Total No. of Questions : 10]

SEAT No. : [ ]

P1693

[Total No. of Pages :4

[5058]-314
T.E.(Mechanical)
THEORY OF MACHINES-II
(2012Course)(Semester-I)

Time :2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Define the following terms & explain the significance. **[2]**

i) Pressure angle

ii) Contact ratio.

b) A pair of involute spur gears with 20° pressure angle mesh externally and give a speed reduction 3:1. The module is 3mm and addendum is 1.1 module. If the pinion rotates at 120 rpm, determine **[8]**

i) Minimum number of teeth on each wheel.

ii) Contact ratio.

OR

Q2) a) Define the following terms & explain the significance **[4]**

i) Normal circular pitch

ii) Helix angle.

iii) Centre distance in spiral gears

iv) Lead angle of worm.

b) Derive an expression for efficiency of spiral gears. **[6]**

P.T.O.

Q3) A drive is made up of two spiral gears of same hand, same diameter & of normal pitch 14 mm. The centre distance between the axes of shaft is approximately 150mm. The speed ratio is 1.6 & the angle between shaft axes is 75°. Assuming coefficient of friction 0.105 determine. **[10]**

i) Spiral angle on each wheel.

ii) Number of teeth on each wheel.

iii) Efficiency of drive

iv) Maximum efficiency.

OR

Q4) The annulus A in an epicyclic gear train rotates at 300 rpm about the axis of fixed sun gear which has 80 teeth. A three armed spider is driven at 180 rpm. Determine the number of teeth required on planet P. Refer Fig.1 **[10]**

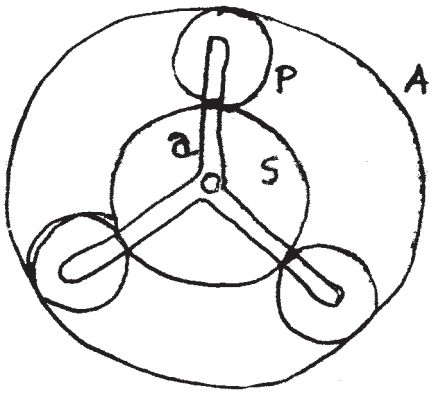

Fig. 1

Q5) a) Explain the advantages and disadvantages of stepped regulation and stepless regulation drives in context of automotive application. **[4]**

b) Explain the following **[12]**

i) Disc variator

ii) Cone variator

iii) Continuous variable Transmission

iv) Infinitely variable Transmission

OR

Q6) A rotor of the turbine of a ship has a mass of 2500 kg and rotates at a speed of 3200 rpm. Counter clockwise as seen from stern. The rotor has a radius of gyration of 0.4 m. Determine the gyroscopic couple and its effect when

a) Ship steers to the left in a curve of 80m radius at a speed of 7.75 m/s

b) Ship pitches 5 degrees above and below the mean position and the bow is descending with its maximum velocity. The pitching motion is SHM with a periodic time of 40 seconds.

c) Ship rolls and at instant, its angular velocity is 0.4 rad/s clock wise when viewed from stern . Also find the maximum angular acceleration during pitching.

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Q7) a) Explain the following terms **[8]**

i) Precision points

ii) Function generation

iii) Body guidance

iv) Chebysheve spacing

b) Design a slider crank mechanism to coordinate three positions of the input and output links for the following data by inversion method. **[8]**

$\theta_{12} = 30°$ $S_{12} = 40$ mm

$\theta_{13} = 60°$ $S_{13} = 96$ mm.

Eccentricity = 20 mm

OR

Q8) a) Design a four link mechanism to coordinate three positions of input and output links for the following angular displacements by inversion method.

$\theta_{12} = 35°$ $\phi_{12} = 50°$

$\theta_{13} = 80°$ $\phi_{13} = 80°$ **[8]**

b) Design a slider crank mechanism to coordinate three positions of crank and slider for the following data by relative pole method. **[8]**

$\theta_{12} = 40°$ $S_{12} = 180$ mm

$\theta_{13} = 120°$ $S_{13} = 300$mm

Take eccentricity of slider as 20 mm.

Q9) a) Derive an expression for displacement, velocity and acceleration of a flat faced follower when it makes contact with a circular arc cam at **[14]**

i) Circular Flank

ii) Nose

b) Explain advanced cam curves. **[4]**

OR

Q10) A cam is to give the following motion to a knief edge follower

- To raise the follower through 30 mm with uniform acceleration and deceleration during 120° rotation of cam.
- Dwell for next 30°
- To lower the follower with SHM during next 90° rotation of cam
- Dwell for rest of cam rotation

Use following data to draw the cam profile

Minimum radius of cam 30 mm

Speed 800 rpm counter clockwise

Follower axis inline.

Also draw displacement, velocity and acceleration diagrams for the motion of follower in one complete rotation given to the cam, indicating the main values.

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