[4758]-514

T.E. (Mechanical / Automobile Engg. / Mech. S/W)
THEORY OF MACHINES - II
(2012 Course) (Semester - I) (End - Sem.) (302043)

Time : 2½ Hours]   *[Max.Marks :70*

Instructions to the candidates:

1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right side indicate full marks.*

4) *Assume suitable data, if necessary.*

Q1) a) State and prove the law of gearing.   **[6]**

b) Explain with the help of neat sketch, the various forces acting on the tooth of a helical gear with usual notations. Also obtain the inter - relationship in between them.   **[6]**

OR

Q2) a) Compare the cycloidal and involute gear tooth profile.   **[6]**

b) A three start worm has pitch diameter of 80mm and a pitch of 20mm. It rotates at 600 rpm and drives a 40 tooth worm gear. If coefficient of friction is 0.05, find   **[6]**

 i) The helix angle of the worm.

 ii) The speed of the gear.

 iii) The centre distance.

Q3) Classify different types of gear trains with neat sketch, explanation with merit, demerits and application.   **[8]**

OR

Q4) Explain tabulation method for Sun and planet gear train and write speed of different elements. **[8]**

Q5) a) Describe cone variators used to transmit the power between parallel, non parallel and intersecting shaft axes. **[6]**

b) Each road wheel of a motor cycle has a mass moment of inertia 1.5 kg-m^2. The rotating parts of the engine of the motor cycle have a mass moment of inertia of 0.25 kg-m^2. The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle with its rider is 250 kg and its center of gravity is 0.6 m above the ground level. Find the angle of heel, if the motor cycle is travelling at 50 km per hour and is taking a turn of 30 m radius. Wheel diameter is 0.6m. **[10]**

OR

Q6) a) What is the PIV chain drive? Compare it with axially displaceable cone drive using rubber belt. **[6]**

b) The turbine rotor of a ship is of mass 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm, clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: **[10]**

i) When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/hr;

ii) When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.

Q7) a) Explain the following terms related to kinematic synthesis **[6]**

i) Function generation,

ii) Path generation and

iii) Body guidance (Motion generation).

b) Synthesize a four-bar mechanism to generate a function $y = 2 \log_{10} (x)$ and x varies from 2 to 4 with an interval of 1. Assume θ to vary from 30° to 70° and ϕ from 40° to 100°. Starting position of input and output link is 30° and 40°. If length of fixed link is 1 unit determine other link lengths and draw mechanism in its first position. **[10]**

OR

Q8) a) Write short notes on [6]

       i) Precision positions,

       ii) Structural error,

       iii) Chebychev spacing.

    b) Synthesis a four bar mechanism by the method of inversion. [10]

       Assume the following data,

       i) Length of fixed link is 100 mm and input link length is 30mm.

       ii) Initial position of input link $30°$ and 2- positions of the input link from the initial position $30°$ and $60°$.

       iii) 2-positions of the output link from the initial position $20°$ and $40°$.

       And determine the length of coupler link, output link and initial position of output link.

Q9) The following data relate to a cam profile in which the follower moves with cycloidal motion during lift and returning it with uniform acceleration and retardation, acceleration being ½ of the deceleration. Minimum radius of cam is 30mm, roller radius is 10 mm, lift of follower is 45 mm, offset of follower axis is 12 mm towards right, angle of ascent is $80°$, angle of decent $120°$, angle of dwell between ascent and decent is $50°$ & speed of cam 175 rpm. Draw cam profile & determine maximum velocity and acceleration during lift. **[18]**

OR

Q10) a) Write short note on Jump phenomenon in cam system. [6]

    b) What do you mean by Advanced Cam Curves? Explain 3-4-5 polynomial curve. [6]

    c) Derive expressions for displacement for circular arc cam operating a flat faced follower, when the contact is on the circular flank. [6]

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