Reg. No. : | | | | | | | | | | |

Question Paper Code: 31472

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

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. What will be the rubbing velocity at pin joint when two links move in the same and opposite directions?
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. What is maximum velocity and acceleration of the follower on the return stroke in SHM?
7. Describe the undercutting of gears.
8. Explain briefly the use of differential in an automobile.
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)

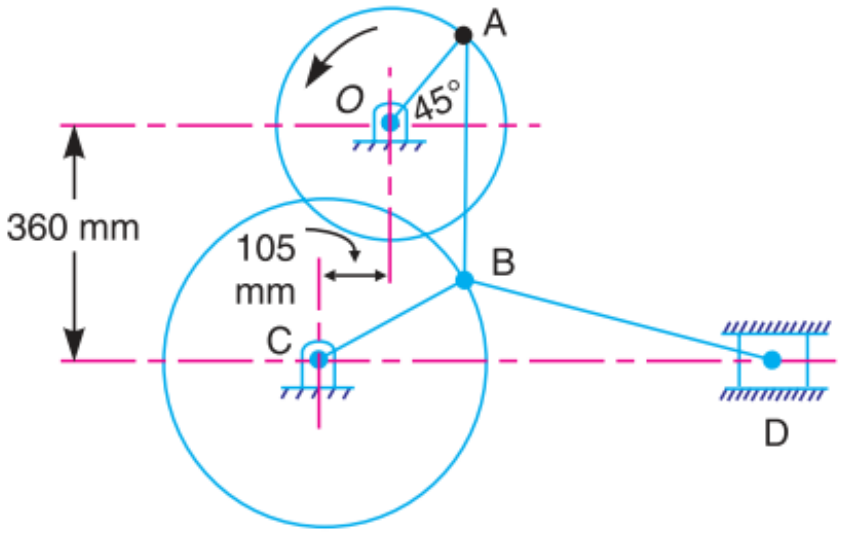
11. (a) Briefly explain the following inversions (i) beam engine (ii) elliptical trammels (iii) crank and slotted lever quick return mechanism. (16)

Or

(b) (i) Describe the peaucellier mechanism with neat sketch. (6)

(ii) Summarize the different kinds of kinematic pairs with examples. (10)

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 *mm*; *CB* = 240 *mm*; *AB* = 360 *mm*; and *BD* = 540 *mm*. For the given configuration, find velocity of slider *D* and angular velocity of links *AB*, *CB* and *BD*. (16)



Or

(b) *PQRS* is a four bar chain with link *PS* fixed. The lengths of the links are *PQ* = 62.5*mm*; *QR* = 175*mm*; *RS* = 112.5 and *PS* = 200*mm*. The crank *PQ* rotates at 10 *rad/s* clockwise. Draw the velocity and acceleration diagrams when angle *QPS* = 60° and *Q* and *R* lie on the same side of *PS*. Find the angular velocity and angular acceleration of links *QR* and *RS*. (16)

13. (a) Construct the profile of a cam to suit the following specifications: cam shaft diameter 40*mm*; least radius of cam 25*mm*; diameter of roller 25*mm*; angle of lift 120°; angle of fall 150°; lift of the follower 40*mm*; 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 12.5*mm* from the center of the cam. (16)

Or

(b) (i) 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. (12)

(ii) Briefly discuss the different types of followers. (4)

14. (a) (i) Describe the advantages and applications of helical and bevel gears. (4)

(ii) Two mating gears have 20 and 40 in-volute teeth of module 10*mm* and 20^o 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. (12)

Or

(b) Two shafts *A* and *B* are co-axial. A gear *C* (50 teeth) is rigidly mounted on shaft *A*. A compound gear *D-E* gears with *C* and an internal gear *G*. *D* has 20 teeth and gears with *C* and *E* has 35 teeth and gears with an internal gear *G*. The gear *G* is fixed and is concentric with the shaft axis. The compound gear *D-E* is mounted on a pin which projects from an arm keyed to the shaft *B*. Sketch the arrangement and find the number of teeth on internal gear *G* assuming that all gears have the same module. If the shaft *A* rotates at 110 *r.p.m.*, find the speed of shaft *B*. (16)

15. (a) (i) A pulley is driven by a flat belt, the angle of lap being 1200. The belt is 100*mm* wide by 6*mm* thick and density $1000 Kg/m^3$. If the coefficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2*MPa*, find the greatest power which the belt can transmit and the corresponding speed of the belt. (12)

(ii) Derive an expression for braking torque on the drum of simple band brake. (4)

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)
