5. (a) A punching press is required to punch 40 mm dia. hole in a plate of 15 mm thickness at the rate of 30 holes per min. It requires 6 N-m of energy per mm^2 of sheared area. If the punching takes 1/10 sec. and the rpm of the flywheel varies from 160 to 140. Determine the mass of the flywheel having radius of gyration of 1 metre. **10**

(b) Derive an expression for energy stored in flywheel. **5**

(c) Explain the work energy principle. **5**

6. (a) Two mating gears have 20 and 40 teeth of module 10 mm and 20° pressure angle. The addendum of each wheel is to be made of such a length that the line of contact on each side of pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of path of contact, arc of contact and contact ratio. **12**

(b) Derive an expression for minimum number of teeth on the pinion in order to avoid the interference. **8**

7. (a) The centre to centre distance between the two sprokets of a chian drive is 600 mm. The chain drive is used to speed from 180 rpm to 90 rpm. The driving sprocket has 18 teeth and a pitch circle diameter of 480 mm. Determine :– **10**

(i) Number of teeth on the driven sprocket

(ii) Pitch of the chain

(iii) Length of the chain.

(b) An open belt drive running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 metres apart and transmits 4 KW from the smaller pulley that rotates at 300 rpm. Coefficient of friction between the belt and the pulley is 0.3 and the safe working tension is 10N per mm width. Determine :– **10**

(i) Minimum width of the belt

(ii) Initial Tension in belt

(iii) Length of the belt required.
