

## Question

A double star system consists of two stars A and B which have time periods  $T_A$  and  $T_B$ . Radius  $R_A$  and  $R_B$  and mass  $M_A$  and  $M_B$ , choose the correct answer, \_\_\_\_\_

**A**  $(T_A/T_B)^2 = (R_A/R_B)^3$

**B** If  $T_A > T_B$  then  $R_A > R_B$

**C**  $T_A = T_B$

**D**  $T_A > T_B$  then  $M_A > M_B$

## Solution

Correct option is

C)

$$M_1 R_1 = M_2 R_2 \quad \text{---(1)}$$

Force acting on both stars, i.e, gravitational force and centripetal forces are balanced .

$$\therefore \frac{GM_1 M_2}{R^2} = \frac{M_1 V_1^2}{R_1} = \frac{M_2 V_2^2}{R_2} \quad \text{--- (2)}$$

Now substitute,  $V_1 = \frac{2\pi R_1}{T_1}$ ,  $V_2 = \frac{2\pi R_2}{T_2}$  in

equation(2) after simplification we get  $\therefore$

$$\frac{M_1 R_1}{T_1^2} = \frac{M_2 R_2}{T_2^2}$$

$$\Rightarrow T_1 = T_2$$