

B A, B SC, B COM DEGREE END SEMESTER EXAMINATION - NOVEMBER 2025**UGP (HONS.) SEMESTER - 1: DISCIPLINE SPECIFIC COURSE****COURSE: 24UPHYDSC101 - FOUNDATIONS OF PHYSICS***(Regular 2025 Admission & Improvement/Supplementary 2024 Admission)*

Time : 1.5 Hours

Max. Marks: 50

PART A (Short Answers)**2 marks each - Answer any 10 questions**

1. Compute the cross product of $\mathbf{A} = \hat{i} + 2\hat{j} - \hat{k}$ and $\mathbf{B} = 2\hat{i} - \hat{j} + 3\hat{k}$. (CO1,2 E)
2. Express velocity and acceleration as derivatives of displacement. (CO3 M)
3. Define centripetal acceleration in the context of circular motion. (CO3 M)
4. Can two vectors in the xy-plane have different magnitudes and same components? Justify. (CO1,2 H)
5. Name the physical principle used by magicians to keep objects stationary while quickly removing a supporting sheet. (CO3 E)
6. Define relative velocity in two dimensions with an example. (CO3 M)
7. What is the mass of a 0.8 kg object on the moon where gravity is 1.63 m/s^2 ? (CO3 M)
8. State Newton's third law of motion with an everyday example. (CO4 E)
9. Given potential energy $U(x) = 8x^4$, determine the force acting on the particle as a function of x . (CO4 M)
10. A 10 g bullet travels at 300 m/s and stops after penetrating a wooden board of thickness 4 cm. Calculate the average stopping force. (CO4 M)
11. Write a Python program to check whether a given number is even or odd. (CO5 E)
12. Write a Python code snippet that takes the user's name and age and prints:
"Hello [name] you are [age] years old."
(CO5 M)

(2 x 10 = 20)

PART B (Short Essays or Problems)

5 marks each - Answer any 6 questions

13. A particle's position along x is given by $x = 2t^3 - 9t^2 + 12t$ (x in meters and t in seconds).
(a) Find $v(t)$ and $a(t)$. (b) At what time is the particle momentarily at rest? (CO1,2,3 E)
14. Vector G has a magnitude of 6.00 N and makes an angle of 30° with the x-axis.
Find G_x and G_y . (CO2 M)
15. Explain the principle of free fall and describe the velocity-time relationship for a falling object. (CO3 M)
16. Four objects move along the x-axis during 1 hour:
- P moves 40 km east.
 - Q moves 60 km west.
 - R moves 70 km east, then 20 km west.
 - S moves 30 km west, then 30 km east.
- (a) Rank their average velocities.
(b) Identify which have the same velocity.
(c) Which have zero average velocity? (CO3 E)
17. Discuss whether a spring balance can measure mass in orbit around Earth. (CO3 E)
18. A system has two masses, 4 kg and 1 kg, connected by a string. A force of 10 N pulls the 1 kg mass. With an acceleration of 2 m/s^2 , find the string's tension. (CO4 M)
19. A block of mass 1.5 kg slides across a surface where the resistive force is $F_r = -0.8/x \text{ J}$ from $x = 0.2 \text{ m}$ to $x = 1.2 \text{ m}$. Calculate the final kinetic energy. (CO4 M)
20. Write a Python program that prints numbers from 1 to 50 and their cubes. (CO5 E)
- (5 x 6 = 30)**