



SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : THEORY OF MACHINES (16ME344)

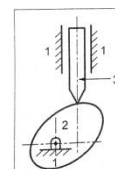
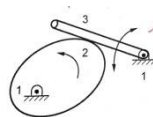
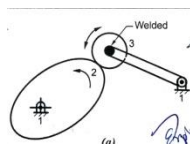
Course & Branch: B.Tech – AGRI

Year & Sem: II-B.Tech & II-Sem

Regulation: R16

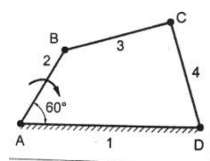
UNIT - I

- 1 Describe the inversions of 4 bar crank chain with suitable sketch and write the practical applications. **12M**
- 2 Explain the classification of the kinematics pairs with the help of neat sketch. **12M**
- 3
 - a) Define the term kinematic link. Give the classification of kinematic link. **6M**
 - b) What is pantograph? Show that it generates a path similar to the path traced by a point on the mechanism. **6M**
- 4
 - a) What is constrained motion and what are the different types of constrained motions? Give one example for each with suitable sketch **6M**
 - b) Describe the oscillating cylinder engine with neat sketch **6M**
- 5
 - a) Define the term degrees of freedom of a mechanism and give an example **6M**
 - b) Find the degrees of freedom for the following kinematic chains **6M**



- 6 In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60° . **12M**

- 7 How the Velocity of a Point on a Link can find by Relative Velocity Method **12M**
- 8 Explain with neat sketch the instantaneous centre method for determination of velocities of links of a mechanism. **12M**
- 9 Locate all the instantaneous centres for a four bar mechanism shown in fig. The lengths of various links are: AD=125mm; AB=62.5mm; BC=CD=75mm. If the link rotates at a uniform speed of 10rpm in clockwise direction, find the angular velocity of the link BC and CD. **12M**



- 10 a) Define the instantaneous centre, explain the types and locate the instantaneous centres by visual inspection. **6M**
- b) Explain the angular velocity ratio theorem. **6M**

UNIT – II

- 1 Draw the terminology of Gear and Define the following terms : **12M**
- (i) Module
 - (ii) Pressure angle
 - (iii) Addendum
 - (iv) Pitch circle
 - (v) Face width
 - (vi) Fillet radius
 - (vii) Top land
 - (viii) Face
 - (ix) Tooth thickness
 - (x) Flank

- 2 State and prove the law of gearing. 12M
- 3 a) Explain the concept of the undercutting with neat sketch. 6M
- b) Write advantages and limitations of gear drives over the belt and chain drives. 6M
- 4 Explain the classification of gears with neat sketches 12M
- 5 Explain the cycloidal forms of teeth with neat sketch 12M
- 6 a) What are the internal and external meshing gears? Explain briefly. 12M
- b) What is the worm and worm wheel? Explain briefly with sketch.
- 7 Explain the involute forms of teeth with neat sketch 12M
- 8 Compare the Involute and cycloidal forms of teeth Gears 12M
- 9 a) Explain the phenomenon of the interference. 6M
- b) What are the intersecting axes gears? Explain briefly with sketch. 6M
- 10 a) A toothed wheel has 112 teeth. Its module is 2mm. Find the circular pitch, pitch diameter and the diametral pitch. 6M
- b) Two mating spur gears have 74 and 36 teeth. Their common module is 5mm. Determine the centre distance between the gears axis. 6M

UNIT - III

- 1 In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise. 12M

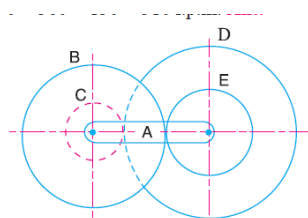


Fig. 13.8

- 2 An epicyclic gear consists of three gears A, B and C as shown in Fig. 13.10. 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. **12M**

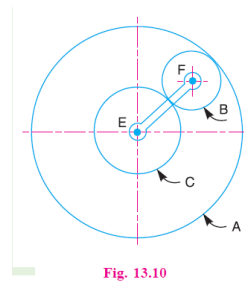


Fig. 13.10

- 3 In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B ? **12M**

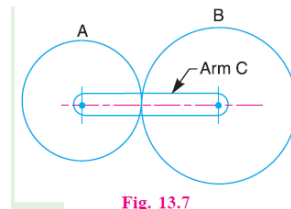


Fig. 13.7

- 4 a) What do you understand by 'gear train'? Explain briefly the operation of simple gear train with neat sketch. **6M**
- b) How the velocity ratio of epicyclic gear train is obtained by tabular method? **6M**
- 5 Explain briefly the differences between simple, compound, and epicyclic gear trains. What are the special advantages of epicyclic gear trains? **12M**
- 6 Discuss the various types of gear trains with neat sketch **12M**
- 7 a) Define the terms Speed ratio and Train Value? **12M**
- b) Differentiate between Simple and Compound gear train.

- 8 a) A compound gear train consists of six gears. The number of teeth on the gears are as follows **6M**

Gear	A	B	C	D	E	F
No. of Teeth	60	40	50	25	30	24

The gears B and C are on one shaft while the gears D and F are on another shaft. The gear A drives gear B, gear C drives gear D and gear E drives gear F. If the speed of the gear A is 100rpm, then determine the speed of the gear F.

- b) Explain briefly about reverted gear train with neat sketch. **6M**
- 9 a) Explain the turning moment diagram of a four stroke cycle internal combustion engine. **6M**
- b) Define the terms 'coefficient of fluctuation of energy' and 'coefficient of fluctuation of speed', in the case of flywheels. **6M**
- 10 a) Discuss the turning moment diagram of a multi cylinder engine. **6M**
- b) Write the applications of flywheel **6M**

UNIT - IV

- 1 A collar bearing internal and external diameter as 200 and 300 mm. maximum intensity pressure as 0.06 N/mm².the coefficient of frictional surface shaft and plate surfaces as 0.03 .determine power lost in to the shaft. Assuming uniform wear.shaft speed rotating with speed of 1200 rpm. **12M**
- 2 A pivot flat bearing internal and external diameter as 300 and 450mm. maximum intensity pressure as 0.075 N/mm².the first disc had three plates and second disc had two disc the coefficient of frictional surface shaft and plate surfaces as 0.02 .power absorbed by disc is 5kw. Assuming uniform wear. shaft rotating with speed of 580 rpm,then findout torque developed on the plate **12M**
- 3 A single disc clutch internal and external diameter as 200 and 300 mm. maximum intensity pressure as 0.06 N/mm².the coefficient of frictional surface shaft and plate surfaces as 0.03 N/mm².determine power lost in to the shaft. Assuming uniform wear. shaft speed rotating with speed of 1200 rpm **12M**
- 4 a) What do you understand by the term friction ? Explain clearly why **6M**

- it comes into play ?
- b) How will you distinguish between static friction and dynamic friction ? 6M
- 5 a) What are the laws of dynamic friction? Explain. 6M
b) Define coefficient of friction and derive the angle of repose. 6M
- 6 a) Discuss briefly the various types of belts used for the transmission of power. 6M
b) Distinguish clearly the difference between an open belt drive and cross belt drive 6M
- 7 a) Derive an equation for length of the open belt 6M
b) What are the materials used for making belt drives 6M
- 8 a) Derive the equation for power transmitted by the belt drive with neat diagram. 6M
b) The tensions in the two sides of the belt are 1000 and 800 newtons respectively. If the speed of the belt is 75 metres per second, find the power transmitted by the belt. 6M
- 9 a) What is meant by slip of the belt? Derive an equation. 6M
b) An engine shaft running at 120 r.p.m. is required to drive a machine shaft by means of a belt. The pulley on the engine shaft is of 2 meters diameter and that of the machine shaft is of 1 meter diameter. If the belt thickness is 5 mm, find the speed of the machine shaft when (i) there is no slip, and (ii) there is a slip of 3%. 6M
- 10 Derive an equation for the velocity ratio for the simple belt drive and compound belt drive. 8M
What are the factors should be considered while selecting the belt drive 4M

UNIT - V

- 1 A shaft is rotating at a uniform angular speed. Four masses M₁, M₂, M₃ and M₄ of magnitudes 300kg, 450kg, 360kg, 390kg respectively are attached rigidly to the shaft. The masses are rotating in the same plane. The corresponding radii of rotation are 200mm, 150mm, 250mm and 300mm respectively. The angle made by these masses with horizontal are 0°, 45°, 120° and 255° respectively. Find (i) the magnitude of balancing mass (ii) the position of balancing mass if its radius of rotation is 200mm. 12M
- 2 Four masses A, B, C, and D are completely balanced masses C and D makes angles of 90° and 195° respectively with B in the same sense. The rotating masses have the following properties: m_A=25kg r_A=150mm m_B=40kg r_B=200mm m_C=35kg r_C=100mm r_D=180mm Planes B and C are 250mm apart. Determine (i) the mass A and its angular position (ii) the position 12M

- of planes A and D.
- 3** A, B, C and D are four masses carried by a rotating shaft at radii 100mm, 125mm, 200mm and 150mm respectively. The planes in which the masses revolve are spaced 600mm apart and the masses of B, C and D are 10kg, 5kg and 4kg respectively. Find the required mass A and relative angular setting of the four masses so that the shaft be in complete balance. 12M
- 4**
- How the governors are classified? 3M
 - What is meant by Sensitiveness of governors? 3M
 - Distinguish between a Governor and a flywheel. 3M
 - What is the effect of friction on the governor? 3M
- 5** A porter governor has equal arms each 250mm long and pivoted on the axis of rotation. Each ball has a mass of 5kg and mass of the central load on the sleeve is 25kg. The radius of rotation of the ball is 150mm when governor is at maximum speed. Find the maximum and minimum speed and range of speed of the governor. 12M
- 6** Calculate the minimum speed of a proell governor, which has equal arms each of 200mm and are provided on the axis of rotation. The mass of each ball is 4kg and the central mass on the sleeve is 20kg. The extension arms of the lower links are each 60mm long and parallel to the axis when the minimum radius of the ball is 100mm. of load. 12M
- 7**
- What is Balancing of rotating masses? What are the different types of balancing machines? 6M
 - Why rotating masses are to be dynamically balanced? And Define direct and reverse cranks 6M
- 8** The data for three rotating masses are given below:- $M_1=4\text{kg}$ $r_1=75\text{mm}$ $\theta_1=45^\circ$ $M_2=3\text{kg}$ $r_2=85\text{mm}$ $\theta_2=135^\circ$ $M_3=2.5\text{kg}$ $r_3=50\text{mm}$ $\theta_3=240^\circ$ Determine the amount of counter mass at a radial distance of 65mm required for their static balance. 12M
- 9**
- Define and explain the following terms relating to governors : 6M
1. Stability, 2. Sensitiveness, 3. Isochronism, and 4. Hunting.
 - Define and explain the following terms relating to governors : 6M
1. Height of a governor 2. Equilibrium speed. 3. Mean equilibrium speed 4. Maximum and minimum equilibrium Speeds 5. Sleeve lift
- 10**
- What is the centrifugal governor? Explain how it works with neat sketch. 6M
 - Calculate the vertical height of a Watt governor when it rotates at 60 r.p.m. Also find the change in vertical height when its speed increases to 61 r.p.m. 6M