UG–AS-1397 BPHYS–11

U.G. DEGREE EXAMINATION —
JULY 2024.

Physics

First Semester

PROPERTIES OF MATTER AND SOUND

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. What is a beam? Give the unit of Young's modulus of a bar.

2. Define surface tension. Give its unit.

3. Give the unit and dimension of co-efficient of viscosity.

4. Define the loudness of the sound.

5. Define reverberation and reverberation time.

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Obtain the expression for depression of the loaded end of a cantilever.

7. Discuss variation of surface tension of a liquid with temperature.

8. Discuss the working of an Ostwald Viscometer.

9. Explain the experimental determination of the frequency AC main using a sonometer.

10. Give some essential conditions for good acoustics in a building.

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Describe the determination of Young's modulus of a bar by Koenig's method.

12. Describe Jaegar's method to determine the surface tension of the liquid. Mention the advantages and drawbacks.

13. Define the coefficient of viscosity of a liquid. Derive Poiseuille's formula for the rate of flow of liquid through a capillary tube.

14. Explain the composition of two simple harmonic vibrations of equal time periods acting at right angles.

15. Derive Sabine's reverberation formula and explain its significance.

16. Obtain the relation connecting three moduli of elasticity.

17. What is meant by Piezo-electric effect? Discuss the production of ultrasonic waves using piezo electric method.

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UG–AS–1398 **BMSSA–11/ BMSSA–11C**

U.G. DEGREE EXAMINATION – JULY, 2024.

First Semester

ALLIED MATHEMATICS — I

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. List out the properties of eigen values.

2. Find y_n where $y = \sin^3 x$.

3. Eliminate the constants from $ax + by + cz = 0$.

4. Define fourier series.

5. Write standard form of LPP.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix}$.

   Also find A^{-1}.

7. If $y = m\cos(\log x) + n\sin(\log x)$ then show that $x^2 y_2 + x y_1 + y = 0$.

8. Solve $\frac{\partial^2 z}{\partial x^2} = z$ given that when $x = 0, z = e^y$ and $\frac{\partial z}{\partial x} = e^{-y}$.

9. Find the half range Fourier cosine series for $f(x) = x(\pi - x)$ in the interval $(0, \pi)$.

10. Solve the following problem by graphical method

    Maximize $z = 5x + 8y$

    Subject to constraints

    $3x + 2y \le 36$,

    $x + 2y \le 20$,

    $3x + 4y \le 42$ and $x, y \ge 0$.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Find the eigen value and eigen vector of the matrix $\begin{bmatrix} 5 & 1 & -1 \\ 1 & 3 & -1 \\ -1 & -1 & 3 \end{bmatrix}$.

12. Find the n^{th} differential coefficients of $\frac{x^2}{(x+1)^2(x+2)}$.

13. Solve $(mz - ny)\,p + (nx - lz)\,q = ly - mx$.

14. Find the Fourier series for the function $f(x) = \pi^2 - x^2$ in the interval $-\pi \le x \le \pi$.

15. Solve the following LPP by simplex method.

Maximize $z = 5x_1 + 7x_2$

Subject to constraints

$x_1 + x_2 \le 4$,

$3x_1 + 8x_2 \le 24$,

$10x_1 + 7x_2 \le 35$ and $x_1, x_2 \ge 0$.

16. If $y = \frac{\sinh^{-1} x}{\sqrt{1+x^2}}$ prove that

$(1+x^2)\, y_{n+2} + (2x+3)\, x y_{n+1} + (n+1)^2 y_n = 0$

17. Find the diagonalize of the matrix $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$.

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UG–AS–1399 BPHYS–21

U.G. DEGREE EXAMINATION —
JULY 2024.

Physics

Second Semester

MECHANICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Define linear momentum. State the law of conservation of linear momentum.

2. State and explain parallel axes theorem.

3. What is meant by gravitational field?

4. Define torque. Find the value of torque when the angular momentum is constant.

5. What do you mean centre of mass and centre of gravity?

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks

6. Derive an equation for the velocity of two smooth spheres after direct impact.

7. Explain the reversibility of centers of oscillation and suspension of compound pendulum.

8. Explain Newtonian law of Universal gravitation with examples.

9. What do you understand by torque and angular acceleration? Establish the relation between them.

10. Derive the equation for centre of gravity of a hollow hemisphere.

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 200 words.

All questions carry equal marks.

11. Derive an expression for the loss of kinetic energy due to direct impact between two smooth spheres.

12. Derive an expression for the time period of oscillations of a compound pendulum.

13. Discuss the variation of 'g' with altitude, depth and rotation of the earth.

14. Obtain the expression for acceleration of a body rolling down an inclined plane without slipping.

15. Obtain an expression for the centre of pressure of a rectangular lamina immersed in a liquid with its one side on the liquid surface.

16. State and prove Torricelli's theorem. Explain the working of Venturimeter.

17. Discuss Kepler's laws of gravitation.

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UG-AS–1400 BMSSA-22

U.G. DEGREE EXAMINATION — JULY 2024.

Second Semester

ALLIED MATHEMATICS — II

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Define beta function.

2. Given that $y_0 = 3$, $y_1 = 12$, $y_2 = 81$, $y_3 = 200$, $y_4 = 100$. Find $\Delta^4 y_0$ using the shift operator.

3. Evaluate $\int_0^1 \int_0^2 y^2 x \, dx \, dy$.

4. What is meant by Laplace transform?

5. Define Scatter diagram.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Show that $\int_0^1 x^n (\log x)^m \, dx = \frac{(-1)^m}{(n+1)\,(m+1)} \overline{\Gamma}\,(m+1)$.

7. Evaluate $\int_0^1 x^2 dx$ using trapezoidal rule using four subintervals.

8. Change the order of integration in $\int_0^a \int_x^a (x+y)\,dy\,dx$ and hence evaluate it.

9. Find the value of $L[t \cos 2t]$.

10. Find the Spearman's Rank Correlation coefficient for the following data :

Marks in Mathematics	20	50	28	25	70	90	76	45	30
Marks in Statistics	30	60	50	40	85	90	56	82	42

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Evaluate the value of $\int_0^{2\pi} (\cos^4\theta + \sin^6\theta) d\theta$ using beta function.

12. From the following data find the value of y when $x = 410$.

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.9	21.27

13. Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by using double integration.

14. Using Laplace transform solve the IVP $y'' - 3y' + 2y = 4,\ y(0) = 2,\ y'(0) = 3$.

15. Calculate the correlation coefficient for the data given below :

x	12	9	8	10	11	13	7
y	14	8	6	9	11	12	3

16. Explain in details about type of correlation.

17. Show that the relation between beta and gamma function is $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.

UG-AS–1401 BPHYS-31

U.G. DEGREE EXAMINATION — JULY 2024.

Physics

Third Semester

OPTICS AND SPECTROSCOPY

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. What is chromatic aberration in lenses?

2. Give the important applications of Michelson interferometer.

3. Differentiate Fresnel and Franhofer diffraction.

4. Calculate the thickness of a quarter wave plate for a light of wavelength 594 nm. Given $\mu_e = 1.552$ and $\mu_o = 1.543$.

5. List out the sources of IR radiations used in IR spectrometer.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Explain the construction and working of Huygen's eye piece.

7. Explain the formation of Newton's rings by reflected light.

8. Give the Rayleigh criterion of resolution.

9. Discuss the working of Nicol prism.

10. Write a note on nuclear magnetic resonance spectroscopy.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Explain the spherical aberration in lenses. Describe the methods of reducing spherical aberration.

12. Describe the construction of Jamin's interferometer and explain how it can be used to determine the refractive index of gases.

13. Discuss the method of determining wavelength of light by plane transmission grating.

14. How would you produce and detect

    (a) plane

    (b) circularly and

    (c) elliptically polarized light.

15. What is Raman effect? Discuss the quantum theory Raman effect. Mention its applications.

16. Give the theory of interference in thin wedge shaped thin film. How this can be used to test the optical flatness of the surface?

17. What is optical activity? Define specific rotatory power of the solution. Give Fresnel explanation of optical activity.

UG-AS–1402 BPHYS-32

U.G. DEGREE EXAMINATION — JULY 2024.

Physics

Third Semester

HEAT AND THERMODYNAMICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Write the principle of calorimetry.

2. What is adiabatic demagnetization?

3. Distinguish between conduction and convection.

4. Define mean free path. Write an expression for mean free path.

5. A quantity of dry air at 27°C is compressed slowly to 1/3 of its volume. Find the change in temperature of the air.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Discuss the principle and working of Platinum resistance thermometer.

7. Describe with clear diagram, the method of K.Onne's liquefaction of Helium.

8. Obtain the differential equation of flow of heat along an uniform bar which is heated at one end.

9. Explain Brownian motion and mention its significance.

10. Deduce Specific heat relation, $C_P - C_V = -T\left(\frac{\partial V}{\partial T}\right)_P^2 \left(\frac{\partial p}{\partial v}\right)_T$ from Maxwell's thermodynamic relations.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Describe Jolly's differential steam calorimeter with neat diagram for finding specific heat capacity of a gas at constant volume (C_v).

12. Explain Joule-Kelvin effect. Describe the liquefaction of gases by Linde's method.

13. Discuss the theory of Newton's law of cooling and explain the experimental method to determine the specific heat capacity of a liquid.

14. Derive Van der Waals equation for gases and calculate the theoretical values of the critical constants.

15. Explain the different stages of Carnot's engine with neat diagram and derive an expression for its efficiency.

16. Explain entropy of a substance. Show that the entropy remains constant in a reversible process but increases in an irreversible process.

17. Derive Planck's radiation formula and show that Raleigh Jean's law and Wien's law are special cases of Planck's law.

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UG–AS–1403 BCHESA–31

U.G. DEGREE EXAMINATION – JULY 2024.

Third Semester

Physics

GENERAL CHEMISTRY – I

Time : 3 hours Maximum marks : 70

SECTION A — (3 × 3 = 9 marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. What are the types of chemical bonds?

2. What is electrophilic substitution reaction? Give an example.

3. Define enzyme catalysis with example.

4. List the types of Vitamins and which vitamin deficiency is caused by night blindness?

5. Define Pollution and write its type.

SECTION B — (3 × 7 = 21 marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Write the difference between ionic and covalent bonds.

7. Explain the types of Pericyclic reaction with example.

8. Explain positive and negative catalysts with suitable example.

9. Write short note on carbohydrates.

10. Discuss about Air pollution and its method of control.

SECTION C — (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Write the definition, conditions, effect, properties, types and importance of hydrogen bond.

12. Explain the following reactions with suitable examples: (5+5)

    (a) Claisen rearrangement

    (b) Beckmarm rearrangement

13. Discuss about the types of catalysis with an example.

14. Discuss in detail about the structure of disaccharides and polysaccharides.

15. Write short notes on:

    (a) Water Pollution and its method of control.

    (b) Radioactive pollution and its method of prevention.

16. Classify the vitamins with suitable examples and write their sources and deficiency diseases.

17. Discuss about the following: (5+5)

    (a) Acid — Base catalysis

    (b) Enzyme catalysis

UG-AS–1404 BPHYS-41

U.G. DEGREE EXAMINATION — JULY 2024.

Physics

Fourth Semester

ELECTRICITY AND ELECTROMAGNETISM

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Explain Ampere's circuital law.

2. State Faraday's laws of electrolysis.

3. Mention the uses of eddy current.

4. Compare series and parallel resonance circuits.

5. Write four Maxwell's equations.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. A circular coil has a radius of 0.1 m and a number of turns of 50. Calculate the magnetic induction at a point

   (a) on the axis of the coil and distance 0.2 m from the centre

   (b) at the centre of the coil when a current of 0.1A flows in it.

7. Explain Arrhenius theory of electrolytic dissociation.

8. Derive an expression for the mutual inductance of a pair of co-axial solenoids.

9. Obtain an expression for current in AC circuit containing resistance and capacitance.

10. Explain Hertz experiment for production and detection of electromagnetic waves.

PART C — (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Give the construction of a moving coil ballistic galvanometer. Derive an expression between the quantity of charge flowing through it and the throw obtained.

12. What is thermoelectric diagram? Show how Peltier and Thomson e.m.f.'s neutral temperature and temperature of inversion can all be represented in this diagram.

13. Describe Anderson's bridge method of determining the self inductance of a coil of wire.

14. Obtain an expression for the growth and decay of charge in a circuit having inductance, capacitance and resistance.

15. A plane electromagnetic wave is incident normally at the boundary of two non-conducting media. Discuss the phenomenon of reflection and transmission of waves.

16. Describe a method of measuring thermo emf using potentiometer.

17. What is meant by coefficient of coupling? Obtain an expression for the coefficient of coupling between two coils.

UG-AS–1405 BPHYS-42

U.G. DEGREE EXAMINATION — JULY 2024.

Physics

Fourth Semester

BASIC ELECTRONICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. What is the principle of photo diode? Mention its uses.

2. State the significance of CE amplifier configuration.

3. Explain Barkhausen criterion.

4. How does FET differ from MOSFET?

5. Why the gain of inverting and non-inverting Op-Amp are differ?

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. State and explain Thevenin's theorem.

7. Explain Class A power amplifier.

8. With neat circuit, explain the working of astable multivibrator.

9. Explain the working of UJT as relaxation oscillator.

10. Draw the circuit diagram of Op-Amp integrator and explain its function.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Give the equivalent circuit of Zener diode and explain its characteristics. Explain zener diode voltage regulator.

12. Analyse a CE amplifier using h-parameters and find expressions for input impedance, output impedance, current gain, voltage gain and power gain.

13. Describe the function of Wien's bridge oscillator with suitable diagram. Obtain the expression for its oscillation condition and frequency of oscillation.

14. Explain the V-I characteristics of SCR. How SCR can be used as switch?

15. Draw the circuit diagram of an Op-Amp square wave generator and explain its action.

16. Explain the construction and working of RC coupled amplifier.

17. Explain the principle and working of LED. Mention the advantages and disadvantages of LED. What are the important applications of LED?

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UG-AS-1406 BCHESA–42

U.G. DEGREE EXAMINATION — JULY 2024

Chemistry

Fourth Semester

GENERAL CHEMISTRY – II

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Find the normality of a solution which contains 0.4 g of sodium hydroxide in 100 mL

2. Define the term solute and solvent.

3. Give the preparation and applications of Teflon.

4. What are antimalarial drugs? Give examples.

5. What is fume disposal?

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Explain the principles and applications of volumetric analysis.

7. Mention the applications of thin-layer chromatography.

8. Account on the vulcanization of rubber.

9. What are Antibiotics? List out the uses of Penicillin, streptomycin and tetracycline.

10. Enumerate the steps to be handled white using Poisonous and Inflammable chemicals.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. (a) Calculate the percent volume of solvent if 10 ml of solute is dissolved in a solvent of 120 ml.

(b) Write the basic requirements of primary and secondary standards. (5+5)

12. Elaborate on the Fractional distillation and steam distillation with a neat diagram.

13. (a) Differentiate Addition and Condensation Polymers.

    (b) Discuss the preparation and properties of Buna-S- rubber. (5+5)

14. What is hormone? Discuss the general functions of it. Give an account on reproductive hormones.

15. Explain in detail about the precautions to be avoided in lab accidents.

16. (a) Find the equivalent weight of NaOH, $NaHCO_3$, $KMNnO_4$ and $CuSO_4$. $5H_2O$.

    (b) Discuss the role of indicators in titrations. (6+4)

17. Explain the Sublimation and crystallisation techniques with a neat diagram.

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UG–AS–1407 BPHYS–51

U.G. DEGREE EXAMINATION – JULY, 2024.

Physics

Fifth Semester

ATOMIC PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

1. State Hall Effect.

2. What is principle of electron microscope? Mention its uses.

3. Define reduced mass of the electron.

4. What is Stark Effect?

5. State Moseley's law and its importance.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

6. Sodium metal with a bcc structure has two atoms per unit cell. The radius of the sodium atom is 1.85 Å. Calculate its electrical resistivity at 0°C. If the classical value of mean free time at this temperature is 3×10^{-14} s.

7. Describe Thomson's parobola method to measure the specific charge of positive ions.

8. Discuss the spectral series of hydrogen atom and represent the energy level diagrams.

9. Discuss j-j coupling and l – s coupling in detail.

10. List out the applications of photoelectric cells.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

11. Describe Electrical and Thermal conductivity of Metals and deduce Widemann Franz law.

12. Enumerate the construction and working of Aston's Mass Spectrograph and show how it can be used in the detection of isotopes.

13. Enumerate the vector model of the atom and discuss the different quantum numbers associated with it.

14. Describe the principle and theory of Stern Gerlach experiment.

15. Give an account on the theory of Compton effect. Describe the experimental verification to determine the Compton shift.

16. Describe in detail the powder crystal method of determining crystal structures.

17. Deduce the expression for Zeeman shift with theoretical explanations and Illustrate the experimental arrangement to study the Zeeman effect.

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UG–AS–1408 BPHYS–52

U.G. DEGREE EXAMINATION – JULY 2024.

Physics

Fifth Semester

RELATIVITY AND QUANTUM MECHANICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

1. What is a frame of reference?

2. What will be the momentum of the incident photon for the light of frequency 'γ'?

3. What is normalized wave function?

4. What are the applications of angular Momentum of electrons

5. What is Rigid Rotator?

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 100 words.

6. Derive the expression for variation of mass with velocity.

7. Describe the construction and working of G. P. Thomson's Experiment.

8. Briefly explain the basic postulates of quantum mechanics. What is the purpose of these postulates?

9. Derive the expression for Pauli spin Matrices.

10. Derive the expression for energy eigen values of the rigid rotator.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

11. Derive an expression for the Michelson - Morley experiment.

12. Discuss in detail about the physical origin of the uncertainty principle.

13. Derive the time-independent Schrödinger equation for a particle moving in a free field.

14. Prove that the linear operators are of prime interest in the mathematical formulation of quantum theory. Justify your answer.

15. Describe the Schrödinger Equation in 3D.

16. Discuss Schrödinger equation for a rigid rotator with free-axis with relevant examples.

17. Briefly explain the linear harmonic oscillator and tunnel effect in quantum mechanics giving appropriate examples.

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UG-AS-1409 BPHYS-53

U.G. DEGREE EXAMINATION –
JULY 2024.

Physics

Fifth Semester

DIGITAL ELECTRONICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words

1. Convert $(2AB.9)_H$ to Octal.

2. What is shift register and its types?

3. Define Extraterrestrial Noise.

4. What is meant by ASK?

5. What is the use of cladding?

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words

6. Explain AND Gate with Transistor circuit.

7. Describe the working Synchronous Counters.

8. What is noise figure, explain with examples?

9. Draw and explain the block diagram of BPSK demodulator.

10. A step-index fiber has a core index of refraction of $n_1 = 1.425$. The cut-off angle for light entering the fiber from air is found to be 8.50. What is the numerical aperture of the fiber?

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words

11. Minimise the following Boolean function

F(A, B, C, D) = $\sum_m (0,1,2,5,7,8,9,10,13,15)$.

12. Explain parallel in serial out and parallel in parallel out Shift Register.

13. Discuss FM Demodulation Basics and Explain types of FM demodulator.

14. Discuss in detail about Telemetry In Various Fields and Their Applications.

15. Discuss Various Losses and distortion in Optical fibre and its special Applications.

16. Describe the operation of 4 bit SIPO and SISO shift register with the help of block diagram, truth table and timing diagram.

17. Explain asynchronous up/down counter.

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UG–AS–1410 BPHYS–54

U.G. DEGREE EXAMINATION —
JULY 2024.

Physics

Fifth Semester

MATHEMATICAL METHODS

Time : 3 hours Maximum marks : 70

SECTION A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

1. What is absolute and relative Errors?

2. Obtain the solution of the following linear simultaneous equations by the matrix inversion method.

$$\begin{bmatrix} 1 & 3 \\ 4 & -1 \end{bmatrix} \begin{bmatrix} \chi_1 \\ \chi_2 \end{bmatrix} = \begin{bmatrix} 15 \\ 12 \end{bmatrix}$$

3. Using the data $\sin(0.1)=0.09983$ and $\sin(0.2)=0.19867$, find an approximate value of $\sin(0.15)$ by Lagrange interpolation.

4. Write Newton's Forward and backward difference formula.

5. Write *Eulers mid-point method.*

SECTION B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 100 words.

6. Determine the maximum relative error for the function $F=3x^2y^2+5y^2z^2-7x^2z^2+38$.

   For $x=y=z=1$ and $\Delta x=-0.05, \Delta y=0.001$ and $\Delta z=0.02$.

7. Use Gauss Jordon elimination to solve the system

$$2x+4y-6z=-4$$
$$x+5y+3z=10$$
$$x+3y+2z=5$$

8. Discuss Lagrange's linear interpolation polynomial.

9. Discuss Simpson's 1/3-Rule.

10. Use Taylor's series method to solve the equation $\frac{dy}{dx} = 3x + y^2$ to approximate y when $x = 0.1$, given that $y = 1$ when $x = 0$.

SECTION C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven in 500 words.

11. Using Newton-Raphson method, find the root between 0 and 1 of $x^3 - 6x + 4 = 0$ correct to five decimal places.

12. Explain Gauss Elimination method and solve the following system

$3x + 2y + z = 11$

$2x + 3y + z = 13$

$x + y + 4z = 12$

13. Example: Use Richardson extrapolation to evaluate the integral $\int_0^{1.2} e^x \, dx$.

14. Evaluate the integral $\int_0^{1.2} e^x \, dx$, taking six intervals by using trapezoidal rule up to three significant figures.

15. Compute $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at the point $x = 0.2$ using Stirling's formula for the data given in the following table.

x	0	0.1	0.2	0.3	0.4	0.5
y	0	0.10017	0.20134	0.30452	0.41076	0.52115

16. Given $y' = x^3 + y, y(0) = 2$, compute $y(0.2), y(0.4)$ and $y(0.6)$ using the Runge-Kutta method of fourth order.

17. Using the Adams — Bashforth predictor-corrector equations, evaluate $y(1.4)$, if y satisfies.

$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$ and $y(1)=1, y(1.1)=0.996, y(1.2)=0.986,$ $y(1.3)=0.972$.

UG-AS-1411 BPHYSE–51A

U.G. DEGREE EXAMINATION — JULY 2024

Physics

Fifth Semester

ENERGY PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Write a note on India's production and reserves of energy sources.

2. Give basic principles of liquid flat plate collector.

3. State the photovoltaic principle.

4. Enlist the biomass classification.

5. List out the advantages of battery for bulk energy storage.

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Enlist the merits and demerits of conventional and non-conventional energy applications.

7. Elaborate the solar disinfection and solar drying.

8. Write the notes on
   (a) PV powered fan, and
   (b) PV powered area

9. List out the advantages and disadvantages of bio-gas from plant wastes.

10. Give brief account of
   (a) Energy and power from waves, and
   (b) Energy storage

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Give a detailed account on conventional and non-conventional sources of energy.

12. Explain the construction and working of Solar cooker (box type).

13. (a) Write a short note on types of solar cells

(b) Enlist the application of solar photovoltaic systems.

14. Discuss the

(a) Biomass conversion technologies

(b) Bio-gas generation

15. Write the brief account about:

(a) Classification and description of wind machines, wind energy collectors,

(b) Energy from oceans and chemical energy resources

16. Explain the solar radiations

(a) Outside earth's atmosphere,

(b) At the earth surface and

(c) On tilted surfaces

17. Elaborate the thermal gasification of biomass and working of downdraft gasifier.

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UG–AS–1412 BPHYSE–51B

U.G. DEGREE EXAMINATION –
JULY, 2024.

Physics

Fifth Semester

PROBLEMS SOLVING SKILLS IN PHYSICS

Time : 3 hours Maximum marks : 70

SECTION A — (3 × 3 = 9 marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Calculate the net force required to give an automobile of mass 1600 kg an acceleration of 4.5 m/s^2.

2. The number density of gas atoms at a certain location in the space above our planet is about 1.00×10^{11} m^{-3}, and the pressure is 2.75×10^{-10}N/m in this space. What is the temperature there?

3. Define electrostatics. Mention its uses.

4. Give fundamental principles of quantum mechanics.

5. What do you mean by elasticity? Give its applications.

SECTION B — (3 × 7 = 21 marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Suppose a bike with a rider on it having a total mass of 63 kg brakes and reduces its velocity from 8.5 m/s to 0 m/s in 3.0 seconds. What is the magnitude of the braking force?

7. (a) What is the change in entropy if you start with 10 coins in the 5 heads and 5 tails macrostate, toss them, and get 2 heads and 8 tails?

   (b) How much more likely is 5 heads and 5 tails than 2 heads and 8 tails?

   (c) If you were betting on 2 heads and 8 tails would you accept odds of 252 to 45? Explain why or why not.

8. Write the notes on

   (a) Poynting vector, and

   (b) Electromagnetic waves.

9. Give a brief account of surface tension and its applications.

10. Give brief account of plotting the graphs for various elementary and composite functions.

SECTION C — (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. (a) There are cars with masses 4 kg and 10 kg respectively that are at rest. The car having the mass 10 kg moves towards the east with a velocity of 5 $m.s^{-1}$. Find the velocity of the car with mass 4 kg with respect to ground.

(b) Find the velocity of a bullet of mass 5 grams which is fired from a pistol of mass 1.5 kg. The recoil velocity of the pistol is 1.5 $m.s^{-1}$.

12. (a) In the planet Mars, the average temperature is around –53° C and atmospheric pressure is 0.9 kPa. Calculate the number of moles of the molecules in unit volume in the planet Mars? Is this greater than that in earth?

(b) A man starts bicycling in the morning at a temperature around 25°C, he checked the pressure of tire which is equal to be 500 kPa. Afternoon he found that the absolute pressure in the tyre is increased to 520 kPa. By assuming the expansion of tyre is negligible, what is the temperature of tyre at afternoon?

13. Describe the calculation of magnetic quantities for various configuration.

14. Discuss the harmonic oscillator problem in detail.

15. Write the brief account about:

    (a) Waves and oscillations,

    (b) Errors and propagation of errors.

16. Explain the Kinetic theory and Maxwell-Boltzmann distribution.

17. State and explain the Bernoulli's theorem in detail.

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UG–AS–1413 BPHYS-61

U.G. DEGREE EXAMINATION —
JULY 2024.

Physics

Sixth Semester

SOLID STATE PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of five questions in 100 words.

All questions carry equal marks.

1. Explain ionic and covalent bonds.

2. What is a primitive cell of a crystal? List the classes of crystal system.

3. What is diamagnetic material? Give an example.

4. Define dielectric polarization.

5. What is type-I superconductor? Give examples.

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of five questions in 200 words.

All questions carry equal marks.

6. What is hydrogen bond? Give the properties of hydrogen bond.

7. Explain the structure of sodium chloride.

8. Write a note on ferromagnetism.

9. Discuss electronic and ionic polarizabilities.

10. Give the applications of superconductors.

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words. All questions carry equal marks

All questions carry equal marks.

11. Obtain the Madelung constant for sodium chloride.

12. Show that the FCC structure is more closely packed than a BCC structure.

13. Describe the Weiss theory of paramagnetism.

14. Explain in detail the frequency and temperature effect on polarization.

15. Mention the types of superconductors. Explain about soft superconductor. Give the applications of superconductors.

16. Describe the 14 types of Bravais lattices in 3 dimensions with suitable diagrams.

17. Discuss the classical theory of diamagnetism.

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UG–AS-1414 BPHYS–62

U.G. DEGREE EXAMINATION — JULY 2024.

Physics

Sixth Semester

NUCLEAR PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Write the significance of binding energy.

2. Write short note on carbon dating and its uses.

3. Obtain Q-value equation of a nuclear reaction.

4. What are properties of neutron sources?

5. What are primary and secondary cosmic rays?

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words

All questions carry equal marks.

6. Explain the features of meson theory of nuclear forces.

7. Compare the properties of Beta and Gamma rays.

8. With theory of nuclear fusion, explain the structure and function of hydrogen bomb.

9. Describe the principle and working of synchrocyclotron.

10. Write about the latitude and altitude effect of cosmic rays.

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. What are characteristics of nuclear forces? Write about the theory of low energy neutron-proton scattering.

12. What are fundamental laws of radioactivity? Discuss the features of Gamow's theory of alpha decay.

13. What is nuclear fission? Explain the various parts of nuclear reactor with suitable diagram.

14. Explain the principle and working of GM counter. What are its advantages?

15. What is nature of cosmic rays? Explain the longitudinal and north-south effect of cosmic rays.

16. Explain the kinematics and types of nuclear reactions with examples.

17. Classify the elementary particles with its quantum numbers.

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UG–AS–1415 BPHYSE-62A

U.G. DEGREE EXAMINATION —
JULY 2024.

Physics

Sixth Semester

NANO PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of five questions in 100 words.

All questions carry equal marks.

1. Explain the lotus effect.

2. Write a note on quantum wire.

3. Briefly explain the use of ion beam in understanding nanostructures.

4. Appreciate powder crystal X-ray diffraction method.

5. Appraise the function of a FED.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of five questions in 200 words.

All questions carry equal marks.

6. Define Bohr exciton radius. Explain quantum confinement.

7. What are semiconductor nanocomposites? Give some applications.

8. Explain sol-gel processing and give the factors affecting it.

9. Discuss the radiative and non-radiative relaxation in lines of photoluminescence spectroscopy.

10. Examine the applications of nanocoating in anti-corrosion and anti-bacterial applications.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Discuss size dependent properties of nano materials by virtue of optical, electrical and magnetic behaviour of materials.

12. Describe the classification of nanomaterials on the basis of dimensions. Explain.

13. Elaborate the chemical vapour deposition method.

14. Discuss the construction and working of Transmission electron microscope.

15. Assess the use of nanotechnology in the field of medicine.

16. Describe the core-shell semiconducting nanocrystals. Hence write a note on magnetic nanoparticles.

17. With a neat diagram explain the working of UV-Vis spectrophotometer. Give its strengths and limitations.

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UG-AS-1416 BPHYSE-62B

U.G. DEGREE EXAMINATION –
JULY, 2024.

Physics

Sixth Semester

LASER PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words

All questions carry equal marks

1. What is LASER? How does it differ from ordinary light?

2. What do you mean by line shape function? How is it normalized?

3. Give the advantages of dye laser.

4. Mention the types of holograms. Write any two applications.

5. Explain any three uses of LIDAR.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words

All questions carry equal marks

6. Differentiate spontaneous and stimulated emission.

7. What is coherence? Explain temporal coherence.

8. Explain the characteristics of CO_2 laser.

9. Compare the advantages and disadvantages of a semi-conductor laser over LED's.

10. Write a note on laser ablations.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words

All questions carry equal marks

11. What is an optical resonator? Discuss the action of an optical resonator.

12. Explain

    (a) directionality

    (b) high intensity

    (c) monochromaticity of a laser beam.

13. Describe the construction and working of He-Ne laser with necessary diagram.

14. Elaborate the functioning of a semiconductor diode laser.

15. Discuss the application of laser for the treatment of cancer.

16. Explain different types of pumping techniques in different types of lasers.

17. Describe the construction and working of H-F laser. Give some applications.