Code No:- 00022665

2a) $\theta = 11/24\ (360) = 165^\circ = 2.87$ rad.

$P = (T_1 - T_2)\,V \quad \therefore T_1 - T_2 = 1485.5\ N \quad -(1)$

$T_1/T_2 = e^{\mu\theta} = 2.372 \quad -(2)$

From (1) & (2); $T_1 = 2568.23\ N$ & $T_2 = 1082.73\ N$.

$T = \sigma b t = 23.75\,b\ N. \quad -(3)$

Mass of the belt per unit length $= m = btp = 0.0104\,b$ kg/m (4)

Centrifugal Tension $= T_c = mv^2 = 5.80\,b'\ N$.

We know that $T = T_1 + T_c$; substituting the values from (3) & (4)

$b = 143.08$ mm.

2b) $R = mT/2 = 200$ mm; $r = mt/2 = 100$ mm.

from the given condition,

path of approach $= r\sin\phi/2 = \sqrt{R_A^2 - R^2\cos^2\phi} - R\sin\phi$

$\therefore R_A = 206.5$ mm

Addendum for larger gear wheel $= R_A - R = 6.5$ mm

Path of recess $= R\sin\phi/2 = \sqrt{r_A^2 - r^2\cos^2\phi} - r\sin\phi$

$\therefore r_A = 116.22$ mm

Addendum for pinion $= r_A - r = 16.22$ mm.

Length of path of contact $= (R+r)\sin\phi/2 = 51.30$ mm.

Length of arc of contact $= 51.30/\cos\phi = 54.60$ mm.

Angular velocity of pinion $= \omega_1 = 2\pi N_1/60 = 26.20$ r/s

Angular velocity of gear $= \omega_2 = \omega_1(T_1/T_2) = 13.10$ r/s

$V_s = (\omega_1 + \omega_2) \times$ length of path of approach $= 67.2$ cm/s.

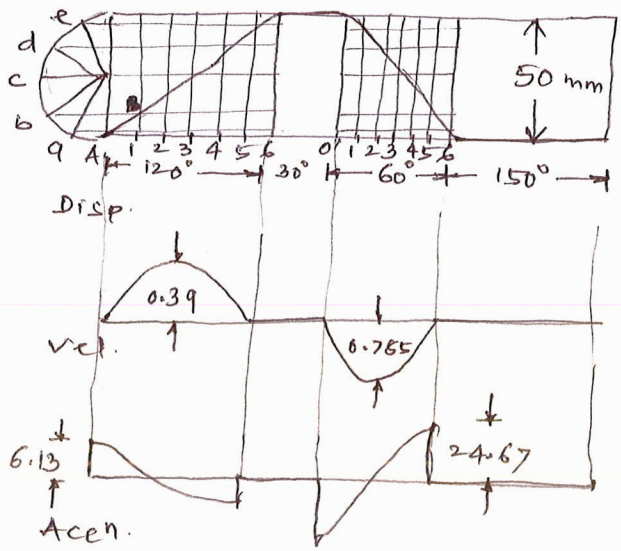
4a) $\omega = 2\pi N/60 = 10.47$ r/s

$V_0 = \pi\omega s/2\theta_0 = 0.39$ m/s

$V_R = \pi\omega s/2\theta_R = 0.785$ m/s

$a_0 = \pi^2\omega^2 s/2(\theta_0)^2 = 6.13$ m/s^2

$a_R = \pi^2\omega^2 s/2(\theta_R)^2 = 24.67$ m/s^2



4b) W.E. principle, Initial K.E + W.D. = final K.E.

Initial K.E. = 0

W.D. by gravity = $mg \times L/2$.

Final K.E = $1/2\ I_A \cdot w^2 = 1/2 \left[mL^2/12 + m(L/2)^2 \right] w^2$

$= 1/6\ mL^2 w^2$

$\therefore \quad w = \sqrt{3g/L}$

5 a) $v_E = 6.92$ m/s.

6 a) $v_E = 1.05$ m/s ; $a_E = 3.1$ m/s^2.