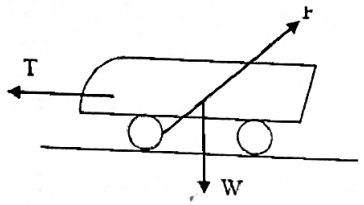
05. (a)



2+2+2

..... (1/2+1/2+1)

(provide 1mark for the three forces to be correct and 1mark for the three forces to meet at one point)

(no marks if the three foces do not meet at one point)

(b) i. $\tilde{F} = ma$,

$30 \times 10^3 = 6000a$

$a = 5ms^{-2}$ .....(1)

$\overleftarrow{V^2} = u^2 + 2as$

$50^2 = 0 + 2 \times 5S$ .....(1)

$S = \frac{2500}{10}$

$= 250m$ .....(1)

Another method

Force x Distance = Gain in Kinetic Energy

$30 \times 10^3 \times s = \frac{1}{2} \times 6000 \times 50^2$

$s = 250m$

ii. The air resistance against the motion has not been considered in the calculation/ the average acceleration of the jet plane is less than $5ms^{-2}$ due to air resistance ..... (1)

(c) i. $L\,Cos30° = 6x10^4$ ..... (1)

$L = \frac{12}{\sqrt{3}} \times 10^4$

$= 4\sqrt{3} \times 10^4 N$ ..... (1)

ii. towards the center

$\tilde{F} = ma$

$L\,Sin30° = m \times \frac{V^2}{r}$ ..... (1)

$= \frac{6000 \times 80^2 \times 2}{4\sqrt{3} \times 10^4}$

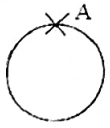
$= \frac{1920}{4\sqrt{3}}$

..... (1)

iii. speed should increase above $80ms^{-1}$ ..... (1)

angle of tilt should increase above 30° ..... (1)

(d) i. I.



..... (1)

(1) Centripetal Force = Gravitational Force ——— (2)

$\frac{mV^2}{r} = mg$

$r = \frac{V^2}{g}$

9(B)(i) $V_{cc} = I_c R_c + V_{CE}$ ------ (1)

$5 = I_c \times 1 \times 10^3 + 0.1$ --- (1)

$I_C = 4.9 \times 10^{-3}$ A

$I_C = 4.9$ mA ---------- (2)

(ii) $I_C = \beta I_B$

$I_{B\,min.} = \frac{4.9\,mA}{100}$ ——— (2)

$= 49\,\mu A$ ——— (2)

(iii) $V_{1min} = 82 \times 10^3 \times 49 \times 10^{-6} + 0.7$ —— (2)

$= 4.72V$ ——— (2)

(iv) NOT gate ——— (2)

(b) (i)

V_A	V_B	V_1	V_{out}
0V	0V	10V	0.1V
0V	5V	5V	0.1V
5V	0V	5V	0.1V
5V	5V	0V	5V

$V_1 = 5\theta_0 + \theta_1 V_A + \theta_2 V_B$

$V_1 = 5 \times 2 + (-1) V_A + (-1) V_B$

$= 10 - V_A - V_B$

——(2)

1 marks For each row. —(4)

(ii)

A	B	F
0	0	0
0	1	0
1	0	0
1	1	1

——> two marks —(2)

$F = A \cdot B$ ——(2)

Not gate —(2)

(III)

A	B	F
0	0	0
0	1	0
1	0	0
1	1	1

——(2)

$V_1 = 5 \times (-1) + 2V_A + 2V_B$

$V_1 = -5 + 2V_A + 2V_B$ ——(1)

(IV) NOR gate ——(1)