

PART 1 - PHYSICS

Topic : Gravitation

SECTION-A : (Maximum Marks : 8)

This section contains **TWO** questions.

Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.

For each question, choose the option corresponding to the correct answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

1. Consider a star of mass m_2 kg revolving in a circular orbit around another star of mass m_1 kg with $m_1 \gg m_2$. The heavier star slowly acquires mass from the lighter star at a constant rate of γ kg/s. In this transfer process, there is no other loss of mass. If the separation between the centers of the stars is r , then its relative rate of change $\frac{1}{r} \frac{dr}{dt}$ (in s^{-1}) is given by:

[JEE Advanced 2025 Paper 2]

- (A) $-\frac{3\gamma}{2m_2}$ (B) $-\frac{2\gamma}{m_2}$ (C) $-\frac{2\gamma}{m_1}$ (D) $-\frac{3\gamma}{2m_1}$

Scan or tap for the
full solution



2. A particle of mass m is under the influence of the gravitational field of a body of mass M ($\gg m$). The particle is moving in a circular orbit of radius r_0 with time period T_0 around the mass M . Then, the particle is subjected to an additional central force, corresponding to the potential energy $V_c(r) = m\alpha/r^3$, where α is a positive constant of suitable dimensions and r is the distance from the center of the orbit. If the particle moves in the same circular orbit of radius r_0 in the combined gravitational potential due to M and $V_c(r)$, but with a new time period T_1 , then $(T_1^2 - T_0^2)/T_1^2$ is given by

[G is the gravitational constant.]

[JEE Advanced 2024 Paper 2]

- (A) $\frac{3\alpha}{GM r_0^2}$ (B) $\frac{\alpha}{2GM r_0^2}$ (C) $\frac{\alpha}{GM r_0^2}$ (D) $\frac{2\alpha}{GM r_0^2}$

Scan or tap for the
full solution



Space for Rough Work

SECTION-B : (Maximum Marks : 4)

This section contains **ONE** question.

The answer to each question is a **NUMERICAL VALUE**.

For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct answer is entered;

Zero Marks : 0 In all other cases.

3. A geostationary satellite above the equator is orbiting around the earth at a fixed distance r_1 from the center of the earth. A second satellite is orbiting in the equatorial plane in the opposite direction to the earth's rotation, at a distance r_2 from the center of the earth, such that $r_1 = 1.21 r_2$. The time period of the second satellite as measured from the geostationary satellite is $\frac{24}{p}$ hours. The value of p is ____ [JEE Advanced 2025 Paper 2]

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Space for Rough Work

JEE ADVANCED GRAVITATION — EARTH
SATELLITES AND ORBITAL VELOCITY — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A																											
Ques.	1	2																									
Ans.	B	A																									

SECTION-B													
Ques.	3												
Ans.	2.3 to 2.4												