B.E 5th Semester Mechanical Engineering

Dynamics of Machinery

FLYWHEEL

1	The equation of the turning moment curve of a three crank engine is (5000 + 1500sin3θ) N-m, where θ is the crank angle in radians. The moment of inertia of the flywheel is 1000 kg-m^2 and the mean speed is 300 rpm. Calculate : 1. power of the engine, and 2. the maximum fluctuation of the speed of the flywheel in percentage when (i) the resisting torque is constant, and (ii) the resisting torque is (5000 + 600sinθ) N-m.
2	A machine punching 38 mm holes in 32 mm thick plate requires 7 N-m of energy per sq. mm of sheared area, and punches one hole in every 10 seconds. Calculate the power of the motor required. The mean speed of the flywheel is 25 meters per second. The punch has a stroke of 100 mm. Find the mass of the flywheel required, if the total fluctuation of speed is not to exceed 3% of the mean speed. Assume that the motor supplies energy to the machine at uniform rate.
3	The turning moment diagram for a multi-cylinder engine has been drawn to a vertical scale of 1 mm = 650 Nm and a horizontal scale of 1mm = 4.5°. The areas above and below the mean torque line are -28, +380, -260, +310, -300, +242, -380, +265 and -229 mm . The fluctuation of speed is limited to ±1.8% of the mean speed which is 400 rpm. The density of the rim material is 7000 kg/m^2 and width of the rim is 4.5 times its thickness. The centrifugal stress in the rim material is limited to 6 N/mm^2 Neglecting the effect of the boss and arms, determine the diameter and cross section of the flywheel rim.
4	A punching machine carries out 6 holes per minute. Each hole of 40 mm diameter in 35 mm thick plate requires 8 Nm of energy/mm^2 of the sheared area. The punch has a stroke of 95 mm. Find the power of the motor required if the mean speed of the flywheel is 20 m/s. If total fluctuation of speed is not to exceed 3% of the mean speed, determine the mass of the flywheel.