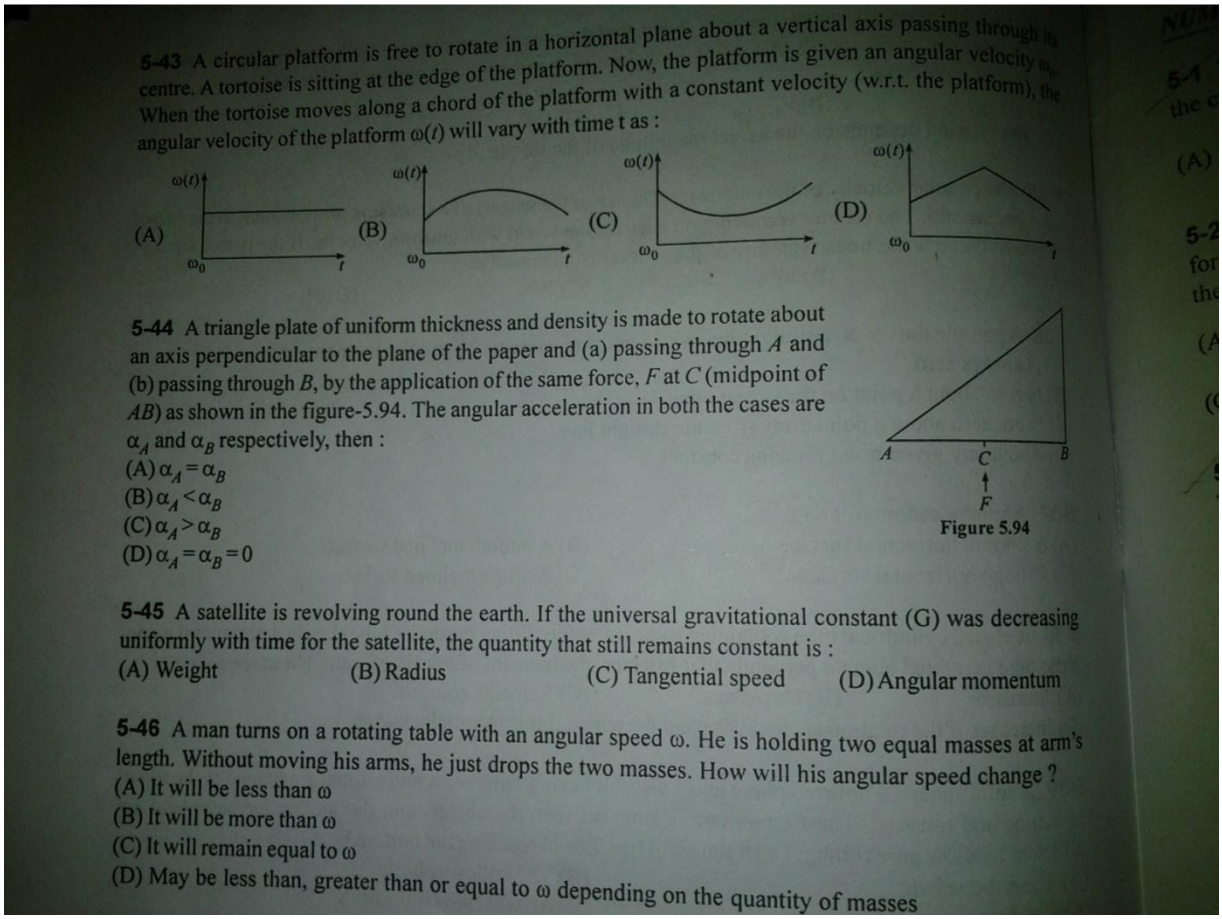
Answer on Question#56551 - Physics - Mechanics - Relativity



5-43 A circular platform is free to rotate in a horizontal plane about a vertical axis passing through its centre. A tortoise is sitting at the edge of the platform. Now, the platform is given an angular velocity ω_0. When the tortoise moves along a chord of the platform with a constant velocity (w.r.t. the platform), the angular velocity of the platform $\omega(t)$ will vary with time t as :

(A) (B) (C) (D)

5-44 A triangle plate of uniform thickness and density is made to rotate about an axis perpendicular to the plane of the paper and (a) passing through A and (b) passing through B, by the application of the same force, F at C (midpoint of AB) as shown in the figure-5.94. The angular acceleration in both the cases are α_A and α_B respectively, then :

(A) $\alpha_A = \alpha_B$
(B) $\alpha_A < \alpha_B$
(C) $\alpha_A > \alpha_B$
(D) $\alpha_A = \alpha_B = 0$

Figure 5.94

5-45 A satellite is revolving round the earth. If the universal gravitational constant (G) was decreasing uniformly with time for the satellite, the quantity that still remains constant is :

(A) Weight (B) Radius (C) Tangential speed (D) Angular momentum

5-46 A man turns on a rotating table with an angular speed ω. He is holding two equal masses at arm's length. Without moving his arms, he just drops the two masses. How will his angular speed change ?

(A) It will be less than ω
(B) It will be more than ω
(C) It will remain equal to ω
(D) May be less than, greater than or equal to ω depending on the quantity of masses

Solution:

(43) Since the angular momentum of the system is conserved, the angular velocity of the platform should first smoothly increase (until the tortoise reaches the center of the chord) and then smoothly decrease. It means that the variant (B) is the most preferable one.

(44) From the shape of this triangle it's easy to notice that the point A is closer to the center of mass than the point B. Therefore, according to the parallel axis theorem the moment of inertia about point A is greater than the momentum of inertia about point B. Thus it is harder to rotate this triangle about point A than about point B and hence $\alpha_A < \alpha_B$.

(45) Since there is no any torque acting on the satellite, the angular momentum is conserved.

Answer:

(43) (B)
(44) (B)
(45) (D)