Question Paper

Exam Date & Time: 24-Nov-2018 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
THIRD SEMISTER B Sc.EXAMINATION NOV 2018

KINEMETICS OF MACHINES [IMET 232]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

Missing data if any may be suitably assumed

1) A) What do you mean by inversion of a mechanism? Elaborate on the inversions of double slider crank chain with examples. (7)

B) Elaborate on the operation of a reverted gear train, with the aid of neat sketch. (6)

C) Why are parallel-crank four-bar linkage and deltoid linkage considered special cases of four-link mechanism? Support your answer with Grashof's law. (7)

2) A) For the Mechanisms shown in the Fig Q2A(i) and Q2A(ii). Calculate the number links, joints, and degrees of freedom. (10)

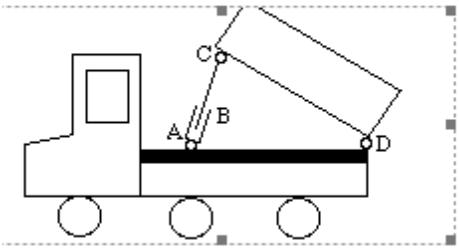


Fig Q2A (i)

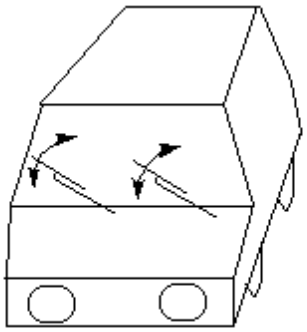
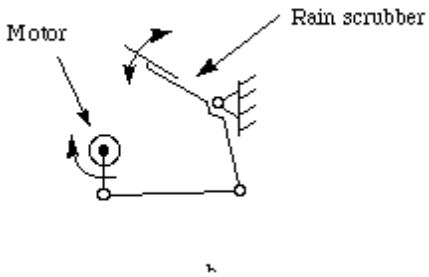


Fig Q2A(ii)



B) Explain step by step procedure of constructing the velocity and acceleration diagrams for the slider crank mechanism. (10)

3) (10)

A)

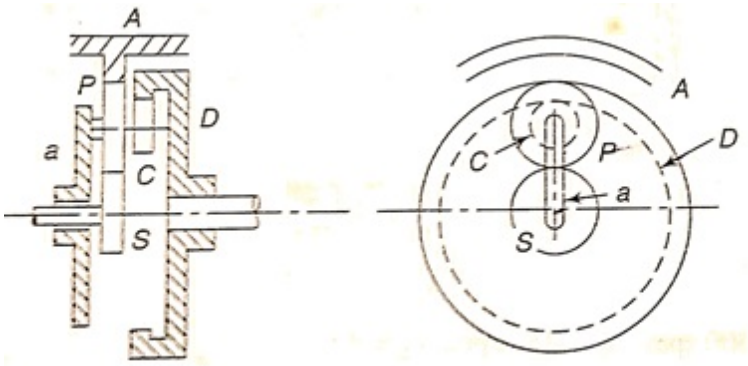


Fig Q3. Epicyclic Gear Train

B) What is Four bar mechanism? In detail elaborate on any three inversions examples of the four bar mechanism with an aid of diagrams. (10)

4) A) Derive an expression for frictional torque in flat pivot bearing using uniform pressure theory. (8)

B) Elucidate on the positive drive cams. Cite an example of the same. (5)

C) Illustrate the mechanism that allows intermittent rotary motion in only one direction while preventing motion in the opposite direction and enumerate the applications of this mechanism. (7)

5) A) Enumerate the step by step procedure of constructing the cam profile, with roller follower which has simple harmonic motion. (8)

B) What is Kutzback's criterion for degree of freedom of freedom of plane mechanisms? In what way is Grubler's criterion different from it? (8)

C) In what way are the angular acceleration of the output link and the coupler found? (4)

6) A) Elaborate on the different types basic rotating unbalance masses with an aid of neat sketches. (8)

B) What are the different types of constrained motion? Elaborate on each type with a suitable example. (6)

C) Derive an expression for perfect steering and in detail explain the Ackerman steering gear mechanism. (6)

7) A) Fig. 7A. Shows an epicyclic gear train. Pinion A has 15 teeth and is rigidly fixed to the motor shaft. The wheel B has 20 teeth and gears with A and also with the annular fixed wheel E. Pinion C has 15 teeth and is integral with B (B, C being a compound gear wheel). Gear C meshes with annular wheel D, which is keyed to the machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheel B, C. If the motor runs at 1000 RPM, find the speed of the machine shaft. Find the torque exerted on the machine shaft, if the motor develops a torque of 100 N-m. (10)

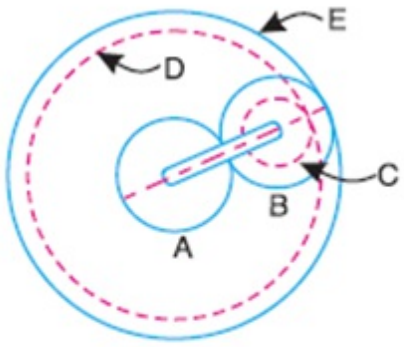


Fig. 7A : Epicyclic Gear Train.

B) For the kinematic linkages shown in the Fig 7B. Calculate the number links, joints and degrees of freedom. (10)

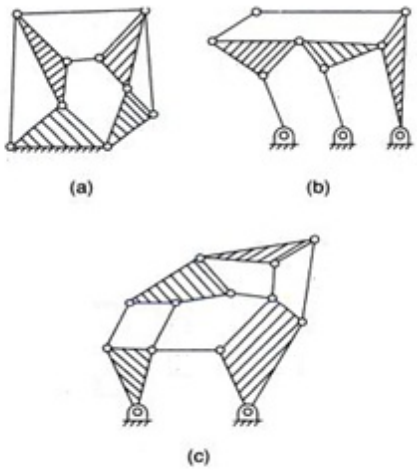


Fig.7B: Kinematic Linkages

8) A) What do you understand by radial acceleration and tangential acceleration of a link in a planar mechanism? Derive an equation for the same. (6)

B) What do you mean by Kinematic pair? Carry out the detailed classification of the same. (8)

C) List out the differences between the Machine and Structure . (6)

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