REG. No. | | | | | | | | | | | | | 9 |

B.E. DEGREE EXAMINATIONS, NOVEMBER 2011 (R 2008)
III Semester B.E. MECHANICAL ENGINEERING

ME 9203 KINEMATICS OF MACHINES

Time: 3 Hours **Max.Marks:100**

Answer ALL the Questions.
Sketches should be drawn neatly.
Give brief procedure for graphical constructions.
A3 size drawing sheet will be given on request. Use both sides of the drawing sheet, if necessary.
Assume missing data, if any, suitably and state them clearly.

PART – A (10 X 2 = 20 Marks)

1. Identify the planar mechanisms from the following list of drives, stating the reasons: Spur Gear, Helical Gear, Straight Bevel Gear, Spiral Bevel Gear, and Worm Gear.
2. State the differences between a double crank mechanism and a double rocker mechanism.
3. Write the general vector equation connecting velocities of two points of a link.
4. How will you determine the magnitude and direction of Coriolis acceleration ?
5. Sketch a cam mechanism with flat face follower and state its advantage.
6. Sketch any two specified contour cam shapes and distinguish them.
7. Write the equation to find the length of arc of contact between two meshing involute teeth gears.
8. How worm gear is different from other gears ?
9. State the relationship between coefficient of friction and angle of repose.
10. State the uses of crown in flat belt pulleys.

PART – B (5 x 16 = 80 Marks)

11. i) Briefly explain the following pairs with suitable sketches: Constrained, Unconstrained, and Successfully constrained. (3)
    ii) State and briefly explain the equations related to the following: a) Assembly condition for a four bar kinematic chain, and b) Grashof's Law. (5)
    iii) Sketch and explain the following mechanisms: a) Elliptic Trammel, and b) Peaucellier mechanism. (8)

12.A) A four bar mechanism is shown in **Fig. 12(A)**. Determine for this position of the mechanism:
   i) Using **Graphical Relative Velocity** method, the absolute linear velocity of the coupler point, **C** , the angular velocities of the coupler and the output link.. (6)
   ii) all the instant centres and validate the results of sub-division (i) by **instant centre** method. (8)
   iii) State the motives for acceleration analysis of mechanisms. (2)

(OR)

B) In a four bar crank rocker mechanism **PQRS**, the fixed link **PS** is 80 mm, input link **PQ** is 50 mm, Coupler **QR** is 60 mm, and the follower **RS** is 75 mm. For this mechanism, determine
   i) Swing angle of the Rocker, and Minimum and Maximum Transmission angles graphically. (8)
   ii) Validate the results of sub-division (i) analytically. (8)

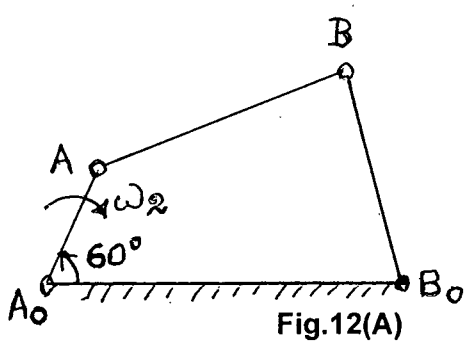

Fig.12(A)

AoBo = 70 mm
AoA = 30 mm
AB = 55 mm
BBo = 50 mm
AC = 25 mm
ω_2 = 3 rad/sec.

13.A) i) Sketch neatly, a cam mechanism with roller follower indicating the important parameters and define them. (10)

ii) Name the four important motion curves used for cam followers. With suitable sketches, explain which motion curve is best for high speed applications ? (6)

(OR)

B) i) State the advantages of cam mechanisms over linkage mechanisms. (4)

ii) Draw neatly, the displacement diagram and the cam profile for a cam with knife edge follower, for the following data:

Lift of the follower	= 40 mm	Offset of the follower	= 10 mm right to Cam axis
Angle of ascent	= 120°	Angle of dwell -1	= 90°
Angle of descent	= 80°	Angle of dwell -2	= 70°

During ascent the motion of the follower is Simple Harmonic and during descent is uniform acceleration and retardation. (12)

14.A) i) State and prove the fundamental law of gearing. Derive also, the velocity of sliding between meshing gears. (12)

ii) What is an involute of a circle ? State the advantages of involute tooth profile for gears. (4)

(OR)

B) i) Explain with neat sketches, different types of gear trains. (6)

ii) A planetary gear train has three gears, namely, Sun gear(S), Planet gear(P), and Ring gear(R). Sun gear, Ring gear, and the arm(A) which carries the planet gear all are rotating about the same . Axis. The outside gear R is fixed, and internally meshing with the gear P. The gear P, in turn Meshing with the gear S, externally. Numbers of teeth on gear R is 100, and gear P is 40. Find the speeds and directions of the gears S and P, when the arm A rotates 50 rpm clockwise. (10)

15.A) i) A Screw Jack has the following data: Pitch of the screw = 10 mm, Diameter of the screw = 50 mm, Co-efficient of friction between screw and nut = 0.125, and the Load = 35 kN. Assuming that the load rotates with the screw determine a) the ratio of torques required to raise and lower the load, and b) the efficiency of the screw jack. (10)

ii) Write short notes on the following: a) Uniform pressure theory in friction, and b) Uniform wear theory in friction. (6)

(OR)

B) i) In a crossed flat belt drive, the shaft centres are 4 m apart. Diameters of the smaller pulley and larger pulley are 250 mm and 400 mm respectively. Determine the exact length required for the flat belt, sketching the arrangement. (6)

ii) Derive from fundamentals, the equation for ratio of tensions in a flat-belt drive. (10)

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