmetric and skew symmetric matrices.

$$\begin{pmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{pmatrix}$$

4. Express  $\begin{pmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{pmatrix}$  as the sum of the symmetric and skew symmetric matrices.

$$\begin{pmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{pmatrix}$$

5. Define Hermitian and Skew Hermitian matrices.

6. Check whether  $A = \begin{pmatrix} 3 & 4 - 5i \\ 4 - 5i & 6 \end{pmatrix}$

7. Show that  $\begin{pmatrix} 3 & 1 + 2i \\ 1 - 2i & 2 \end{pmatrix}$

8. Define Orthogonal matrix.

$$\begin{pmatrix} -1 & 2 & 2 \\ 2 & 2 & -1 \end{pmatrix}$$

9. Show that  $\frac{1}{3} \begin{pmatrix} 2 & -1 & 2 \\ 2 & 2 & -1 \end{pmatrix}$  is Orthogonal.

$$\begin{pmatrix} 2 & -1 & 2 \\ 2 & 2 & -1 \end{pmatrix}$$

10. Define Unitary matrix.

$$\begin{pmatrix} 1+i & -1+i \\ 2 & 1-i \end{pmatrix}$$

11. Prove that  $A = \begin{pmatrix} 2 & 1-i \\ 1+i & 2 \end{pmatrix}$  is Unitary.

$$\begin{pmatrix} 2 & 1-i \\ 1+i & 2 \end{pmatrix}$$

12. State Cayley Hamilton Theorem.

13. Verify Cayley Hamilton Theorem for  $\begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$ .

$$\begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$$

14. Verify Cayley Hamilton Theorem for  $\begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$ .

$$\begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$$

15. Find The Inverse of  $\begin{pmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -1 \end{pmatrix}$  using Cayley Hamilton Theorem.

$$\begin{pmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -1 \end{pmatrix}$$

16. Define Eigen values and Eigen Vectors.

17. Find the w eigen values and eigen vector:  $\begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$ .

$$\begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$$

18. Find the w eigen values and eigen vector:  $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{pmatrix}$ .

$$\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{pmatrix}$$

19. If  $\lambda_1, \lambda_2, \lambda_3$  are the eigen roots of A, find  $\lambda_3$  of  $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{pmatrix}$ .

$$\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{pmatrix}$$

20. Define similar matrices.

21. Diagonalize the matrix  $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$ .

$$\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$$

22. Show that  $\frac{1}{\sqrt{7}} \begin{pmatrix} 1+i & 2+i \\ 2-i & -1+i \end{pmatrix}$  is unitary.

$$\begin{pmatrix} 1+i & 2+i \\ 2-i & -1+i \end{pmatrix}$$

23. Show that  $\begin{pmatrix} \sin \theta & \cos \theta \\ -\sin \theta & \cos \theta \end{pmatrix}$  is orthogonal.

$$\begin{pmatrix} \sin \theta & \cos \theta \\ -\sin \theta & \cos \theta \end{pmatrix}$$

24. Verify Cayley-hamilton theorem for the matrix  $\begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{pmatrix}$

$$\begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{pmatrix}$$

25. Determine the Eigen values and eigen vectors of  $A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 2 \\ 1 & 0 & -1 \end{pmatrix}$ .

$$\begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 2 \\ 1 & 0 & -1 \end{pmatrix}$$



2 -1 0

26. Determine the Eigen values and eigen vectors of  $A = \begin{pmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{pmatrix}$ .

27. Diagonalize The matrix  $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$ .

### UNIT III

1.  $(x+a)^n = ?$

2. Expand

3.  $(1+x)^n$

4.  $(1-x)^n$

5.  $(1+x)^{-n}$

6.  $(1-x)^{-n}$

7. Find the Coefficient of  $x^n$  in the expansion of  $(1/1-x^2)$

8. Expand

9.  $(1+x)^{-1}$

10.  $(1-x)^{-1}$

11.  $(1+x)^{-2}$

12. Find the Coefficient of  $x^n$  in the expansion of  $(2+3x)^{-3}$

13. Find the Coefficient of  $x^2$  in the expansion of  $(1+x)^{-3}$

14. Sum to infinity the series  $\frac{4}{2.4} + \frac{4.5}{2.4.6} + \frac{4.5.6}{2.4.6.8} + \dots + \infty$ .

15. Sum to infinity the series  $\frac{2.4}{3.6} + \frac{2.4.6}{3.6.9} + \dots + \infty$ .

16. Show that  $3 + \frac{3.5}{8} + \dots + \infty = 4(\sqrt{8} - 1)$

17. Prove that  $\frac{\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots}{\frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + \dots} = \frac{e^2 + 1}{e^2 - 1}$

18. Sum to infinity the series  $1 + \frac{1+2}{2!} + \frac{1+2+2^2}{3!} + \dots + \infty$ .

19. Expand  $\frac{e^x + e^{-x}}{2}$

20. Sum to infinity the series  $1 + \frac{2^3}{2!} + \frac{3^3}{3!} + \dots + \infty$ .

21. Sum to infinity the series  $\sum_{n=0}^{\infty} \frac{5n+1}{(2n+1)!}$

22. Sum to infinity the series  $1 + \frac{1}{1!} + \frac{1}{2!} + \dots + \infty$ .

23. Sum to infinity the series  $1 + \frac{2^3x}{2!} + \frac{3^3x}{3!} + \dots + \infty$ .

24. Expand  $\log(1-x)$

25. Expand  $\log \frac{(1+x)}{(1-x)}$

26. Sum to infinity the series  $\frac{11.14}{10.15.20} + \frac{11.14.17}{10.15.20.25} + \dots + \infty$ .

27. Show that  $\log x = \frac{x-1}{x+1} + \frac{1}{2} \left( \frac{x^2-1}{(x+1)^2} \right)$

28. When  $n$  is large Show that  $\left(\frac{n+1}{n-1}\right)^{n/2} = \exp\left(1 + \frac{1}{3n^2}\right)$

## UNIT IV

### 2 MARK QUESTIONS

1. Write down the formula for the expansion of  $\sin n\theta$  and  $\cos n\theta$
2. Write the expansion of  $\tan n\theta$
3. Solve the equation  $\cos \theta = \cos \alpha$
4. Show that for any positive integer  $n$

$$\sin \theta = n \cos^{n-1} \theta \sin \theta - \frac{n(n-1)(n-2)}{3!} \cos^{n-3} \theta \sin^3 \theta + \dots$$

5. Write the expansion of  $\frac{\sin 4\theta}{\sin \theta}$
6. Prove that  $\cos 6\theta = 1 - 18\sin^2 \theta + 48\sin^4 \theta - 32\sin^6 \theta$
7. Write the expansion of  $\cos 4\theta$
8. Write down the formula for  $\tan(A+B+C\dots)$
9. Express  $\sin 3\theta$  in terms of  $\sin \theta$
10. Solve the equation  $\sin \theta = \sin \alpha$
11. Show that  $\tan \theta = \theta + \frac{\theta^3}{3} + \frac{2\theta^5}{15}$  upto five terms
12. Show that the error involved in replacing  $\frac{1}{6}(8\sin \theta - \sin 2\theta)$  by  $\theta$  is approximately  $\frac{1}{30} \theta^5$  if  $\theta$  is small
13. Evaluate  $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{\sin^3 x}$
14. Prove that  $16\sin^5 \theta = \sin 5\theta + 5\sin 3\theta + 10\sin \theta$
15. If  $\frac{\sin \theta}{\theta} = \frac{5045}{5046}$  prove that  $\theta = 1^\circ 58'$  approximately
16. Find  $\lim_{x \rightarrow 0} \frac{\sin 2x - 2\sin x}{x^3}$
17. Prove that  $2^3 \cos^4 \theta = \cos 4\theta + 4\cos 2\theta + 3$
18. The expansion of  $\sin \theta$  and  $\cos \theta$
19. If  $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$  show that  $x+y+z=xyz$
20. Show that  $2\tan^{-1} x = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$
21. Show that  $\tanh 2x = \frac{2\tanh x}{1+\tanh^2 x}$
22. Prove that  $\cosh^{-1} x = \log(x + \sqrt{x^2 - 1})$
23. Show that  $\cosh 2x = \cosh^2 x + \sinh^2 x$

24. If  $x+iy=\sin(A+iB)$  prove that (i)  $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$  (ii)  $\frac{x^2}{\sinh^2 A} - \frac{y^2}{\cosh^2 B} = 1$

25. Prove that  $\cosh(x+y)=\cosh x \cosh y + \sinh x \sinh y$

26. Show that  $\tanh^{-1} x = \frac{1}{2} \log_e \frac{1+x}{1-x}$

27. Prove that  $\sinh^{-1} x = \log(x + \sqrt{x^2 + 1})$

28. Show that  $\cosh^2 x + \sinh^2 x = 1$

29. Prove that  $\cosh 2x = \frac{1+\tanh^2 x}{1-\tanh^2 x}$

30. What is the addition formula for  $\tanh(x+y)$

### 5 Marks

1. Prove that  $\cos 6\theta = 32\sin^6\theta - 48\sin^4\theta + 18\cos^2\theta - 1$

2. Find the equation whose roots are  $\tan \frac{\pi}{16}, \tan \frac{5\pi}{16}, \tan \frac{9\pi}{16}, \tan \frac{13\pi}{16}$

3. Prove that  $\frac{\sin 6\theta}{\sin \theta} = 32\cos^5\theta - 32\cos^3\theta + 6\cos\theta$

4. Expand  $\frac{\sin 7\theta}{\sin \theta}$  in the powers of  $\sin \theta$

5. If  $\frac{\tan \theta}{\theta} = \frac{2524}{2523}$  find  $\theta$  approximately

6. If  $\alpha, \beta, \gamma$  be the roots of the equation  $x^3+px^2 + qx + p = 0$  prove that  $\tan^{-1} \alpha + \tan^{-1} \beta + \tan^{-1} \gamma = n\pi$  radians expect when  $q=1$

7. Derive the formula for  $\tan(A+B+C\dots)$

8. Prove that when  $x = 2\cos\theta, \frac{1+\cos 7\theta}{1+\cos\theta} = (x^3 - x^2 - 2x + 1)^2$

9. Write down the expansion of  $\cos 9\theta$

10. Prove that equation  $a\sec \theta - b\csc \theta = a^2 - b^2$  has four roots and that the sum of the four values of  $\theta$  which satisfy it is equal to an odd multiple of  $\pi$  radians

11. Determine a,b,c such that  $\lim_{\theta \rightarrow 0} \frac{\theta(a+b\cos\theta) - c\sin\theta}{\theta^5} = 1$

12. Expand  $\cos^2\theta \cdot \sin^4\theta$  in a series of cosines of multiple of  $\theta$

13. Expand  $\sin^6\theta$  in series of cosines of multiples of  $\theta$

14. If  $\cos^2\theta = A\cos\theta + B\cos 3\theta + C\cos 5\theta$  show that the value of A, B, C

15. Find  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin x + \cos x}{\cos^2 x}$

16. If  $\sin(\frac{\pi}{6} + \theta) = 0.51$  find  $\theta$  approximately

17. Prove that  $\sin\theta = \theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} \dots$

18. Prove that  $\cos\theta = 1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} \dots$

19. Determine a and b such that  $\lim_{\theta \rightarrow 0} \frac{a - \theta \sin\theta - b \cos\theta}{\theta^4} = \frac{1}{12}$

20. Show that  $2 \tan^{-1} x = \sin^{-1} \left( \frac{2x}{1+x^2} \right)$

### 10 Marks

1. Find the equation whose roots are  $2\cos\frac{2\pi}{7}, 2\cos\frac{4\pi}{7}, 2\cos\frac{6\pi}{7}$

2. Show that  $\cos\frac{2\pi}{9} \cdot \cos\frac{4\pi}{9} \cdot \cos\frac{6\pi}{9} \cdot \cos\frac{8\pi}{9} = \frac{1}{16}$

3. Prove that  $\cos 8\theta = 1 - 32\sin^2\theta + 160\sin^4\theta - 256\sin^6\theta + 128\sin^8\theta$

4. Show that the equation  $\sin(\theta + \alpha) = a \sin 2\theta + b$  has four roots and that if they are  $\theta_1, \theta_2, \theta_3, \theta_4$  then  $\theta_1 + \theta_2 + \theta_3 + \theta_4 = (2k + 1)\pi$

5. Prove that  $\frac{\sin 9\theta}{\sin\theta} = 256\cos^8\theta - 448\cos^6\theta + 240\cos^4\theta - 49\cos^2\theta + 1$

6. Prove that  $\sin\frac{\pi}{5} \cdot \sin\frac{2\pi}{5} \cdot \sin\frac{3\pi}{5} \cdot \sin\frac{4\pi}{5} = \frac{5}{16}$

7. Prove that the equation  $\cos 2\theta + a \cos\theta + b \sin\theta + c = 0$  has in general four solutions  $\alpha, \beta, \gamma, \delta$  lying between 0 and  $2\pi$  and  $\alpha + \beta + \gamma + \delta$  is a multiple of  $\pi$

8. Expand  $\sin 7\theta$  as a polynomial in  $\sin\theta$ . Hence obtain the cubic equation whose roots are  $\sin^2\frac{2\pi}{7}, \sin^2\frac{4\pi}{7}, \sin^2\frac{6\pi}{7}$

9. Expand  $\tan 4\theta$  in terms of  $\tan\theta$  and show that  $\tan\frac{\pi}{16}, \tan\frac{5\pi}{16}, \tan\frac{9\pi}{16}, \tan\frac{13\pi}{16}$  are roots of the equation

10. Derived expansion of  $\cos n\theta$  and  $\sin n\theta$

11. Expand  $\cos^5\theta \cdot \sin^3\theta$  in a series of sines of multiple of  $\theta$

12. Solve approximately in radians  $\sin\left(\frac{\pi}{3} + x\right) = 0.87$

13. Show that  $\cos^2\theta \cdot \sin^6\theta = -\frac{1}{27}(\cos 8\theta - 4\cos 6\theta + 4\cos 4\theta + 4\cos 2\theta - 5)$

14. Prove that  $2^7 \sin^8\theta = \cos 8\theta - 8\cos 6\theta + 28\cos 4\theta - 56\cos 2\theta + 35$

15. Find  $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{\sin^3 x}$

16. Prove that  $\sin^{-1}\frac{4}{5} + \sin^{-1}\frac{5}{13} + \sin^{-1}\frac{16}{65} = \frac{\pi}{2}$

17. Prove that  $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}$

18. Prove that  $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$

19. Solve the equation  $\tan^{-1} 2x + \tan^{-1} 3x = \frac{3\pi}{4}$



20. Prove that  $\cos^{-1} \frac{63}{65} + 2\tan^{-1} \frac{1}{5} = \sin^{-1} \frac{3}{5}$
21. If  $\tan(A+iB) = x+iy$  prove that (i)  $x^2 + y^2 + 2x\cot 2A = 1$   
 a. (ii)  $x^2 + y^2 - 2y\coth 2B = -1$
22. Prove that  $\tanh^{-1} x = \frac{1}{2} \log \left( \frac{1+x}{1-x} \right)$
23. If  $\log \sin(\theta + i\varphi) = A + iB$  prove that (i)  $\cos(\theta - B) = e^{2\varphi} \cos(\theta + B)$   
 1. (ii)  $\cosh 2\varphi - \cos 2\theta = 2e^{2A}$
24. Prove that  $\frac{\cosh x - 1}{\sinh x} = \frac{\sinh x}{\cosh x + 1} = \tanh \frac{x}{2}$
25. If  $\cos(x+iy) = r(\cos \alpha + i \sin \alpha)$  show that  $y = \frac{1}{2} \log \left[ \frac{\sin(x-\alpha)}{\sin(x+\alpha)} \right]$
26. Separate into real and imaginary part of  $\tan^{-1}(x + iy)$
27. Expand  $\cosh^3 \theta$  in terms of hyperbolic cosines of  $\theta$
28. If  $\cos^{-1}(\alpha + i\beta) = \theta + i\varphi$  show that (a)  $\alpha^2 \operatorname{sech}^2 \varphi + \beta^2 \operatorname{cosech}^2 \varphi = 1$   
 1. (b)  $\alpha^2 \sec^2 \theta - \beta^2 \operatorname{cosec}^2 \theta = 1$
29. 9. If  $u = \log \tan \left( \frac{\pi}{4} + \frac{\theta}{2} \right)$  show that (i)  $\theta = -i \log \tan \left( \frac{\pi}{4} + i \frac{\pi}{2} \right)$   
 i. (ii)  $\tanh \frac{u}{2} = \tan \frac{\theta}{2}$
30. Separate into real and imaginary part of  $\tanh(1 + i)$

## Unit -V

### Section - A

- If  $x^3 + y^3 = 3ax$ , find  $\frac{dy}{dx}$ .
- Define Saddle point.
- Find  $y_n$  if  $y = \log(2x + 3)$
- If  $y = e^{ax}$  then find  $y_n$ .
- If  $y = \frac{ax+b}{cx+d}$  find  $\frac{d^2y}{dx^2}$ .
- If  $y = e^x \sin 2x$  find  $\frac{d^2y}{dx^2}$ .
- If  $x = at^2$ ,  $y = 2at$ , find  $\frac{d^2y}{dx^2}$ .
- Find the  $n^{\text{th}}$  derivative of  $\frac{1}{ax+b}$ .
- Find the  $n^{\text{th}}$  derivative of  $\log(ax+b)$ .
- Find the  $n^{\text{th}}$  derivative of  $\sin(ax+b)$
- Find the  $n^{\text{th}}$  derivative of  $\cos(ax+b)$ .
- Find the  $n^{\text{th}}$  derivative of  $\sin^3 2x$ .
- Find the  $n^{\text{th}}$  derivative of  $\cos^4 x$ .
- Find the  $n^{\text{th}}$  derivative of  $\sin 2x \sin 4x \sin 6x$ .
- Find the  $n^{\text{th}}$  derivative of  $x^2 e^{5x}$ .
- Find the  $n^{\text{th}}$  derivative of  $x^2 \sin 5x$ .

17. Find the  $n^{\text{th}}$  derivative of  $e^x \log x$ .



18. Find the  $n^{\text{th}}$  derivative of  $\log(4x^2-1)$ .
19. If  $u = e^x \sin y$  where  $x = st^2$  &  $y = s^2t$  find  $\frac{\partial u}{\partial s}$  &  $\frac{\partial u}{\partial t}$ .
20. If  $u = x^3y^4z^2$  where  $x = t^2$ ,  $y = t^3$ ,  $z = t^4$  find  $du/dt$ .
21. If  $x = r \cos\theta$ ,  $y = r \sin\theta$ , find  $\frac{\partial}{\partial (x,y)}$ .
22. If  $u = x+y$ ,  $y = uv$  then find  $\frac{\partial}{\partial (u,v)}$ .
23. If  $u = x^2 + y^2 + z^2$ ,  $x = e^t$ ,  $y = e^t \sin t$  and  $z = e^t \cos t$  find  $du/dt$ .
24. If  $x = u(1+v)$  and  $y = v(1+u)$  find  $\frac{\partial}{\partial (u,v)}$ .
25. If  $u = 1/x$ ,  $v = x^2/y$  and  $w = x + y + zy^2$  find  $\frac{\partial}{\partial (x,y,z)}$ .
26. Find the angle between the radius vector and the tangent at any point on the conic section  $\frac{x^2}{r} = 1 + e \cos\theta$ .
27. Find the angle between the radius vector and the tangent at any point on the curve  $r = a(1 + \cos\theta)$  at  $\theta = \pi/2$ .
28. Find the angle between the radius vector and the tangent at any point on the curve  $r^2 = a^2 \cos 2\theta$  at  $\theta = \pi/6$ .
29. Find the pedal equation of the curve  $r^2 = a^2 \cos 2\theta$ .
30. Find the pedal equation of the curve  $r = ae^{\theta \cot \alpha}$ .
31. Find the pedal equation of the curve  $r^n = a^n \sin n\theta$ .
32. Write the formula for radius of curvature in polar co-ordinates.
33. Write the formula for finding the curvature of the curve  $x = f(\theta)$  and  $y = \phi(\theta)$ .
34. Show that the radius of curvature of the curve  $y = e^x$  at  $(0,1)$  is  $2\sqrt{2}$ .
35. Find the co-ordinates of centre of curvature of the curve  $xy = 2$  at the point  $(2, 1)$ .
36. Define radius of curvature.
37. Find the radius of curvature at the point  $(r, \theta)$  for the curve  $r = a/\theta$ .
38. Find the radius of curvature at the point  $(r, \theta)$  for the curve  $r = a \cos\theta$ .
39. Find the radius of curvature at the point  $(r, \theta)$  for the curve  $r = a(1 - \cos\theta)$ .
40. Show that the radius of curvature at the point  $(x, y)$  on the curve  $y = \cosh \frac{x}{c}$  is  $y^2/c$ .
41. Show that the radius of curvature at the point  $(a, 0)$  on the curve  $x^3 + y^3 = 2a^3$  is  $a/\sqrt{2}$ .
42. Find the radius of curvature at the point  $(3, 10)$  on the curve  $xy = 30$ .
43. Find the points on the curve  $y^2 = 8x$  at which the radius of curvature is  $7\frac{13}{16}$ .
44. Find the p-r equation for the curve  $r \sin\theta + a = 0$ .
45. Find the p-r equation for the curve  $r = a/\theta$ .
46. Find the p-r equation for the curve  $r = a \cos\theta$ .
47. Find the p-r equation for the curve  $r = a \sec^2 \frac{\theta}{2}$ .
48. Find the p-r equation for the curve  $r = a \sin^3 \frac{\theta}{3}$ .
49. Find the length of the chord of curvature through the of the equiangular spiral  $r = ae^{\theta \cot \alpha}$ .

### Section – B

50. If  $y = (x + \sqrt{1+x^2})^m$  show that  $(1+x^2)y'' + xy' - m^2y = 0$ .
51. If  $y = a \sin^m x$  prove that  $\sin^2 x \frac{d^2 y}{dx^2} = (m^2 \cos^2 x - m)y$ .
52. Find the  $n^{\text{th}}$  derivative of  $e^{ax} \sin(bx + c)$  &  $e^{ax} \cos(bx + c)$ .
53. Find the  $n^{\text{th}}$  derivative of  $e^{3x} \sin x \sin 2x \sin 3x$ .

54. Find the  $n^{\text{th}}$  derivative of  $\sin^5 x \cos^4 x$ .
55. Find the  $n^{\text{th}}$  derivative of  $\cos x \cos 2x \cos 3x$ .
56. If  $y = a \cos(\log x) + b \sin(\log x)$  prove that  $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$ .
57. If  $y = e^{a \sin^{-1} x}$  prove that  $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$ .
58. If  $y = \sin(m \sin^{-1} x)$  prove that  $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (m^2-n^2)y_n = 0$ .
59. If  $r^2 = x^2 + y^2$  then show that  $\frac{6^2 r}{6x^2} + \frac{6^2 r}{6y^2} = \frac{1}{r} \left[ \left(\frac{6r}{6x}\right)^2 + \left(\frac{6r}{6y}\right)^2 \right]$ .

60. If  $u = \sqrt{x^2 + y^2 + z^2}$  show that  $\sum x^2 \frac{6^2 u}{6x^2} + 2 \sum yz \frac{6^2 u}{6x 6y} = 0$ .

61. If  $u = x^2 \tan^{-1} \frac{y}{x} - y \tan^{-1} \frac{x}{y}$  prove that  $\frac{6^2 u}{6x 6y} = \frac{x^2 - y^2}{x^2 + y^2} = \frac{6^2 u}{6y 6x}$ .

62. If  $u = \sin \left( \frac{x^2 + y^2}{x+y} \right)$  show that  $x \frac{6u}{6x} + y \frac{6u}{6y} = \frac{x^2 + y^2}{x+y} \cos \left( \frac{x^2 + y^2}{x+y} \right)$ .

63. If  $z = f(x, y)$  where  $x = r \cos \theta$  &  $y = r \sin \theta$  show that  $\left(\frac{6z}{6x}\right)^2 + \left(\frac{6z}{6y}\right)^2 = \left(\frac{6z}{6r}\right)^2 + \frac{1}{r} \left(\frac{6z}{6\theta}\right)^2$ .

64. Transform  $\frac{6^2 v}{6x^2} + \frac{6^2 v}{6y^2}$  into polar co-ordinates.

65. If  $x = \sin \theta \sqrt{1 - a^2 \sin^2 \varphi}$ ,  $y = \cos \theta \cos \varphi$  then show that  $\frac{6(x, y)}{6(\theta, \varphi)} = \frac{-\sin \varphi [(1 - a^2) \cos^2 \theta + a^2 \cos^2 \varphi]}{\sqrt{1 - a^2 \sin^2 \varphi}}$ .

66. If  $x + y + z = u$ ,  $y + z = uv$ ,  $z = uvw$  prove that  $\frac{6(x, y, z)}{6(u, v, w)} = u^2 v$ .

67. If  $x = \rho \sin \varphi \cos \theta$ ,  $y = \rho \sin \varphi \sin \theta$ ,  $z = \rho \cos \varphi$  find  $\frac{6(x, y, z)}{6(\rho, \theta, \varphi)}$ .

68. If  $u^3 + v^3 = x + y$ ,  $u^2 + v^2 = x^3 + y^3$  show that  $\frac{6(u, v)}{6(x, y)} = \frac{1}{2} \frac{y^2 - x^2}{uv(u-v)}$ .

### Section - C

69. If  $y^{1/m} + y^{-1/m} = 2x$  prove that  $(x^2 - 1)y_{n+2} + (2n+1)xy_{n+1} + (n^2 - m^2)y_n = 0$ .

70. If  $y = [\log(x + \sqrt{1 + x^2})]^2$  show that  $(1 + x^2)y_{n+2} + (2n+1)xy_{n+1} + n^2 y_n = 0$ .  
Hence find  $y_n(0)$ .

71. If  $e^{m \sin^{-1} x}$  prove that  $(1 - x^2)y_{n+2} - (2n+1)xy_{n+1} - (m^2 + n^2)y_n = 0$ . Hence find  $y_n(0)$ .

72. Find the radius of curvature of the curve  $r^2 = a^2 \sin 2\theta$ .

73. Show that the radius of curvature of the curve  $r^n = a^n \cos n\theta$  is  $\frac{a^{n+1}}{n+1}$ .

74. Prove that the p-r equation of the cardioids  $r = a(1 - \cos \theta)$  is  $p^2 = \frac{r^3}{2a}$ .

75. Prove that the radius of curvature of the curve  $y^2 = \frac{1}{a^2(a-x)}$  at  $a, 0$  is  $\frac{1}{2} a$ .

76. Find the radius of curvature at any point of the cycloid  $x = a(\theta + \sin \theta)$ ,  $y = a(1 - \cos \theta)$ .

77. Show that the evaluate of the cycloid  $x = a(\theta - \sin \theta)$ ,  $y = a(1 - \cos \theta)$  is another cycloid.

78. Find the angle of intersection of the curves  $r = \frac{a}{1 + \cos \theta}$  and  $r = \frac{b}{1 - \cos \theta}$ .

79. Prove that the parabolas  $r = \frac{a}{1 + \cos \theta}$  and  $r = \frac{b}{1 - \cos \theta}$  intersect at each other orthogonally.

80. Find the pedal equation of the curve  $\frac{1}{r} = 1 + e \cos \theta$ .

81. Find the pedal equation of the curve  $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ .

82. Show that the curves  $r = \frac{a}{1+\cos\theta}$  and  $r = b(1 - \cos\theta)$  cut each other orthogonally.

83. Find the angle between the curves  $r = 2a\cos\theta$ ,  $r = 2a\sin\theta$ .

84. Find the angle between the curves  $r^2 = a^2\cos 2\theta + b^2$ ,  $r = b$ .

85. Find the p-r equation of the curve  $y^2 = 4a(x + a)$ .
86. Find the p-r equation of the curve  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .
87. Find the p-r equation of the curve  $r^m a^m \cos m\theta$ .
88. Find the p-r equation of the curve  $r = a(1 - \cos\theta)$ .
89. Find the radius of curvature at the point  $(\frac{a}{4}, \frac{a}{4})$  to the curve  $\sqrt{x} + \sqrt{y} = \sqrt{a}$ .
90. Find the radius of curvature at  $x = y = \frac{3a}{2}$  to the curve  $x^3 + y^3 = 3axy$ .
91. Find the radius of curvature of the curve  $xy^2 = a^3 - x^3$  at the point  $(a, 0)$ .
92. Show that the radius of curvature at  $t$  on the curve is  $x = 6t^2 - 3t^4$ ,  $y = 8t^3$  is  $6t(1 + t^2)^2$ .
93. Find the radius of curvature at any point on the curve  $r^2 = a^2 \cos 2\theta$ .
94. Show that the radius of curvature at any point on the equi angular spiral  $r = ae^{\theta \cot \alpha}$  is  $r \csc \alpha$ .
95. Show that the radius of curvature for the cardioid  $r = a(1 + \cos\theta)$  at the point  $(r, \theta)$  is  $\frac{2}{3}\sqrt{2ar}$ .



**DEPARTMENT OF PHYSICS**  
**QUESTION BANK**  
**SUBJECT: BASIC ELECTRICAL TECHNOLOGY (CSPH32)**  
**SUBJECT HANDLED BY: DR.N.MYTHILI**  
**SEM : III (ODD)**

**UNIT: 1**

**BASIC ELECTRICITY PRINCIPLES**

**TWO MARKS**

1. Define voltage with its unit
2. What is current?
3. Define resistance
4. What is power? Write its SI units
5. Define ohm's law
6. Define charge
7. Explain coulomb's law
8. What is capacitors? Write its uses
9. Difference between LT/HT electric lines
10. Define the earthing in electrical circuits
11. What is MCB'S and its uses?
12. Write any three electrical safety measures

**FIVE MARKS**

1. Basic definitions of electricity with its SI units
2. Describe coulomb's law with its derivations
3. Write the applications of fuses
4. Describe the MCB and ELCB relays in detail
5. Write in detail about neutral and earthing in electrical circuits. Give its importance

**TEN MARKS**

1. Write in detail about the resistors in series and parallel with neat circuit

2. Explain detail the capacitors, and capacitance of a capacitors
3. Describe detail about electrical safety and the safety precaution of electricity
4. Define what is electrical shock? Write about the safety precautions to be carried to avoid electrical shocks

## UNIT: 2

### CELL AND BATTERIES

#### TWO MARKS

1. What are the types of cells
2. Define dry cells
3. What is voltaic cells?
4. Define Daniel cell
5. What is difference between cells and batteries?
6. What are the types of batteries?
7. What is the principle of lead-acid batteries?
8. Define hydrogen batteries
9. What is UPS batteries?
10. Explain the importance of UPS batteries
11. Write the principle of solar cells
12. What are the advantageous of solar cells?
13. Draw the schematic diagram of solar cell

#### FIVE MARKS

1. Write in detail about primary cells with neat diagram
2. Explain the classification of secondary cells
3. Write about the difference between lithium ion and lead acid batteries
4. Write in detail about UPS batteries with neat diagram

#### TEN MARKS

1. Describe the construction, working of hydrogen batteries. Write the advantageous of hydrogen batteries
2. Write in details about the batteries, its major classifications with neat diagrams
3. Define the principle, working and construction of solar cells with necessary diagrams
4. Write about cells, classification and working with examples

**UNIT: 3**  
**DC CIRCUITS**

**TWO MARKS**

1. Define Kirchoff's current law
2. Define Kirchoff's voltage law
3. What is source conversion?
4. Define Joules law
5. What electric power? Give its SI unit
6. Define the principle of DC generators
7. What is the speed of DC motors?

**FIVE MARKS**

1. Write in detail about Kirchoff's current law and voltage law
2. Describe about wheatstone's bridge
3. Write in detail about Joule's law of electric heating
4. State and prove thevenin's theorem
5. State and prove Norton's theorem

**TEN MARKS**

1. State and prove superposition theorem
2. Describe the construction and working of DC generators
3. Write the construction and working of DC motors and also explain the speed of motors

**UNIT: 4**  
**AC FUNDAMENTALS**

**TWO MARKS**

1. Define alternating voltages
2. Define alternating currents
3. Define waveforms
4. What is time period?
5. Define frequency
6. Define amplitude
7. What is phase difference?
8. What is RMS?
9. Draw RLC circuits
10. What is single phase connections?
11. What is three phase connections?
12. Define star connections

13. What is delta connections

**FIVE MARKS**

1. Write about the generation of alternating voltages and currents
2. Write the equations of alternating voltages
3. Explain cycle, time period, frequency and amplitude
4. Write the different forms of emf equation
5. Describe the graphical representation of series resonance

**TEN MARKS**

1. Explain phase, phase difference, RMS, average and peak values
2. Write about RLC circuit in series and resonance
3. Write in detail about single and three phase connections, star and delta connections

**UNIT: 5**  
**TRANSFORMERS & MOTORS**

**TWO MARKS**

1. Define transformers
2. What is step up transformers?
3. Define step down transformers
4. Define the efficiency of transformers
5. What are the types of transformers?
6. Define AC generators
7. Define induction motors
8. What is the principle of induction motors?

**FIVE MARKS**

1. Write about step up transformer principle, construction and working
2. Discuss about step down transformer construction and working
3. Write about the losses of transformers
4. Write about the efficiency of transformers
5. Explain the types of transformers

**TEN MARKS**

1. Explain the construction, working of AC generators and its applications with neat diagram
2. Write in detail about its principle and working of induction motors with neat diagram





**DEPARTMENT OF PHYSICS**  
**SUBJECT: INTRODUCTION TO INFORMATION TECHNOLOGY (CNCA 35)**  
**SUBJECT HANDLED BY: MS.S.SURIYA**  
**SEM : III (ODD)**

**PART – A (2 Marks)**

1. Define data.
2. What is information?
3. Explain about Information Technology?
4. Define desktop computer?
5. Explain the term VDU?
6. Define data acquisition?
7. Define MICR?
8. Define text data?
9. Explain Image data?
10. Define audio data?
11. Define video data?
12. Define memory cell?
13. Define capacitor storage cell?
14. Explain flip flop storage cell?
15. Define magnetic storage cell?
16. Define Polycarbonate cell?
17. Define RAM?
18. Define ROM?
19. Explain about CDROM?
20. Define floppy disk with diagram?
21. Explain about flash memory?
22. Define disk interface?
23. Define CPU?
24. Define main memory?
25. Define embedded processor?
26. Define MAR.

27. Define MDR.
28. Define LAN.
29. Explain about client server computing.
30. Define Ethernet connection?
31. Define token ring?
32. Explain star connection?
33. Define WAN?
34. Define Internet?
35. Explain about IP Address?
36. Define about Soft copy?
37. Define about Hard copy?
38. Define CRT?
39. Explain about Display method?
40. Define LCD?
41. Define Active matrix LCD?
42. Define Passive matrix LCD?
43. Define Printer?
44. Explain WYSIWYG?
45. Define programming language?
46. Define operating system?
47. Explain about BIOS?
48. Define Scripting language?
49. Define high level language?
50. Define database?
51. Define AI?
52. Explain about E-Mail with example?
53. Define ISP.
54. Define WWW.
55. Define URL with example.
56. Define telnet.
57. Define Internet telephony.
58. Define URL.
59. Explain the functions of browser.
60. Define hypertext.

**PART – B (5 Marks)**

1. Explain about types of data?
2. Write note on simple model of computer?
3. How data are processed in computer?
4. Explain about Desktop computer?
5. Explain about the characters represented in computer?
6. Write note on error detecting codes?
7. Explain about memory cell?
8. List out the physical devices used as memory cells?

9. Explain about Floppy disk drive?
10. Explain about archival memory?
11. Write about specification of CPU?
12. How does the CPU interconnects with memory and I/O Units?
13. Explain about LAN Connections?
14. What are all the technologies used in the LAN?
15. Explain about futures of internet technologies?
16. Explain about Video display devices?
17. Explain about Flat panel display?
18. Explain about Laser Printer?
19. Explain the types of operating system?
20. Detail note on functions of operating system?
21. Explain about Classification of programming language?
22. Explain about how to organize the database?
23. Explain about structure of database?
24. Explain about the queries which are used in Database with example?
25. How does the programming language classified based on applications?
26. What are the IT enabled services and careers.
27. Explain about users in IT.
28. How does the information retrieval from the WWW.
29. What are the facilities provided by browser.
30. Explain about resource directories.

#### **PART – C (10 Marks)**

1. Detail note on input units?
2. Write an detail note on internal representation on number system?
3. Detail note on RAM?
4. Explain about Ready Only Memory?
5. Explain about Secondary memory and its types?
6. Explain about CPU and Its structure?
7. Write note on LAN and its applications?
8. Detail note on WAN with neat diagram?
9. Detail note on Printers and its types?
10. Explain about Output devices with suitable examples?
11. Detail note on Operating system?
12. Write in detail about programming languages?
13. Write note on DBMS with examples?
14. What are career opportunity in Information Technology.
15. Detail note on E-Mail with examples.
16. Explain about information browsing service.
17. Explain about audio on the internet.
18. Explain about WWW in detail.



**KRISHNASWAMY COLLEGE OF SCIENCE, ARTS AND MANAGEMENT  
FOR WOMEN, CUDDALORE**

**DEPARTMENT OF PHYSICS**

**SUBJECT: MECHANICS**

**Subject Handled by: DR.R. BHUVANESWARI  
Sem: I (ODD sem)**

**UNIT I - Vectors and Dynamics**

**Part – A- Two marks questions**

1. Define scalar and vector quantities.
2. What is gradient of scalar field
3. Write the divergence of a vector field
4. Define curl of vector
5. Write a short note on (i) surface and (ii) volume integral (iii) Line integral
6. Define stoke's theorem
7. Define gauss theorem.
8. State Green's theorem.
9. State newton's laws of motion.
10. Define projectile
11. Write a note on (i) Range (ii) time of flight
12. Define center of mass and gravity

**Part – B – Five marks questions**

1. What do you understand by the gradient of a scalar field? Show that the gradient of a scalar field is a vector field. Give an examples.
2. Give the expression for divergence in Cartesian coordinates.
3. State and prove Stoke's theorem in vector analysis.
4. Define curl of a vector function and give its physical significance. Obtain an expression for curl A in Cartesian coordinates.
5. A particle is projected with a velocity of  $32 \text{ ms}^{-1}$  at an angle of  $60^\circ$  to the horizontal. Find the range on a plane inclined at  $30^\circ$  to the horizontal when projected (i) up the plane (ii) down the plane.

**Part – C – Ten marks questions**

1. State and prove Gauss' divergence theorem. Hence deduce Green's Theorem.
2. A particle is projected with velocity  $u$  at an angle  $\alpha$  to the horizontal. Find the range of particle on the inclined plane through its point of projection inclined at an angle  $\beta$  to the horizontal.
3. Define centre of gravity and explain the centre of gravity of a solid tetrahedron.

4. Show that motion of two interacting bodies may be reduced to the motion of single body. Hence explain the concept of reduced mass.

## **UNIT II - Dynamics of rigid bodies**

### **Part – A- Two marks questions**

1. Define rotation kinetic energy
2. Define moment of inertia
3. What is angular acceleration and momentum
4. State the law of conservation of angular momentum
5. Define torque
6. State the perpendicular and parallel axes theorem.
7. Define acceleration due to gravity
8. Define compound pendulum
9. What is Bifilar pendulum?
10. Define the work done by torque.

### **Part – B – Five marks questions**

1. Derive an expression for the rotational kinetic energy and moment of inertia.
2. Explain in detail about the law of conservation of angular momentum.
3. Derive in brief of work done by a torque.

### **Part – C – Ten marks questions**

1. Explain the terms: moment of inertia and radius of gyration. State and prove the theorem of parallel and perpendicular axes.
2. Find the moment of inertia of a uniform circular disc about an axis passing through its center and perpendicular to its plane.
3. Describe the experimental method to determine the acceleration due to gravity by compound pendulum.
4. Describe the experimental method to determine the moment of inertia of parallel threads by bifilar pendulum method.

## **UNIT III - Work, Energy and Collisions**

### **Part – A- Two marks questions**

1. What is conservation of force?
2. Define potential energy.
3. State the principle of conservation of energy
4. Define elastic and inelastic collisions.
5. Define oblique impact of smooth spheres.
6. Write the loss of kinetic energy.
7. What is collision?

### **Part – B – Five marks questions**

1. Write in detail about the work, energy theorem.
2. Explain the principle of conservation of energy of a freely falling body.
3. Discuss in detail about the elastic and in elastic collisions.
4. Discuss the loss of kinetic energy due to oblique impact

### **Part – C Ten marks questions**

1. Derive an expression for the oblique impact of smooth sphere on a fixed smooth plane.
2. Explain in detail of oblique impact of two smooth spheres.

## **UNIT IV – Elasticity**

### **Part – A- Two marks questions**

1. Define elasticity.
2. State poisson's ratio.
3. Define plasticity
4. State Hookes' law
5. Define poisson's ratio
6. Write a notes on Youngs' modulus, Rigidity modulus and Bulk modulus.
7. Define stress and strain and its SI units.
8. Define cantilever?
9. What are bending of beams?
10. Define torsion pendulum.
11. What is couple of twist?

### **Part – B – Five marks questions**

1. Define E, G and K. Obtain the relations connecting these quantities.
2. Describe and derive the expression for the bending moment of beams.
3. Describe Konig's method for the determination of Young's modulus of a beam.
4. Derive an expression for the work done in stretching of twisting a wire.

### **Part – C Ten marks questions**

1. Describe with necessary theory, how you would determine the rigidity modulus of a wire experimentally by using the torsion pendulum.
2. Describe with necessary theory, how the rigidity modulus of a rod experimentally by the static torsion method.
3. What is cantilever? Obtain an expression for the depression at the free end of a thin light beam clamped horizontally at one end and loaded at the other

4. Derive an expression for the moment of the couple required to twist one end of the cylinder when the other is fixed.
5. Describe the relevant theory, an experiment to determine the Young's Modulus of the material of a bar by uniform bending (Pin and microscope method).
6. Describe the relevant theory, an experiment to determine the Young's Modulus of the material of a bar by uniform bending (Optic lever method).

## **UNIT V – Gravitation**

### **Part – A- Two marks questions**

1. Define Gravitation.
2. What is acceleration due to gravity?
3. Define inertia.
4. Define gravitational mass
5. Define gravitational field and potential.
6. State Kepler's law.
7. State newton's third law.
8. Define escape velocity and orbital velocity.
9. Define geosynchronous orbit.
10. Define GPS.
11. What is weightlessness.

### **Part – B – Five marks questions**

1. Explain and derive the Escape velocity of orbit
2. Derive and explain the orbital velocity of a satellite.
3. Explain about the Geosynchronous orbits and its benefits.
4. State and explain in detail about the kepler's laws.
5. What is about the GPS? Explain in details.

### **Part – C– Ten marks questions**

1. Determine the gravitational potential and the gravitational field at a point (i) inside and (ii) outside a hollow spherical shell.
2. Determine the gravitational potential and the gravitational field at a point (i) inside and (ii) outside a solid sphere.



**KRISHNASWAMY COLLEGE OF SCIENCE, ARTS AND MANAGEMENT  
FOR WOMEN, CUDDALORE**

**SUBJECT: ALLIED CHEMISTRY**

**Subject Handled by: Dr. C.M Mahalakshmi & Ms. Vijayakumari  
Sem: I (ODD sem)**

**UNIT I**

**Part – A- Two marks questions**

1. Define ores and mineral.
2. Difference between ores and minerals.
3. What is concentration of the ores? Give its types.
4. Write the chemical separation of ore particles.
5. What is metallurgy? Its mention various steps.
6. Define calcination.
7. What is roasting? its types.
8. Define smelting.
9. Define flux and slag.
10. Write the uses of flux and slag.
11. Write the ores of cobalt.
12. Write the ores of titanium.

**Part – B – Five marks questions**

1. Explain magnetic separation of ore particles.
2. Draw and explain froth floatation methods.
3. Explain gravity separation of ore particles.
4. Draw and explain zone-refining.
5. Explain van-arkel method of refining.
6. Explain the isolation of metals by reduction methods

**Part – C – Ten marks questions**

1. Describe different methods of concentration of ores.
2. How is titanium extracted from its ores.
3. How is cobalt extracted from its ores.



## UNIT II

### Part – A- Two marks questions

1. What are cycloalkanes? Give any four examples.
2. How cycloalkanes are prepared by dieckmann ring closure method?
3. What is polarisation?
4. What are polar effects? Explain anyone of it.
5. Define enantiomers. Give an example.
6. Define inductive effect. Give an example.
7. Define mesomeric effect. Give an example.
8. Define steric effect.
9. Why phenol is more acidic in nature?
10. Why phenol is more acidic than alcohol?
11. Why aniline is less basic than methylamine?
12. What is racemisation?
13. What is stereoisomerism? Mention its types.
14. Give the examples for geometrical isomers.
15. Give the examples for optical isomers.
16. Define optical activity.
17. What are the conditions of optical activity?

### Part – B – Five marks questions

1. How is cyclohexane and cyclopropane prepared?
2. Discuss the angle strain in cyclopentane and cyclohexane.
3. Explain the geometrical isomerism with suitable example.
4. Explain elements of symmetry.
5. Compare the strength of acetic acid and chloro acetic acid.
6. Differentiate maleic and fumaric acid.

### Part – C – Ten marks questions

1. Explain preparation and properties of cycloalkanes.
2. Write note on stereoisomerism.
3. Write short notes on:
  4. a) Inductive effect.
  5. b) Mesomeric effect.
  6. c) Steric effect.
7. Explain the methods of resolution and racemisation.

## UNIT III

### Part – A- Two marks questions

1. Define order of a reaction.
2. Define molecularity.
3. What is first order reaction? Give an examples.

4. What is rate and rate constant?
5. Write the unit of 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> order reaction.
6. Define catalysis. Give an examples.
7. Define positive catalyst.
8. Define negative catalyst.
9. What is an autocatalyst?
10. Give the industrial applications of a catalyst.
11. What is catalytic promotor? Give an examples.
12. What is catalytic poisons? Give an example.
13. Define homogeneous catalyst. Give an examples.
14. Define heterogeneous catalyst. Give an examples.
15. What is thermal reaction?
16. What photochemical reaction?
17. State Grothus-Droper law.
18. State Stark-Einsteins law.
19. Define quantum yield.

### **Part – B – Five marks questions**

1. Deduce the rate equation for  $t_{1/2}$  of a first order reaction.
2. Derive rate constant for a first order reaction.
3. Differentiate order and molecularity.
4. Derive and determine the rate constant of ester hydrolysis.
5. Discuss the industrial applications of catalysts.
6. Explain the catalytic poisons and action of promoters.
7. Explain the active centres.
8. Difference between homogeneous and heterogeneous catalysis.
9. State and explain all the laws of photochemistry.
10. Write note on phosphorescence and fluorescence.
11. Write notes on photosynthesis.
12. Difference between thermal and photochemical reaction.

### **Part – C Ten marks questions**

1. Explain catalysis and types of catalysis.
2. Discuss about the mechanism of catalytic action.
3. Explain photosynthesis, phosphorescence and fluorescence.
4. Write notes on:
  5. a) Photosensitisation.
  6. b) Enzyme catalyst.
  7. c) Primary and Secondary process.

## **UNIT IV**

### **Part – A- Two marks questions**

1. How is sea water desalinated?
2. Mention the different types of repulsion according to VSEPR theory.
3. Draw the shapes of SF<sub>6</sub>.
4. Draw the shapes of XeF<sub>6</sub>.
5. Draw the shapes of BF<sub>3</sub>.
6. Draw the shapes of PCl<sub>5</sub>.
7. Define solar energy.
8. Why is solar energy necessary?
9. Define calorific values of a fuel. Give an examples.
10. Define non-conventional fuels. Give some examples.
11. What are fuels? How are they classified?
12. What are biofuels? Give an examples.
13. What is water gas?
14. What are the applications of biofuels.
15. What is producer gas? Mention its uses.
16. What is the uses of producer gas?
17. What is carburetted water gas?
18. List out the composition of water gas.
19. List out the composition of producer gas.
20. List out the composition of carburetted water gas.
21. What is meant by osmosis and reverse osmosis?
22. Define osmotic pressure.

### **Part – B – Five marks questions**

1. Discuss the structure of XeF<sub>6</sub> & SF<sub>6</sub> based on VSEPR theory.
2. Draw and explain the structure of PCl<sub>5</sub> & BF<sub>3</sub>.
3. Discuss about the solar energy.
4. Write note on reverse osmosis and its applications.
5. Write notes on desalination of sea water.
6. Explain bio-fuels and its applications.
7. What are the application of LPG, oil gas and water gas?
8. What is water gas? Explain its application and composition.
9. Explain the need and advantages of using solar energy.
10. Differentiate between osmosis and reverse osmosis.
11. Write notes on natural gas.
12. Write notes on gobar gas.
13. Explain the determination of osmotic pressure.
14. What is reverse osmosis? with a neat diagram explain the desalination of sea water.
15. Explain oil gas.

### **Part – C Ten marks questions**

1. Explain the VSEPR theory with the help of this theory discuss about hybridisation and shapes of  $\text{BF}_3$ ,  $\text{PCl}_5$ ,  $\text{XeF}_6$ .
2. Explain non-conventional fuels.
3. Discuss about the biogas.

### **UNIT V**

#### **Part – A- Two marks questions**

1. Define radioactivity.
2. What is crude oil? its type.
3. Define atomic number and mass number.
4. Define isotope.
5. Define isobars.
6. Define isotones.
7. Define half life period.
8. What is mean by mass defect and N/P ratio ?
9. Define Nuclear binding energy.
10. What are the types of nuclear reaction? Give an examples.
11. What is nuclear fission?
12. What is nuclear fusion?
13. What is the application of radioactive elements?
14. What are radioactive series?
15. Write the any four applications of isotopes.
16. Draw the structure of naphthalene.
17. Write the uses of naphthalene.
18. What is refining of petroleum?
19. Define cracking.
20. What is thermal cracking? Mention its types.
21. What is catalytic cracking? Mention its types.
22. What are conductors and insulators? Give suitable examples.
23. What is semiconductors? How are they classified.

#### **Part – B – Five marks questions**

1. Explain nuclear fission.
2. Explain nuclear fusion.
3. Distinguish nuclear fission and fusion.
4. Explain liquid drop model of nuclear fission reaction.
5. Discuss the applications of nuclear chemistry in various fields.

6. Write notes on C-14 dating.
7. How is naphthalene prepared?
8. Describe the structure of naphthalene.
9. Discuss the refining of petroleum and applications of cracking.
10. Explain the application of cracking.
11. What are conductors? Explain the types of conductors.
12. Explain p-type and n-type semiconductors with illustration.

**Part – C– Ten marks questions**

1. Explain types of nuclear reactions.
2. How is naphthalene prepared? Write its chemical properties, structural elucidation and uses.
3. Explain the types of cracking with diagrams.
4. Write notes on conductors.



**KRISHNASWAMY COLLEGE OF SCIENCE, ARTS AND MANAGEMENT  
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**DEPARTMENT OF PHYSICS  
QUESTION BANK  
ACADEMIC YEAR (2021-2024)  
SUBJECT: Environmental science**

**Subject Handled by: DR.R. BHUVANESWARI and Dr. N. MYTHILI  
Sem: I (ODD sem)**

**Unit 1 – INTRODUCTION TO ENVIRONMENTAL SCIENCES: NATURAL  
RESOURCES**

**Part – A – Two marks questions**

1. Define environmental studies
2. What is an ecosystem?
3. What are the biotic components of an ecosystem?
4. Define producers, consumers and decomposers
5. What is renewable and non conservation energy?
6. Write the conflicts over resource sharing system.

**Part – B– Five marks questions**

1. Write the scope of environmental studies
2. Write an account of importance of environmental studies
3. Explain the need for public awareness on environmental studies
4. Explain the steps taken by the Indian government to create awareness on the protection of environment.

**Part – C– Ten marks questions**

1. Explain the types of resources in detail
2. Write in detail about land exploitation and the effects of using fertilizers

**UNIT 2 – ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION**

**Part – A – Two marks questions**

1. What is biodiversity? Explain its kind
2. Write notes on a. Genetic diversity
3. Define species diversity
4. What is a food chain?
5. What is ecosystem diversity?
6. Classify India based on its biogeography

7. What are the values of biodiversity?
8. Explain biodiversity at global level
9. Give a list of sanctuaries and national parks in India
10. India is a mega diversity zone-Discuss
11. Write an account on Indian forests
12. What are the hot spots?
13. What are endemic species?

**Part – B– Five marks questions**

1. Write an essay on hot spots
2. Sum up the threats of biodiversity
3. Write an account on endangered species
4. What are in-situ and ex-situ conservation
5. Write about biodiversity at national level
6. Write about food chain and food web
7. Write in detail about values of biodiversity

**Part – C– Ten marks questions**

1. Write in detail about aquatic ecosystem
2. Explain with necessary diagram about grassland and forest ecosystem

**Unit 3 – ENVIRONMENTAL POLLUTION AND MANAGEMENT**

**Part – A – Two marks questions**

1. What are the types of pollution?
2. What are nuclear hazards?
3. Define earthquakes
4. What is pollution?
5. Write about the terms (i) cyclone (ii) land slides (iii) earth quakes.
6. Explain the causes of floods.

**Part – B– Five marks questions**

1. Write an account on the sources, causes and effects of pollution
2. Write an essay on water pollution
3. What do you know about soil pollution
4. Write an account of marine pollution
5. Explain noise pollution
6. Write an essay on thermal pollution

**Part – C– Ten marks questions**

1. Write an essay on the causes, effects and management of solid wastes of cities and industries

2. How an individual can play effective roles in preventing pollution?
3. Write an account on disaster management

#### **Unit 4 SOCIAL ISSUES – HUMAN POPULATION**

##### **Part – A – Two marks questions**

1. What is water conservation?
2. Define environmental ethics
3. What is global warming
4. What is value education
5. Define energy.
6. Define resettlement and rehabilitation issues.
7. How to give awareness to womens and child care.
8. What is meant by environmental ethics?

##### **Part – B– Five marks questions**

1. Give an account on population
2. Write notes on family welfare programme
3. Write note on population exposition
4. Write an essay on environment and human health
5. Write an account on human rights
6. What do you know about value education
7. Explain the role of HIV/AIDS in teation to human populations
8. Write an essay on woment and children welfare
9. Explain the role of I.T on environment and human health

##### **Part – C– Ten marks questions**

1. Sketch the Environmental Ethics.
2. Explain the environmental production act 1986 in detail.
3. Write brief about the air, water, wildlife and forest conservation act.