Q. 15. (i) $\frac{u^2 \sin^2 \alpha}{2g} = 3.6 \ldots . (1)$

$\frac{2u^2 \sin\alpha \cos\alpha}{g} = 19.2 \ldots . (2)$

Dividing (1) by (2)

$\Rightarrow \frac{\tan \alpha}{4} = \frac{3}{16}$

$\Rightarrow \tan\alpha = \frac{3}{4}$

$\Rightarrow \sin\alpha = \frac{3}{5}$

Putting this result into (1) gives

$\frac{u^2\left(\frac{9}{25}\right)}{19.6} = 3.6$

$\Rightarrow u^2 = 196$

$\Rightarrow u = 14$ m/s

(ii) $R_{max} = \frac{u^2}{g}$

$= \frac{196}{9.8} = 20$ m

Q. 16. (i) 30°, 150°

(ii) $R = \frac{u^2 \sin 2\alpha}{g}$

$= 40$

$\Rightarrow \frac{784 \sin 2\alpha}{9.8} = 40$

$\Rightarrow \sin 2\alpha = \frac{1}{2}$

$\Rightarrow 2\alpha = 30°$ **OR** $150°$

$\Rightarrow \alpha = 15°$ **OR** $75°$

Q. 17. $H = \frac{u^2 \sin^2 \alpha}{2g}$

$\Rightarrow 2.5 = \frac{100 \sin^2 \alpha}{19.6}$

$\Rightarrow \sin^2\alpha = 0.49$

$\Rightarrow \sin\alpha = 0.7$

Q. 18. As in Q. 18(iii), $\alpha = 45°$

$H = \frac{u^2 \sin^2 45°}{2g}$

$= \frac{u^2\left(\frac{1}{2}\right)}{2g}$

$= \frac{u^2}{4g}$

$R = \frac{u^2 \sin 2(45°)}{g}$

$= \frac{u^2}{g}$

Therefore, $H : R = 1 : 4$

Q. 19. (i) Let T = time of flight

$\therefore PT = 60$ ....(I) and $QT - \frac{1}{2}(9.8)T^2 = 0$ ....(II)

When it is at greatest height

$v_y^2 = u_y^2 + 2a_y s_y$

$0 = Q^2 + 2(-9.8)(5.625)$

$\therefore 110.25 = Q^2$

$\therefore Q = 10.5$

Put this into (II): $10.5T - 4.9T^2 = 0$

$\therefore T = \frac{15}{7}$

Put this into (I): $P\left(\frac{15}{7}\right) = 60$

$\therefore P = 28$

(ii) The greatest distance $= 7 \times \frac{15}{7}$

$= 15$ m