



QP Code :12443

(3 Hours)

Total Marks : 80

N. B. : (1) Question no.1 is compulsory.

(2) Attempt any **Three** questions from the remaining **five** questions.(3) Assume any suitable data if **necessary** with justification.(4) Figures to the right indicates **full** marks1. Attempt any **four** of the following questions.

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(a) Explain different kinds of kinematic pairs giving example for each **one** of them.

(b) Describe the construction operation of a prony brake dynamometer.

(c) Explain the "Law of gearing."

(d) What do you understand by Centre of rotation? State and explain Kennedy's Theorem.

(e) Explain epicyclic gear train with train with its merits and demerits as compared to reverted gear train.

2. (a) The mechanism of a wrapping machine, as shown in figure, has the dimen-

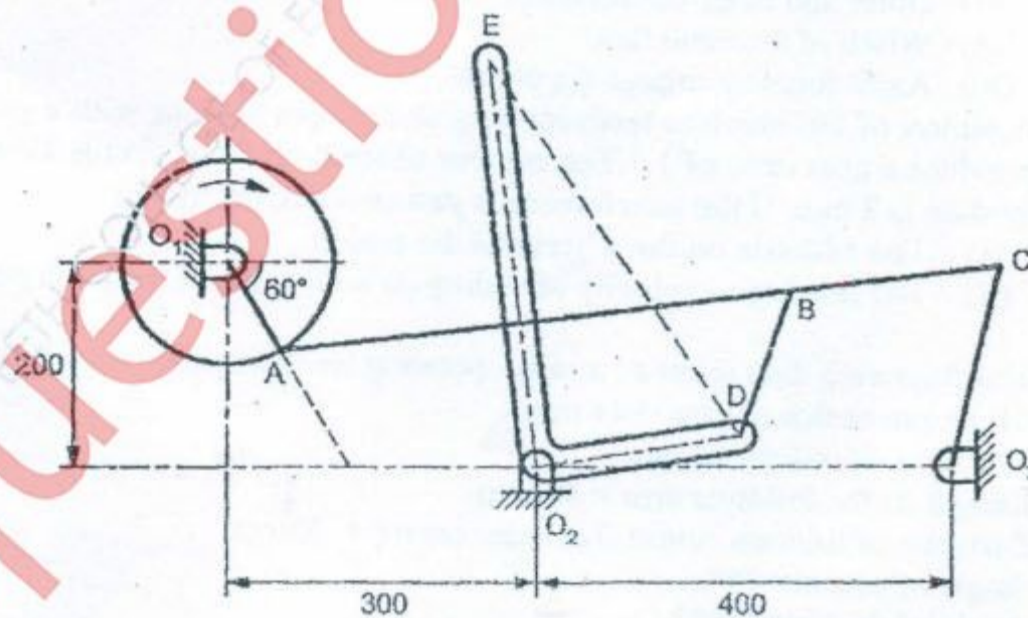
15

sions as follows : $O_1A = 100$ mm; $AC = 700$ mm; $BC = 200$ mm; $BD = 150$ mm; $O_3C = 200$ mm; $O_2E = 400$ mm; $O_2D = 200$ mm; The crank O_1A rotates at a uniform speed of 100 rad/s. For the given configuration, determine

(i) Linear velocity E on the bell crank lever,

(ii) Accelerations of points E and B

(iii) Angular acceleration the bell crank lever.



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- (b) Sketch and describe the Peaucellier straight line mechanism indicating clearly the conditions under which the point P on the corners of the rhombus of the mechanism, generates a straight line. 05
3. (a) A band and block brake, having 12 blocks each of which subtends an angle of 16° at the centre, is applied to a rotating drum with a diameter of 600 mm. The blocks are 75 mm thick. The drum and flywheel mounted on the same shaft have a mass of 1800 kg and have a combined radius of gyration of 600mm. The two ends of the band are attached to pins on the opposite sides of the brake fulcrum distances of 40 mm and 150 mm from it. If a force of 250 N is applied on the lever at a distance of 900mm from the fulcrum, find the: 10
- (i) Maximum braking torque,
 - (ii) Angular retardation of the drum, and
 - (iii) Time taken by the system to be stationary from the rated speed of 300 r.p.m.
- The coefficient of friction between blocks and drum may be taken as 0.25.
- (b) What are the causes and effects of the vibrations? What are the methods to determine the equation of motion? Explain any one method with example. 10
4. (a) A cone clutch with a semi cone angle of 15° transmits 10 KW at 600 rpm. The 08 normal pressure intensity between the surfaces in contact is not to exceed 100 KN/m². The width of the friction surfaces is half of the mean diameter. Assume $\mu = 0.25$ 8
- Determine the
- (i) Outer and inner diameters of the plate
 - (ii) Width of the cone face
 - (iii) Axial force to engage the clutch
- (b) A pinion of 20° involute teeth rotating at 275 rpm meshes with a gear and provides a gear ratio of 1.8. The number of teeth on the pinion is 20 and the module is 8 mm. If the interference is just avoided, determine 12
- (i) The addenda on the wheel and the pinion
 - (ii) The maximum velocity of sliding on both sides of the pitch point.
5. (a) The following data relate to a cam operating an oscillating roller follower: 15
- Minimum radius of cam = 44 mm
 - Diameter of roller = 14 mm
 - Length of the follower arm = 40 mm
 - Distance of fulcrum centre from cam centre = 50mm
 - Angle of ascent = 75°
 - Angle of descent = 105°
 - Angle of dwell for follower in the highest position = 60°
 - Angle of oscillation of follower = 28°
- Draw the profile of the cam if the ascent and descent both takes place with SHM.



- (b) Derive an expression for minimum number of teeth on gear wheel to avoid interference. 05
6. (a) A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. 12
- (b) Sketch and explain different inversions of a double slider crank mechanism with one application each. 8

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