

B.E. Fourth Semester (Production Engineering) (CGS)  
**10915 : Theory of Machine : 4 PE 03**

P. Pages : 2

Time : Three Hours



AU - 2574

Max. Marks : 80

- Notes :
1. All question carry equal marks.
  2. Answer **three** question from Section A and **three** question from Section B.
  3. Due credit will be given to neatness and adequate dimensions.
  4. Assume suitable data wherever necessary.
  5. Illustrate your answer necessary with the help of neat sketches.
  6. Discuss the reaction, mechanism wherever necessary.
  7. Use of pen Blue/Black ink/refill only for writing the answer book.

**SECTION - A**

1. a) Describe with neat sketch the "Scotch Yoke Mechanism". Justify, why it is called inversion of double slider crank chain mechanism. 7

- b) Explain Grubler's criterion for determining degree of freedom of mechanism. 7

**OR**

2. a) Explain with neat sketch any two types of straight line mechanism. 7

- b) What do you understand by "Inversion" sketch the inversion of a slider crank mechanism with shorter link, having two turning pairs as fixed. 7

3. a) In a slider crank mechanism, the length of the crank and the connecting rod are 200 mm and 80 mm respectively. Locate all the I-center of the mechanism for the position of the crank when it has turned  $30^\circ$  from the inner dead center. 8

- b) Classify different types of follower why roller follower is frequently used than knife edge follower. 5


**OR**

4. a) Draw the profile of a cam operating a roller reciprocating follower with the following data: 8

Minimum radius of cam = 30 mm

lift = 25 mm, Roller diameter = 15 mm.

The cam lift the follower for  $120^\circ$  with SHM followed by a dwell period of  $30^\circ$  then the follower lower down during  $150^\circ$  of the cam rotation with uniform acceleration and deceleration followed by dwell period.

- b)  neat sketch 'Klein's construction diagram' for velocity and acceleration of crank chain mechanism. 5

5. a) Explain with neat sketch 6

i) Law of gearing

ii) Interference involute gears

iii) Limiting angle of friction

- b) Explain with neat sketch simple gear train compound train, gear train, and reverted gear train along with train value and speed ratio. 7

OR

6. a) Classify types of gears with neat sketches. 7  
b) Derive an expression of efficiency of inclined plane for a motion of a body up the plane. 6

SECTION - B

7. a) Explain : 8  
i) Slip of the belt ii) Double block shoe brake  
iii) Prony brake dynamometer iv) Creep in a belt drive  
b) Deduce expression for the length of belt in crossed belt drive. 6

OR

8. a) What is dynamometer ? Explain with neat diagram "Torsion Dynamometer" to find torque and power. 8  
b) Describe with the help of a neat sketch the principle of operation of a different band brake. 6  
9. a) Explain : 8  
i) Co-efficient of fluctuation of energy. ii) Governor  
iii) D'Alembert's principle iv) Energy storing capacity of fly wheel  
b) What is static force analysis and dynamic force analysis. 5

OR

10. a) What is flywheel ? How is the energy stored and released from flywheel ? Explain with the help of T-O diagram of two stroke single cylinder double acting engine. 8  
b) Differentiate "Governor" & flywheel. 5  
11. a) Explain : 6  
i) Under, critical and over damping.  
ii) Algebraical and graphical conditions of static and dynamic balancing of rotating masses.  
iii) Vibration isolation.  
b) What do you mean by whirling of shafts ? What is whirling of critical speed ? Explain with derivation. 7

OR

12. a) What do you understand by natural frequency of vibration ? What is its importance. 4  
b) Four masses  $m_1$ ,  $m_2$ ,  $m_3$  &  $m_4$  are 200 kg, 300 kg, 240 kg & 260 kg resp. The corresponding radii are 0.2 m, 0.15 m, 0.25 m and 0.3 resp. and angle between successive masses are  $45^\circ$ ,  $75^\circ$  and  $135^\circ$ . Find the position and magnitude of the balance mass required if its radius of rotation is 0.02 m. 9

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