



3. The component of the acceleration, parallel to the velocity of the particle, at the given instant is called CO1 [K<sub>2</sub>]
- a) Radial component b) Tangential component  
 c) Coriolis component d) Resultant Component
4. The balancing of rotating and reciprocating parts of an engine is necessary when it runs at CO5 [K<sub>2</sub>]
- a) Slow speed b) Medium speed  
 c) High speed d) Very high speed
5. Consider the following statements in case of belt drives: CO2 [K<sub>2</sub>]
- 1) Centrifugal tension in the belt increases the transmitted power.  
 2) Centrifugal tension does not affect the driving tension  
 3) Maximum tension in the belt is always three times the centrifugal tension.
- Which of the statements given above is/are correct?
- a) 1, 2 and 3 b) 1 and 3 only  
 c) 2 and 3 only d) 1 only
6. The size of a cam depends upon CO4 [K<sub>2</sub>]
- a) base circle b) pitch circle  
 c) prime circle d) pitch curve
7. Assertion (A): A cam and follower is an example of a higher pair. CO4 [K<sub>3</sub>]  
 Reason(R) : The two elements have surface contact when the relative motion takes place
- a) Both A and R are individually true and R is the correct explanation of A b) Both A and R are individually true but R is not the correct explanation of A  
 c) A is true but R is false d) A is false but R is true
8. The primary unbalanced force is maximum when the angle of inclination of the crank with the line CO5 [K<sub>3</sub>]
- a) 0° b) 90°  
 c) 180° d) 360°
9. Sources of power loss in a chain drive are given below: CO2 [K<sub>3</sub>]
- 1) Friction between chain and sprocket teeth.  
 2) Overcoming the chain stiffness.  
 3) Overcoming the friction in shaft bearing.  
 4) Frictional resistance to the motion of the chain in air or lubricant.
- The correct sequence of descending order of power loss due to these sources is
- a) 1,2,3 & 4 b) 1,4,3 & 4  
 c) 4,3,2 & 1 d) 2,3,1 & 4

10. Longitudinal vibrations are said to occur when the particles of a body moves CO6 [K<sub>2</sub>]
- a) Perpendicular to its axis b) Parallel to its axis
- c) In a circle about its axis d) All of the above

**PART B (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

11. Define a kinematic pair and kinematic chain. CO1 [K<sub>2</sub>]
12. What are the inversions of a slider crank chain? CO1 [K<sub>2</sub>]
13. State the laws of solid friction CO2 [K<sub>2</sub>]
14. What is the difference between flat, V and circular belt drives? CO2 [K<sub>2</sub>]
15. What are the various types of gear trains? CO3 [K<sub>2</sub>]
16. What are the different types of follower motion? CO4 [K<sub>2</sub>]
17. What is the difference between the balancing of rotating masses and balancing of reciprocating masses? CO5 [K<sub>3</sub>]
18. What is meant by swaying couple? CO5 [K<sub>2</sub>]
19. Define Degree of freedom. CO6 [K<sub>3</sub>]
20. Define torsional equivalent shaft. CO6 [K<sub>2</sub>]

**Answer any FIVE Questions:-**

**PART C (5 x 14 = 70 Marks)**

**(Answer not more than 300 words)**

**Q.No. 21 is Compulsory**

21. ABCD is a 4 - bar chain with link AD fixed. The length of the link are AB= 6.25 cm, BC = 17.5 cm, CD = 11.3 cm and DA = 20 cm. The crank AB makes 180 rpm. Find the acceleration of C and the angular acceleration of BC and CD when angle BAD is 15<sup>0</sup> and B and C lie on the opposite sides of AD. CO1 [K<sub>4</sub>]
22. a) Sketch and explain any two types of four bar chain mechanisms. (7) CO1 [K<sub>2</sub>]
- b) Discuss briefly the various types of flat belt drives used for the transmission of power. (7) CO2 [K<sub>2</sub>]
23. An open belt drive running over two pulleys 24 cm and 60 cm diameter connects two parallel shafts 3 m apart and transmits 3.75 kW from the smaller pulley that rotates at 300 rpm. The coefficient of friction between the belt and the pulleys is 0.3 and the safe working tension is 100 N per cm width. Determine (1) maximum width of the belt (2) initial belt tension (3) length of the belt required. CO2 [K<sub>3</sub>]

24. An epicyclic gear consists of three gears A, B and C as shown in figure - 1. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m.. If the gear A is fixed, Determine the speed of gears B and C. CO3 [K<sub>4</sub>]

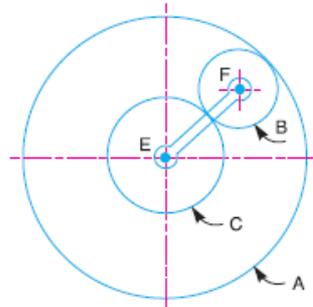


Figure - 1

25. A cam is to give the following motion to a knife edged follower: CO4 [K<sub>3</sub>]  
 (i) Outstroke during  $60^\circ$  of cam rotation (ii) Dwell for the next  $30^\circ$  of cam rotation.  
 (iii) Return stroke during next  $60^\circ$  of cam rotation (iv) Dwell for the remaining  $210^\circ$  of cam rotation. The stroke of the follower is 40mm and the minimum radius of the cam is 50mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when (a) the axis of the follower passes through the axis of the cam shaft, and (b) the axis of the follower is offset by 20mm from the axis of the cam shaft.
26. A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B  $45^\circ$ , B to C  $70^\circ$  and C to D  $120^\circ$ . The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. CO5 [K<sub>4</sub>]
27. A flywheel is mounted on a vertical shaft as shown in Figure – 2. The both ends of the shaft are fixed and its diameter is 50 mm. The flywheel has a mass of 500 kg. Find the natural frequencies of longitudinal and transverse vibrations. Take  $E = 200 \text{ GN/m}^2$ . CO6 [K<sub>3</sub>]

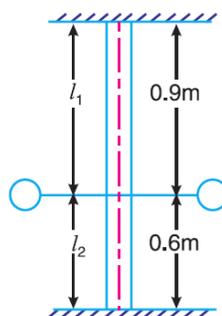


Figure - 2

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