Given:

Bore dia $(D) = 67\,mm$.

Weight piston $(m_p) = 0.5\,kg$.

Stroke length $= 62.4\,mm$.

Compression ratio $= 9.5$

Combustion volume $V_c = 25.88243612\,cc$

MOI of flywheel $(J) = 1\,kgm^2$.

Link length $(l) = 60\,mm$.

Radius of flywheel $(r) = 31.2\,mm$.

Atmospheric pressure $(P_1) = 1\,bar$

Gear Ratio $(GR) = 22$

Coefficient of friction $(\mu) = 0.5$

No load RPM $(N_{NL}) = 18000$

Damping factor $(k) = 0.11$.

Constant $(c) = 1$, $m = -0.000530516$.

$$T_L = k\frac{d\theta}{dt} - \frac{\left[P_2 A - m_p\left(\frac{d\theta}{dt}\right)^2 r\left(\cos\theta + \frac{\cos 2\theta}{n}\right)\right] \cdot r\sin\left(\theta + \sin^{-1}\left(\frac{\sin\theta}{n}\right)\right)}{\cos\left[\sin^{-1}\left(\frac{\sin\theta}{n}\right)\right] + \mu\sin\left[\sin^{-1}\left(\frac{\sin\theta}{n}\right)\right]}$$

$$T_m = \frac{d\theta}{dt} \cdot GR.m + c$$

$$T_m = \frac{T_L + J\frac{d^2\theta}{dt^2}}{GR.} \quad \text{(equation to be solved)}$$

$$P_2 = \frac{P_1 V_1}{V_2} - P_1 \quad \text{where } V_2 = V_c + A\left[(r+l) - \left[r\cos\theta + l\cos\left(\sin^{-1}\left(\frac{\sin\theta}{n}\right)\right)\right]\right]$$

Initial Conditions :- $\theta = 0$, $\phi = 0$, $\omega = 0$, $t = 0$, $dt = 0.01$

Plot graph b/w $\frac{d\theta}{dt}$ vs time, time vs θ, time vs T_m.