FIFTH SEMESTER B.TECH DEGREE EXAMINATION

(2013 SCHEME)

13.502 THEORY OF MACHINES (MP)

3Hrs 100 Marks

PART A

Answer all questions. Each question carries 2 marks.

1. Define Grashof's law.
2. What are the types of automobile steering gear? Deduce the fundamental equation of steering gears.
3. Explain the working of Geneva mechanism with help of a neat sketch.
4. What is the significance of Chebychev spacing in synthesis of mechanism?
5. What are centripetal and tangential components of acceleration? How are they determined?
6. Deduce the expression for the velocity and acceleration of the follower when it moves with cycloidal motion.
7. Deduce the expression for velocity of sliding in a gear drive.
8. State and derive Law of Gearing.
9. What is meant by Coriolis component of acceleration? How it is determined?
10. What are uniform pressure and wear theories? Deduce the expression for torque considering both theories on a flat collar.

PART B

Answer any one full question from each module.

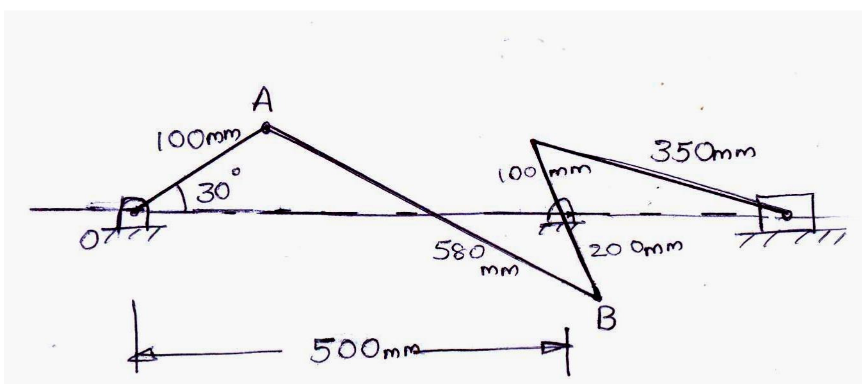
Module I

11. Describe the inversions of a double slider crank chain. Give examples with neat sketch.

12. Synthesis a four link mechanism to coordinate three positions of the input and output links as follows: $\theta_1 = 120^0$, $\varphi_1 = 35^0$; $\theta_2 = 35^0$, $\varphi_2 = 45^0$ and $\theta_3 = 50^0$, $\varphi_3 = 60^0$.

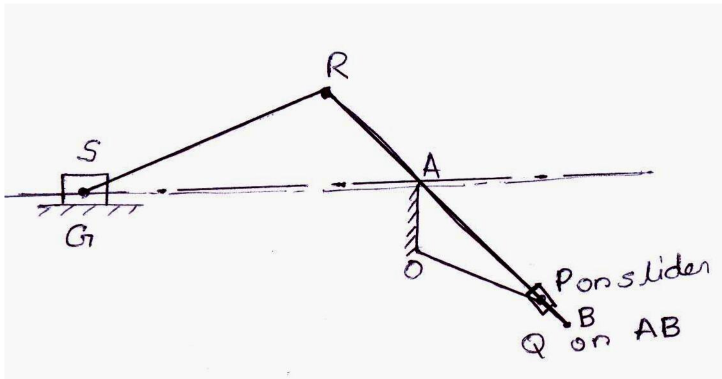
Module II

13. In a six link mechanism, the dimensions of the links are OA= 100mm, AB= 580 mm, BC= 300 mm, QC= 100 mm, CD= 35mm and OQ = 500mm. the crank OA rotates at 150 rad/s. for the position when the crank OA makes an angle of 30^0 with the horizontal, determine the (i) linear velocity of points b, C and D and (ii) angular velocity of link AB, BC and CD.



14. A Withworth, quick return mechanism with dimension of links as crank OP= 240 mm, OA = 150 mm, AR= 165 mm and RS= 430mm. the crank OP has an angular velocity of 25 rad/s and angular deceleration of 20 rad/s^2.

Determine (i) acceleration of slider S and(ii) angular acceleration of link AR and RS.



Module III

15. Draw the profile of a cam operating a roller reciprocating follower with the following data, minimum radius of cam = 25 mm, lift= 30mm, roller diameter= 15mm. The cam lifts the follower for 120^{0} with SHM followed by a dwell period of 30^{0}.then the follower lowers down during 150^{0} of cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum acceleration and velocity of the follower descent period.

16. A pinion of 20^{0} 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 8mm. if the interference is just avoided, determine (i) the addenda on the wheel and pinion (ii) the path of contact and (iii) the maximum velocity of sliding on both sides of the pitch point.

Module IV

17. The initial tension in a belt drive is found to be 600 N and the ratio of tension is 1.8. The mass of the belt is 0.8 kg/m length. Determine the (i) velocity of the belt for maximum power transmission (ii) tension on tight

side of belt when it is started and (iii) tension on tight side of belt when it is running at maximum speed.

18. A simple band brake is applied to a shaft carrying a fly wheel of 250 kg mass and radius of gyration 300 mm. the shaft speed is 200 rpm. The drum diameter is 200 mm and the coefficient of friction is 0.25. Determine (i) braking torque when a force of 120 N is applied at lever end (ii) number of turns of flywheel before it comes to rest and (iii) time taken by flywheel to come to rest.