

Registration No. :

--	--	--	--	--	--	--	--	--	--

Total number of printed pages – 3

B. Tech.
CPME 6201

Third Semester Examination – 2010

MACHINE DYNAMICS – I

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

1. Answer the following question briefly : 2×10
- (a) Define kinematic links.
 - (b) How kinematic pairs are classified ?
 - (c) Give two examples of mechanisms which are based on four-bar chain.
 - (d) Why square threads are preferred for power transmission screws ?
 - (e) What is the importance D'Alembert's principle?
 - (f) What is crowning of pulleys in flat belt drives ? Why it is required ?
 - (g) What are the effects of centrifugal tension in belt drives ?
 - (h) Explain what a riveted gear train is.
 - (i) Explain where uniform pressure theory and uniform wear theory is used for power transmissions in clutch mechanisms.
 - (j) How transmission type of dynamometers are different absorption type of dynamometers ?

P.T.O.

2. In a four bar chain ABCD, AD is the fixed link and is 150 mm long. The crank AB is 40 mm long and rotates at 120 rpm clockwise, while the link CD is 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of the link CD when the angle BAD is 60° . 10
3. (a) Show that slider crank mechanism is an inversion modification of the basic four-bar mechanism. 2
- (b) The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Using Klein's construction method find out: 8
- (i) velocity and acceleration of the piston,
- (ii) velocity and acceleration of the mid point of the connecting rod and
- (iii) angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to the inner centre.
4. (a) What are the conditions to be satisfied to have an equivalent dynamic system? 2
- (b) The following data relates to a connecting rod of a reciprocating engine:
Mass = 50 kg; distance between bearing centres = 900 mm; diameter of small end bearing = 80 mm ; diameter of the big end bearing = 100 mm ;
Time of oscillation, when the connecting rod is suspended from small end = 1.85s; Time of oscillation, when the connecting rod is suspended from big end = 1.7s. Determine : 8
- (i) the radius of gyration of the rod about an axis passing through the centre of gravity and perpendicular to the plane of oscillation,
- (ii) the moment of inertia of the rod about the same axis and
- (iii) the dynamic equivalent system for the connecting rod, constituted of two masses, one of which situated at small end.

5. (a) What is the difference between clutch and brake ? 2
- (b) A single plate clutch transmits 7.5 kW at 900 rpm. The axial pressure is limited to 0.07 N/mm^2 . The coefficient of friction is 0.25. If the outer radius is 25% more than inner radius find the inner radius and outer radius of the clutch plate. 8
6. (a) Classify different types of gear trains. 2
- (b) An epicyclic gear train consists of a sun wheel 'S', a stationary internal gear 'E' and three identical planet wheels 'P' carried on a star-shaped planet carrier 'C'. The number of teeth of wheel 'S' is 40 and of internal gear 'E' is 90. Determine : 8
- (i) number of teeth of the different planet wheels
- (ii) If sun wheel 'S' rotates at 120 rpm clockwise find the speed of the planet carrier 'C'.
7. (a) Explain the phenomena of 'slip' and 'creep' in a belt drive. 2
- (b) Derive an expression to find tension ratio for flat belt drives. Use standard notations. How it varies when centrifugal force is considered 8
8. (a) Classify different types of brakes. Briefly describe working of any one brake. 5
- (b) Classify different types of dynamometer. Explain with sketches one form of torsion dynamometer. 5