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Question Paper Code: 34702

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Mechanical Engineering

01UME402 – KINEMATICS OF MACHINERY

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Write down Kutzbach criterion to find the mobility of a planar mechanism.
2. Define kinematic pair and illustrate any two types of constrained pair.
3. Define Kennedy's theorem.
4. How will you determine the magnitude and direction of coriolis component of acceleration?
5. Define (a) pressure angle (b) pitch curve of radial cam.
6. Define the term trace point.
7. How epicyclic gear train differs from the other type of gear trains?
8. What are the different types of gears?
9. Give the condition for maximum efficiency of a screw jack.
10. Differentiate: slip and creep of belt.

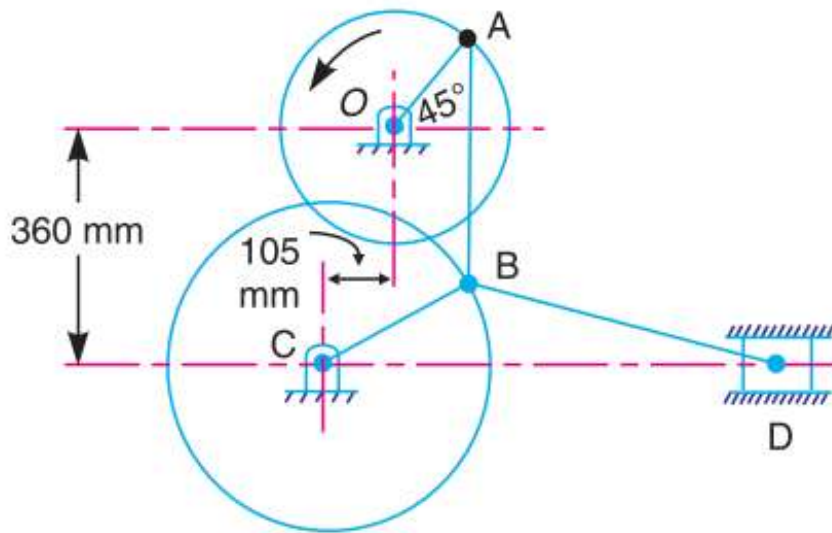
PART - B (5 x 16 = 80 Marks)

11. (a) Briefly explain the following inversions (i) beam engine (ii) elliptical trammels (iii) crank and slotted lever quick return mechanism. (16)

Or

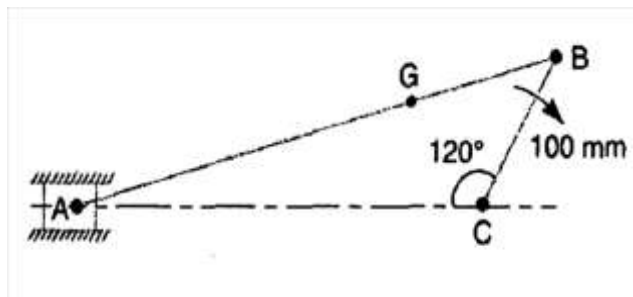
(b) Discuss about clamping and indexing mechanisms with neat sketches. (16)

12. (a) In the toggle mechanism shown in figure, the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter clockwise direction at a speed of 180 r.p.m. The dimensions of the various links are as follows: $OA = 180 \text{ mm}$; $CB = 240 \text{ mm}$; $AB = 360 \text{ mm}$; and $BD = 540 \text{ mm}$. For the given configuration, find velocity of slider D and angular velocity of links AB , CB and BD . (16)



Or

- (b) An engine mechanism is shown in Fig. below. The crank $CB = 100 \text{ mm}$ and the connecting rod $BA = 300 \text{ mm}$ with centre of gravity G , 100 mm from B . In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s^2 . Find: 1. Velocity of G and angular velocity of AB , and 2. Acceleration of G and angular acceleration of AB . (16)



13. (a) Construct the profile of a cam to suit the following specifications: cam shaft diameter 40mm ; least radius of cam 25mm ; diameter of roller 25mm ; angle of lift 120° ; angle of fall 150° ; lift of the follower 40mm ; number of pauses are two of equal interval between motions. During the lift, the motion is S.H.M. During the fall, the motion is UAUR. The speed of the cam shaft is uniform. The line of stroke of the follower is offset by 12.5mm from the center of the cam. (16)

Or

- (b) A symmetrical circular cam operating a flat faced follower has the following particulars: minimum radius of the cam 30 mm ; total lift 20 mm ; angle of lift 75° ; Nose radius 5 mm ; speed 600 rpm . Find the principal dimensions of the cam. (16)
14. (a) A pair of gears, having 40 and 20 teeth respectively, are rotating in mesh, the speed of the smaller being 2000 r.p.m . Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are 20° involute form, addendum length is 5 mm and the module is 5 mm . Also find the angle through which the pinion turns while any pairs of teeth are in contact. (16)

Or

- (b) Two mating gears have 20 and 40 in-volute teeth of module 10mm and 20° pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio. (16)
15. (a) A load of 15 kN is raised by means of a screw jack. The mean diameter of the square threaded screw is 42 mm and the pitch is 10 mm . A force of 120 N is applied at the end of a lever to raise the load. Determine the length of the lever to be used and the mechanical advantage obtained. Is the screw self locking? Take $\mu = 0.12$. (16)

Or

- (b) A leather faced conical clutch has a cone angle of 30° . If the intensity of pressure between the contact surfaces is limited to 0.35 N/mm^2 and the breadth of the conical surface is not to exceed of the mean radius. Determine the dimensions of the contact surfaces to transmit 22.5 kW at 2000 rpm . Assume uniform wear rate and $\mu = 0.15$. (16)

