QUES 04:-

If the mass of sun were ten times smaller and gravitational constant G were ten times larger in magnitudes-

i. walking on the ground would become more difficult.
ii. the acceleration due to gravity on earth will not change.
iii. raindrops will fall much faster.
iv. airplanes will have to travel much faster.

Sol. Given:

New gravitational constant G' = 10G

M_s' = Ms/10

Gravitational field due to earth is given by

$g' = \frac{G'M_{earth}}{R^2} = \frac{10GM_{earth}}{R^2}$ = 10 g

Force on the man due to sun

F = G$\frac{M_s'm}{r^2} = \frac{GMm}{10r^2}$

Where r = distance between the centre of the sun and man

since r >> R the effect due to sun can be neglected and the gravity pull will increase. Due to it walking on the ground can be difficult.

As the acceleration due to gravity g increases, the raindrops fall much faster than usual

Also, aeroplanes will have to travel much faster to overcome the increased gravitational pull of the earth