USN | | | | | | | | | | |

10ME/AU/TL44

Fourth Semester B.E. Degree Examination, June / July 2014
Kinematics of Machines

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. ***Graphical solutions may be obtained on graph sheets or on answer book itself.***

PART - A

1 a. Define the following : i) Kinematic chain ii) Mechanism iii) Structure iv) inversions v) Degrees of freedom. **(10 Marks)**

b. Sketch and explain the working of an elliptical trammel. Prove that it traces an ellipse. **(10 Marks)**

2 a. Explain with a neat sketch, crank and slotted lever quick return motion mechanism. **(08 Marks)**

b. Explain with a neat sketch, pantograph mechanism. State its applications. **(06 Marks)**

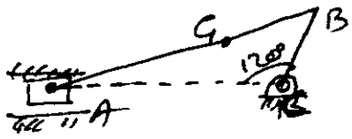
c. Explain with a neat sketch, Geneva mechanism. **(06 Marks)**

3 A single slider crank mechanism shown in fig. Q3 has the crank CB = 100mm and connecting rod BA = 300mm, with center of gravity G 100mm from B. The crank shaft has a speed of 75 rad/sec and an angular acceleration of 1200 rad/sec^2. Find

a. The velocity of 'G' and the angular velocity of AB.

b. The acceleration of 'G" and the angular acceleration of AB. **(20 Marks)**

Fig.Q3



4 a. State and prove Kennedy's theorem. **(06 Marks)**

b. Explain the analysis of velocity and acceleration of a piston in a single slider mechanism using Klein's construction. **(06 Marks)**

c. For a pin jointed four bar mechanism having the following dimensions. Fixed link AD = 4m, Driving link AB = 1.5m , Driven link CD = 2.5m , Connecting rod BC = 3m and angle BAD = 60^0, Link AB rotates at 25rpm. Determine using instantaneous centre method.
i) Angular velocity of link CD and ii) Angular velocity of link BC. **(08 Marks)**

PART - B

5 a. The crank of an engine is 20cm long and the connecting rod length to crank radius is 4. Determine the acceleration of the piston when the crank has turned through 45^0 from the inner dead center position and moving towards the other center at 240rpm, counter clock wise direction using complex algebra analysis. **(16 Marks)**

b. Explain in brief Loop closure equation. **(04 Marks)**

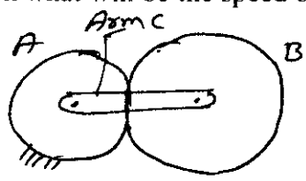
6 a. Derive an equation to determine the length of path of contact by a pair of mating spur gear. **(08 Marks)**

b. Two 20^0 involute spur gears have a module of 10mm and addendum of one module. The number of teeth on pinion is 13 and on the spur gear is 52. Does interference occur? If it occurs to what value should the pressure angle be changed to eliminate the interference? **(12 Marks)**

7 a. Explain with a neat sketch the "sun and planet wheel". **(04 Marks)**

b. In an epicyclic gear train, an arm carries two gears A & B having 36 & 45 teeth respectively. If the arm rotates at 150rpm in the anti clock wise direction about the center of gear 'A' which is fixed, determine the speed of the gear B. If the gear A instead of being fixed makes 300rpm in the clock wise direction what will be the speed of gear 'B'. **(16 Marks)**

Fig.Q7(b)



8 Construct the profile of a cam to suit the following specification :
Cam shaft diameter = 40mm
Least radius of cam = 25mm
Diameter of roller = 25mm
Angle of lift = 120^0
Angle of fall = 150^0
Lift of the follower = 40mm
No. of pauses are two of equal interval between motion. During the lift the motion is SHM. During the fall motion is UARM. The speed of cam shaft is uniform. The line of stroke is centre of the cam. **(20 Marks)**

*****