

Code No: 135SB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, August - 2022

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours

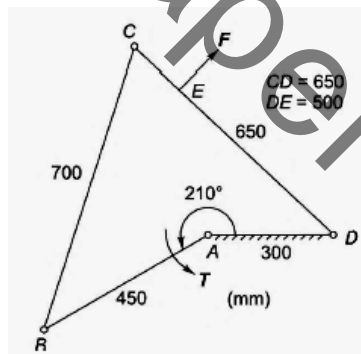
Max. Marks: 75

Answer any five questions

All questions carry equal marks

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- The moment of inertia of a pair of locomotive wheels with the axle is  $250\text{Kg}m^2$ . The distance between the wheel centers is 160 cm and the wheel diameter is 180 cm. Due to defective ballasting on wheel falls by 6 mm and rises again in a total time of 2 seconds while the locomotive travels on a level track at 72 Kmph. Assuming SHM for the displacement of the wheels, determine the reaction between the wheel and rail due to gyroscope and plot the same during one cycle of motion with respect to the displacement of the wheel. [15]
- Find the torque required to be applied to link AB of the linkage shown in figure to maintain the static equilibrium. [15]



- The torque developed by an IC engine is given by  $M = (1000 + 300 \sin 2\theta - 500 \cos 2\theta) \text{ Nm}$  where  $\theta$  is the angle turned by the crank from inner dead centre. The engine speed is 300 rpm. The mass of the flywheel is 200 kg and radius of gyration is 400 mm. Determine (a) power developed by the engine, (b) percentage fluctuation of speed with reference to the mean speed, (c) angular acceleration of the flywheel when the crank has rotated  $60^\circ$  from the inner dead centre, and (d) maximum angular acceleration and the retardation of the flywheel. [15]
- The stroke of a steam engine is 600 mm and the length of connecting rod is 1.5 m. The crank rotates at 180 r.p.m. Determine: a) velocity and acceleration of the piston when crank has travelled through an angle of  $40^\circ$  from inner dead centre and b) The position of the crank for zero acceleration of the piston. [15]

- 5.a) Explain friction circle and friction axis.  
b) How is the correct tangent to the friction circle for correct friction axis of a slider crank mechanism decided when the friction at the journals is considered. [7+8]
6. A simple band brake is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the brake band embraces  $\frac{5}{8}$  of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2 kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [15]
- 7.a) Each arm of a porter governor is 400 mm long and is pivoted on the axis of rotation. Each ball has a mass of 8 kg and the sleeve weighs 20 kg. The radius of rotation of the ball is 300 mm, when the governor begins to lift and 350 mm, when the speed is maximum. Determine the maximum and minimum speeds and the range of speed of the governor.  
b) Explain the balancing of V engines. [10+5]
8. The measurements on a mechanical vibrating system show that it has a mass of 8 kg and the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating systems have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1m/s, Find:  
a) Critical damping coefficient,  
b) Damping factor,  
c) Logarithmic decrement and  
d) Ratio of two consecutive amplitudes. [15]

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