SUPPLEMENTARY EXAMINATION   February -2019

ME-261 Kinematic and Dynamic of Machines

Time: 3:00 Hours   Max. Marks : 40

Note: Q. No. 1 is compulsory.
Attempt any *four* from the rest
Assume suitable missing data, if any.

Q.1 Answer any *six*   (6*2=12)

a) Explain Grubler's criteria for finding DOF of a body in space.

(b) Write a note on types of Kinematic pairs.

(c) Draw a turning moment diagram for a four stroke cycle I. C. Engine.

(d) Define Interference? How it is avoided.

(e) What do you meant by static and dynamic balancing?

(f) Write two inversion of Double slider crank mechanism.

(g) Define free vibrations and forced vibrations.

Q.2. In a slider crank mechanism the crank is 500 mm long and   (7)
rotates at 20 rad/sec in the counter clockwise direction. the
length of connecting rod 2000mm .when the crank turns 60⁰
from inner dead centre, determine the velocity of slider,
angular velocity of connecting rod and velocities of rubbing
at the pin of crankshaft and crank having diameter 80 and 60
mm respectively?

P.T.O

Q.3 (a) Four masses m1, m2, m3, m4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively and the angle between successive masses are 0^0, 45^0, 75^0 and 135^0.Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m? (3.5)

(b) Two 20^0 involute spur gear meshes externally and give a velocity ratio of 3, module is 3 mm and addendum is equal to 1.1 module .if the pinion rotates at 120 rpm. Determine minimum number of teeth on each gear to avoid interference and number of pair of teeth in contact? (3.5)

Q.4 (a) A vibrating system consists of a mass 4 kg, a spring having stiffness 2.5 N/mm and a damper co-efficient 0.020 N/mm/sec. Determine: i) Damping factor ii) Natural frequency of damped vibration iii) Periodic time of damped vibration iv) Logarithmic decrement v) Ratio of frequency of damped and undamped vibration. (3.5)

(b) Drive an expression for finding velocity and acceleration of piston. (3.5)

Q.5 Draw the profile of a cam operating with roller follower having minimum radius of cam 25 mm, roller radius is 10 mm and a Lift of 30mm.The cam raises the follower for 120^0 with constant acceleration and deceleration followed by dwell period of 60^0 and then the follower lower down during next 110^0 of the cam rotation with simple harmonic motion (SHM) and again followed by a dwell period. If the cam rotates at 120rpm. Calculate maximum velocity and acceleration of the follower during ascent and descent period. (7)

Q.6 (a) An epicyclic gear train consists of three gears S, P & A .The gear A has 72 internal teeth and gear S has 32 external teeth. Gear P mesh with both S&A and is carried on an arm 'a' which rotates about the centre A at 20 rpm. If gear A is fixed, determine the speed of gears S&P? (3.5)

(b) A disc with radius of gyration 60 mm and has a mass of 4 kg is mounted centrally on a horizontal axle of 80mm length between the bearing. It spins about the axle at 800 rpm counter clockwise when viewed from the right hand side bearing. The axle precesses about a vertical axis at 50 rpm in clockwise direction when viewed from the above. Determine the resultant reaction at each bearing due to the mass and the gyroscopic effect? (3.5)

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