

- i) Explain the following terms as related to Flywheels :

Coefficient of fluctuation of energy

Coefficient of fluctuation of speed.

- j) Draw displacement diagram for a follower which is ascending 40 mm during 120° rotation of cam with uniform acceleration and retardation.

SECTION-B

2. What is meant by inversion of a mechanism? Describe any one inversion of slider crank chain mechanism with the help of neat diagram.
3. What is an engine indicator? Describe any one engine indicator using a neat diagram.
4. Determine the width of a 9.75 mm thick leather belt required to transmit 15 kW from a motor running at 900 RPM. The diameter of the driving pulley of the motor is 300 mm. The driven pulley runs at 300 RPM and the distance between the centers of the pulleys is 3 meters. The density of the leather is 1000kg/m^3 . The maximum allowable stress in the leather is 2.5 MPa. The coefficient of friction between leather and pulley is 0.3. Assume open belt drive and neglect sag and slip of the belt.
5. The turning moment diagram for a multi cylinder engine has been drawn to scale of 1 mm = 325 Nm (Vertically) and 1 mm = 3° (horizontally). The areas above and below the mean torque line are -26, +378, -256, +306, -302, +244, -380, +261 and -225 mm². The engine is running at a mean speed of 600 RPM. The total fluctuation of speed is not to exceed $\pm 1.8\%$ of the mean speed. If the radius of flywheel is 0.7 m, find the mass of the flywheel.
6. Explain with the help of neat diagram the working of the Rope Brake Dynamometer.

SECTION-C

7. Figure 1 shows a four bar mechanism in which lengths of the links are as follows :
 $AB = 150 \text{ mm}$, $BC = 180 \text{ mm}$, $CD = 180 \text{ mm}$, $AD = 300 \text{ mm}$.

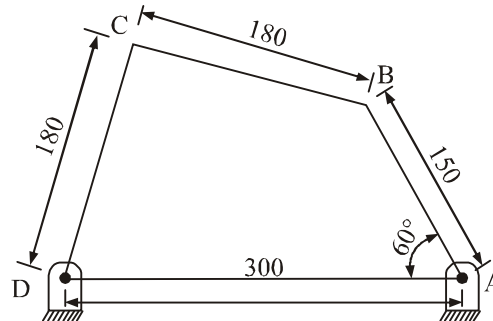


Figure.1

Crank AB is rotating anti clockwise at an angular velocity of 20 rad/s and has an angular acceleration of 30 rad/s^2 . Determine the angular velocities and angular accelerations of link BC. Also find the velocity and acceleration of joint C.

8. Arms of the porter governor are each 25 cm long and pivoted on the axis of the governor axis. Mass of each ball is 5 kg and mass of the central sleeve is 30 kg . The radius of rotation of balls is 16 cm when the sleeve begins to rise and reaches a value of 20 cm for maximum speed. Determine the range of speed of the governor.

If a friction of 20 N is considered at the sleeve, how this speed range is modified.

9. Following motions are required to be given to a knife edge follower by a cam rotating in clockwise direction :

1. Outstroke for 90° rotation of the cam.
2. Dwell for next 30° rotation of cam.
3. Return stroke for next 60° rotation of cam.
4. Dwell for rest 180° rotation of cam.

Follower moves with simple harmonic motion during outstroke and return stroke. Minimum radius of the cam is 75 mm and the maximum follower lift is 50 mm . Draw the cam profile when axis of the follower passes through the axis of the camshaft.

Determine the maximum velocity and acceleration of the follower during ascent and descent, if the cam is rotating at 250 RPM .