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Printed Pages: 6 | 412 | NME-502

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 140502 Roll No. | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION 2015-16

KINEMATICS OF MACHINES

[Time:3 hours] **[Total Marks:100]**

SECTION-A

Attempt **all** parts. Write answer in brief. (10x2=20)

1. (a) Write the difference between a machine and structure.

   (b) List different types of instantaneous centres and write formula to find the number of IC for four bar mechanism.

   (c) Briefly explain the formation of involute tooth profile.

   (d) Define degree of freedom and explain Kutzbach Criterion to Plane Mechanisms.

   (e) What are different types of links?

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(f) Define module and circular pitch for a gear profile.

(g) List factors on which power transmission of belt pulley system depends.

(h) Explain pitch circle and pressure angle for a cam profile.

(i) Write relation for a kinematic chain and describe the condition for locked and unconstrained chain.

(j) Draw any one inversion of four bar chain mechanism.

SECTION-B

Attempt **any five** questions. Each question carries equal marks. (5x10=50)

2. Define and explain with neat sketch types of constrained motions.

3. A single slider crank chain mechanism shown in fig. 1 having crank OA=20 cm, connecting rod AP=70 cm and angular velocity of crank is 10 radian per second. Find the velocity of piston P, angular velocity of link PA and the velocity of Point B at a distance of 20 cm from A on link AP when $\theta = 45°$.

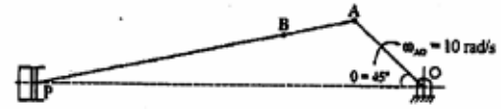

Fig.1

4. Define the fundamental law of gearing. Derive the condition that must be satisfied for two bodies having constant velocity ratio.

5. A cam operates a roller, in line reciprocating follower, while rotating at 300 rpm, The further specifications are: Minimum radius of cam=25mm, lift of follower=30 mm (SHM in nature), Diameter of roller=15 mm, Angle of lift=120°, dwell angle=30° Angle of return =150°(Uniform retardation in nature). Draw the cam profile and fine the maximum velocity and acceleration of the follower during lift as well as return.

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6. In Fig.2, the angular velocity of the crank OA is 600 rpm. Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of 75° to the vertical. The dimensions of various links are:OA=28 mm; AB=44 mm'BC=49 mm;and BD=46 mm. the centre distance between the centres of rotation O and C is 65 mm. the path of travel of the slider is 11 mm below the fixed point C. The slider moves along a horizontal path and OC is vertical.

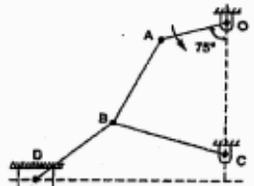

Fig. 2

7. Derive the relationships for frictional torque acting on a plate clutch using uniform pressure and uniform wear theory.

8. The speed ratio of the reverted gear train, as shown in fig.3, is to be 12. The module of gears A and B is 3.125 mm and of gears C and D is 2.5 mm. Calculate the suitable numbers of teeth for the gears. No gear is to have less than 24 teeth.

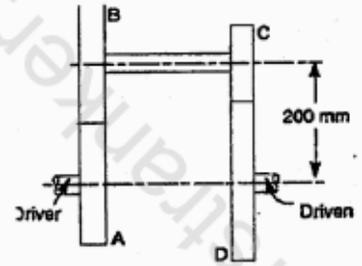

Fig 3

9. Explain and derive the realtionship for Hart's mechanism to prove that it is a exact straight line mechanism.

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SECTION-C

Attempt **any two** questions. Each question carries equal marks. (2x15=30)

10. Explain Coriolis component of acceleration and show that the magnitude of Coriolis component of acceleration is $2V\omega$. Where V is the linear velocity of slider.

11. Derive the expression for the path of contact and arc of contact for involute in contact.

12. An epicyclic gear consists of three gears A, B and C as shown in Fig. 4. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C.

Fig 4

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