[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2123)

1364

B. Tech 3rd Semester Examination

Kinematics of Textile Machines (O.S.)

ME-3051

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

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all by choosing atleast one question from each section; however, Q. No. 9 (Section E) is compulsory. Assume missing data if any. Non programmable calculators can be used, no other electronic devices are permitted.

SECTION - A

1. (a) What do you understand by the term mechanism? With suitable examples explain how are these classified?

   (b) The crank and connecting rod of an engine are 0.5 and 2 m long respectively. The crank rotates at 180 rpm in clockwise direction. When it has turned 45° from inner dead centre determine:

   (a) Velocity of piston

   (b) Angular velocity of connecting rod

   (c) Velocity of a point 1.5 m from the gudgeon pin

   (d) Velocity of rubbing at one pins of the crankshaft and crank if the diameter of the pins are 5 cm and 3 cm respectively.

   (5+15=20)

2. (a) What do you understand by the term Instantaneous Centre? How can it be located?

   (b) Locate all the instantaneous centres in the linkage shown in Fig. 1. **(5+15=20)**

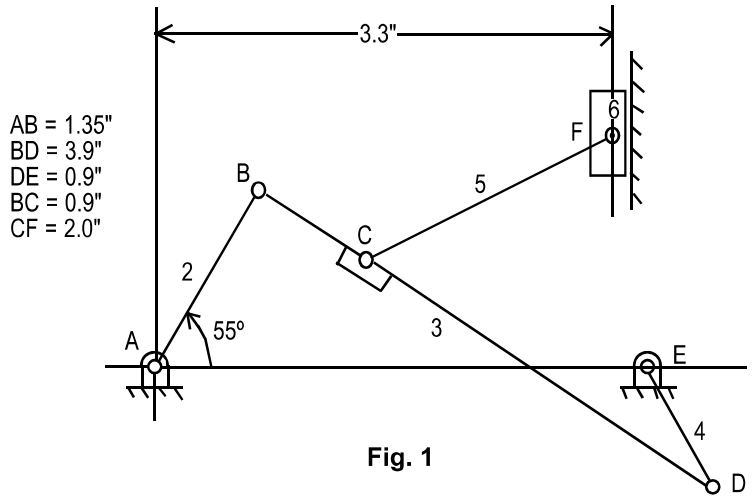


Fig. 1

SECTION - B

3. (a) In which type of engine speed fluctuation will be maximum and why?

   (b) The resisting torque on the crank of a riveting machine is 200 Nm for first 90°, from 90° to 135° is 1600 Nm then it drops linearly to 200 Nm upto 180° and remains the same upto 360°. The duration of cycle is 2 sec. The motor driving the machine, however, has a speed of 1450 rpm and it delivers constant torque. The crank shaft of the machine is geared to the motor shaft. The speed fluctuation is limited to ± 2% of mean speed. Determine :

   (i) power of the motor, and

   (ii) moment of inertia of the flywheel mounted on the motor shaft. **(5+15=20)**

4. (a) What is the relation of power transmitted by belt? Deduce appropriate relation for maximum power transmission by the belt.

   (b) What is phenomenon of creep in belts? What role does it play in power transmission?

   (c) From the results of the condition given, state the significance of power lost due to creep. Driving pulley of 1 m diameter runs at 300 rpm, driven pulley 2.5 m diameter. The dimensions of belt are: width=50cm and thickness=10 mm. The tensions on the tight side of the belt and the slack side of the belt are 100 N/cm and 40 N/cm respectively. E=10kN/cm^2. **(5+5+10=20)**

SECTION - C

5. (a) What is the law of gearing? Deduce the relationship.

   (b) Two mating involute gears of 20° pressure angle have a gear ratio of 2. The number of teeth on pinion is 20. The speed of pinion is 250 rpm and module is 12 mm. If the addendum on each wheel is such that the path of approach and path of recess on each side are of half the maximum possible length each, find:

   (i) Addendum for pinion and gear

   (ii) Length of arc of contact

   (iii) Maximum velocity of sliding during approach and recess

(5+15=20)

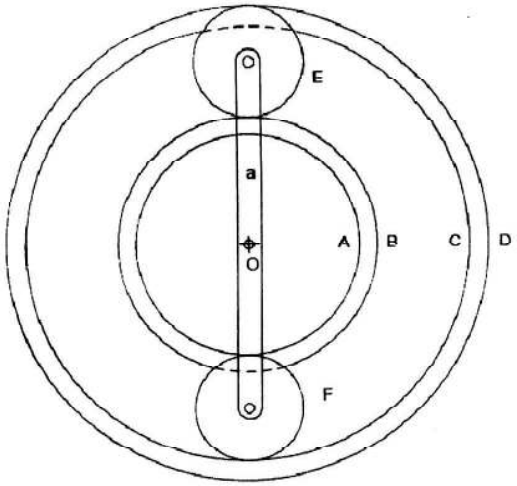
6. (a) What are gear trains? With suitable examples classify the gear trains.

   (b) In the epicyclic gear train shown in Fig below, the compound wheels A and B as well as internal wheels C and D rotate independently about the axis O. The wheels E and F rotate on the pins fixed to arm a. All the wheels are of the same module. The number of teeth on the wheels are A = 52, B = 56, E = F = 36. Determine the speed of C if

   (i) the wheel D fixed and arm a rotates at 200 rpm clockwise

   (ii) the wheel D rotates at 200 rpm counter-clockwise and the arm a rotates at 20 rpm counter-clockwise.

(5+15=20)



SECTION - D

7. (a) Why is a cycloidal motion programme the most suitable for high-speed cams? Explain with appropriate reasoning.

   (b) The following data relate to a symmetrical circular cam operating a flat-faced follower:
   Minimum radius of the cam 40 mm
   Lift 24 mm
   Angle of lift 75°
   Nose radius 8 mm
   Speed of the cam 420 rpm
   Determine the main dimensions of the cam and the acceleration of the follower at
   a. the beginning of the lift
   b. the end of contact with the circular flank
   c. the beginning of contact with the nose
   d. the apex of nose. **(5+15=20)**

8. a) What is balancing? Why is it required? Explain the ill effects of unbalanced parts in any machine with suitable examples.

   (b) Four masses A, B, C, and D are completely balanced. Masses C and D make angles 80° and 200° respectively with B in the same sense. The rotating masses have the following properties: m_b = 25 kg, m_c = 50 kg, m_d = 35 kg, r_a = 150 mm, r_b =200 mm, r_c = 100 mm, r_d = 180 mm, planes B and C are 250 mm apart. Determine the mass A and its position; position of planes A and D. **(5+15=20)**

SECTION - E

9. (a) With simple example explain how structure is converted into a mechanism?
   (b) Explain how sliding pair is an extension of turning pair?
   (c) State the difference between cycloidal and involute tooth profile?
   (d) What are the advantages of helical gears over spur gears?
   (e) What is undercutting in cam? What is its significance in cam design?
   (f) Why tangent cam is not used with flat-faced follower?
   (g) What is pressure angle in cam? Explain its significance.
   (h) What is the material composition for V-belts? Write the advantages/disadvantages of such belts.
   (i) How are chain drives different to belt and rope drives? Enumerate with suitable examples.
   (j) Why flywheels are used in punching machines? **(2×10=20)**