

CBCGS SCHEME

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15AU43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Kinematics of Machines

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat figure explain construction and working of crank and slotted lever mechanism. (08 Marks)
- b. Determine mobility of the mechanisms given below :
 - i)
 - ii)

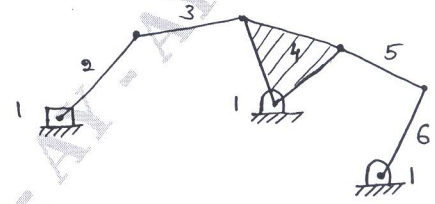
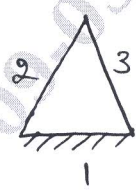


Fig.Q1(b)

(08 Marks)

OR

- 2 a. With neat figure explain construction and working of Ratchet and Pawl mechanism. (08 Marks)
- b. Represent the construction of Ackermann steering gear mechanism and discuss on fundamental equation for correct steering. (08 Marks)

Module-2

- 3 a. Define :
 - i) Linear velocity
 - ii) Angular velocity
 - iii) Linear acceleration
 - iv) Angular acceleration. (06 Marks)
- b. A four bar mechanism ABCD is made up of four links, pin jointed at the ends. AD is a fixed link which is 180mm long. The links AB, BC and CD are 90mm, 120mm and 120mm long respectively. At certain instant, the link AB makes an angle of 60° with the link AD. If the link AB rotates at a uniform speed of 100 rpm clockwise determine :
 - Angular velocity of the links BC and CD
 - Angular acceleration of the links CD and CB. (10 Marks)

OR

- 4 a. Discuss on Arnold – Kennedy theorem. (08 Marks)
- b. In a slider crank mechanism shown in Fig. Q4(b), the crank OA = 300mm and connecting rod AB = 1200mm. The crank OA is turned 30° from IDC. Locate all the instantaneous centres. If the crank rotates at 15 rad/sec clockwise find :
 - i) velocity of slides B
 - ii) angular velocity of connecting rod AB.

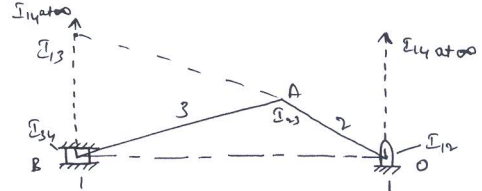


Fig.Q4(b)

(08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain Klein's construction for slider crank mechanism. (08 Marks)
 b. Determine the velocity and acceleration of the piston by Klein's construction to the following specifications. Stroke = 300mm ; ratio of length of connecting rod to crank length = 4 ; speed of the engine = 300rpm ; position of crank = 45° with IDC. (08 Marks)

OR

- 6 a. Derive an expression for velocity and acceleration of the piston in a reciprocating mechanism by using complex algebra method. (08 Marks)
 b. If the crank and connecting rod are 150mm and 600mm long respectively and the crank rotation at a constant speed of 100 rpm, determine :
 i) Velocity and acceleration of piston
 ii) Angular velocity and angular acceleration of connecting rod. The angle which the crank makes with the inner dead centre is 30° . (08 Marks)

Module-4

- 7 a. Derive expression for length of arc of contact of spur gear. (08 Marks)
 b. Two spur gears have 30 teeth each of involutes shape. The circular pitch is 25mm. Pressure angle = 20° . Determine the addendum of wheels if arc of contact is twice the circular pitch. (08 Marks)

OR

- 8 a. With neat figure explain :
 i) Compound gear train
 ii) Simple gear train
 iii) Reverted gear train
 iv) Epicyclic gear train. (08 Marks)
 b. Two spur gears A and B of an epicyclic gear train is shown in Fig.Q8(b) have 24 and 30 teeth respectively. The arm rotates at 100rpm clockwise direction . Find the speed of gear B on its own axis when gear A is fixed. If instead of being fixed the wheel 'A' rotates at 200rpm in CCW direction, what will be the speed of 'B'?

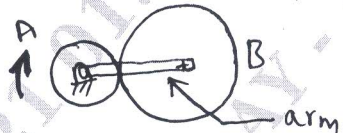


Fig.Q8(b)

(08 Marks)

Module-5

- 9 A cam with 3cm as minimum radius is rotating clockwise at a uniform speed of 1200 rpm and has to give the motion to the knife edge follower as defined below :
 i) Follower to move outward through 3cm during 120° of cam rotation with SHM
 ii) Dwell for the next 60°
 iii) Follower to return to its starting position during the next 90° with UARM
 iv) Dwell for the remaining period.
 v) Draw the cam profile. Follower axis passes through cam axis. Also find the maximum velocity and acceleration during outward and inward or return stroke. (16 Marks)

OR

- 10 Draw to full size the profile of a cam which will give a lift of 38mm to a follower carrying a roller of 25mm diameter. The axis of the follower is off-set by 18mm to the right of the axis of cam. Ascent of the follower takes place with SHM in 0.05 second followed by a period of rest 0.0125sec. The follower by then descent with UARM during 0.125 second, the acceleration being $3/5$ times retardation. The cam rotates in clockwise direction at a constant speed of 240rpm and the base circle radius is 50mm. (16 Marks)