

P.R. Government College (A), Kakinada.

I B.Sc., Physics-Semester-I Paper – I

W.e.f. 2019-20 ADMITTED BATCH

MECHANICS

Course Code: PH1202
4 Hours/Week

No. of credits: 03
Total hours: 60 hrs

Module – 1 Vector Analysis (8):

Scalar and vector fields, gradient of a scalar field and its physical significance (L). Divergence of vector field and its physical significance (L). Curl of a vector field and its physical significance (L). Vector related problems. Vector integration- line, surface and volume integrals. Stokes, Gauss and Greens theorems (Statements only) (L).

Module – 2 Mechanics of Particles(10)

Laws of motion, motion of variable mass system (L), motion of a rocket, multi-stage rocket(S), conservation of energy and momentum (L). Collisions in two and three dimensions (L), concept of impact parameter, Rutherford scattering angle - derivation (L)

Module – 3 Mechanics of rigid bodies(10)

Definition of Rigid body (L), rotational kinematic relations (L), equation of motion for a rotating body (T), angular momentum and inertial tensor (L). Euler's equation (T), Gyroscope(S), precession of the equinoxes (L)

Module – 4 Mechanics of continuous media(10)

Elastic constants of isotropic solids and their relations (L), Poisson's ratio and expression for Poisson's ratio in terms of ν , n , k (T). Classification of beams (P), cantilever with an end load (L) – Torsional oscillations – determination of rigidity modulus by torsional pendulum (T) (Disc method)

Module – 5 Central forces(12)

Central forces – definition and examples(L), conservative nature of central forces(L), conservative force as a negative gradient of potential energy(T), equation of motion under a central force(T), gravitational potential and gravitational field, motion under inverse square law(S), derivation of Kepler's laws(T). Geo stationary satellite , motion of the satellite.

Module – 6 Special theory of relativity (10)

Galilean relativity (L), absolute frames, Michelson-Morley experiment(S), Postulates of special theory of relativity(S). Lorentz transformations, time dilation, length contraction, mass-energy relation (T).

Textbooks

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **Waves and Oscillations**. S. Badami, V. Balasubramanian and K. Rama Reddy *Orient Longman*.
4. **First Year Physics - Telugu Academy**.
5. **Mechanics of Particles, Waves and Oscillations**. Anwar Kamal, *New Age International*.
6. **College Physics-I**. T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*.
7. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
8. **Waves and Oscillations**. N. Subramaniam and Brijlal *Vikas Publishing House Private Limited*.

Reference Books

1. Physics Halliday & Resnick
2. Properties of Matter D.S.Mathur
3. Lectures on Physics Richard Feynmann
4. University Physics Zemansky
5. Mechanics Berkley Series
6. Mechanics, waves and oscillations S.L. Gupta and Sanjeev gupta
7. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company Edition, 2008*.
8. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.
9. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition*.
10. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
11. **Mechanics**. Hans & Puri. *TMH Publications*.
12. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
13. **Mechanics** by D.S Mathur.

Physics Board of Studies

I B.Sc., Semester – I (Model paper) PHYSICS - Paper 1 (MECHANICS)

Course Code: PH1202

No. of credits: 03

W.e.f. 2019-20 ADMITTED BATCH

Note: - Set the question paper as per the blue print given at the end of this model paper.

Time: $2\frac{1}{2}$ Hours

Max Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	-	1	1	10
II	1	1	-	15
III	1	1	-	15
IV	1	1	1	20
V	1	1	-	15
VI	1	1	1	20
Total Marks				95

Note: At least ONE problem should be answered.

SUBJECT: PHYSICS

QUESTION BANK

PAPER: I

SEMESTER: I

MECHANICS

UNIT - I (VECTOR ANALYSIS)

Short Questions - 5M

1. What is divergence of a vector field? Explain its physical significance.
2. What is curl of a vector field? Explain its physical significance?
3. Explain gradient of a scalar field and its physical significance.
4. What are line, surface and volume integrals?
5. State Gauss, Greens and Stokes theorems?

Problems - 5M

6. If $A=2xi+2yj+3zk$, find curl A?
7. If $A= iy^2+ j(x+y) + k (yz+zx)$ then find diva at (1,-1, 1)?
8. Find the value of curl ($\mathbf{a} \times \mathbf{r}$), where a is a constant vector?
9. Obtain the values of (i) curl grad ϕ (ii) div curl A?
10. If $A= iy+ j(x^2+y^2) + k (yz +zx)$ then find curl A at point (2, 2,-2).

UNIT – II (MECHANICS OF PARTICLES)

Essay Questions - 10M

11. Derive an expression for Rutherford's scattering angle.
12. State Newton's laws. Derive the equation of motion of variable mass system?
13. Explain the motion of a rocket under constant gravitational field.

Short Questions – 5 M

14. Explain the multistage Rocket?
15. Derive the equation for the final velocities of particles in two dimensional elastic collision
16. Write a note on impact parameter?
17. State and prove the conservation of angular momentum.

UNIT – III (MECHANICS OF RIGID BODIES)

Essay Questions - 10M

18. What is rigid body? Derive Euler's equations for a rigid body?
19. Define rigid body. Obtain rotational kinematic relations of rigid body..

Short Questions - 5M

20. Obtain the equation of motion for a rotating body.
21. Explain the principle and working of a Gyroscope.
22. Write a short notes on inertia tensor.
23. Write a note on precession of Equinoxes.

UNIT - VI (MECHANICS OF CONTINUOUS MEDIA)

Essay questions - 10M

24. Define three moduli of elasticity and obtain the relation between them.
25. What is cantilever. Obtain the expression for the depression at the loaded end of cantilever.

Short Questions – 5 M

26. Classify different types of beams.
27. How can you determine the Rigidity Modulus of a wire by using Torsion pendulum method?

Problems - 5M

28. Calculate Poisson's ratio for silver, given its young's modulus $7.25 \times 10^{10} \text{ N/m}^2$ and bulk modulus $11 \times 10^{10} \text{ N/m}^2$
29. The young's modulus for steel is $Y = 2 \times 10^{11} \text{ N/m}^2$ and its rigidity modulus $10 \times 10^{10} \text{ N/m}^2$. find the poisson's ratio and its bulk modulus.

UNIT – V (CENTRAL FORCES)

Essay questions - 10M

30. What are central forces? "Show that the central force is conservative"
31. State and prove Kepler's first law of planetary motion?
32. State and prove Kepler's second and third laws of planetary motion?

Short Questions – 5M

30. Show that conservative force is equivalent to negative gradient of potential energy.
31. Derive equation of motion under central force?
32. What are satellites? Discuss the motion of satellite and derive expression for velocity.
33. Write a note on geo stationary satellite.

UNIT – VI (SPECIAL THEORY OF RELATIVITY)

Essay Questions - 10M

34. Describe Michelson-Morley experiment and explain the physical significance of negative results
35. State the Postulates of Special theory of Relativity. Derive Einstein's Mass Energy equivalence relation.
36. What is relativity? Derive Lorentz transformation equations?

Short Questions – 5M

37. Write about Galilean relativity
38. Explain Length Contraction.
39. Explain time dilation.

Problems - 5M

40. Calculate the velocity of the rod, when its length will appear 90% of its proper length.
41. A particle of mass M_0 is moving with a velocity $0.9C$. Calculate its relativistic mass.
42. Find the mass of Electron moving with a velocity 10^{10} cm/sec . The rest mass of the electron is $9.1 \times 10^{-31} \text{ Kg}$.
43. The total energy of a particle is exactly twice its rest energy. Find its speed.