GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Engineering

B.TECH Mechanical Engineering
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

Sem VI - G3UB602B - BTME3008 - Dynamics of Machines

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Define coefficient of fluctuation of energy	K1(2)
2)	Explain the application of gyroscopic principles to aircrafts.	K2(4)
3)	Derive an expression for the frequency of free torsional vibrations for a shaft fixed at one end and carrying a load on the free end.	K2(6)
4)	Derive an expression for the natural frequency of free longitudinal vibrations by Energy method.	K3(9)
5)	The mass of a single degree damped vibrating system is 7.5 kg and makes 24 free oscillations in 14 seconds when disturbed from its equilibrium position. The amplitude of vibration reduces to 0.25 of its initial value after five oscillations. Determine : 1. stiffness of the spring, 2. logarithmic decrement	K3(9)
6)	A shaft of length 0.75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0.25 m from one end. Find the natural frequency of transverse vibration. Assume E = 200 GN/sq.m and shaft diameter = 50 mm.	K5(10)
7)	The following data are given for a vibratory system with viscous damping: Mass = 2.5 kg ; spring constant = 3 N/mm and the amplitude decreases to 0.25 of the initial value after five consecutive cycles. Determine the damping coefficient of the damper in the system.	K4(12)
8)	A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing	K5(15)

masses revolve at a radius of 100 mm, determine their magnitudes and angular positions.

9) The three cranks of a three cylinder locomotive are all on the same axle and are set at 120°. The pitch of the cylinders is 1 metre and the stroke of each piston is 0.6 m. The reciprocating masses are 300 kg for inside cylinder and 260 kg for each outside cylinder and the planes of rotation of the balance masses are 0.8 m from the inside crank. If 40% of the reciprocating parts are to be balanced, determine : 1. the magnitude and the position of the balancing masses required at a radius of 0.6 m ; and 2. the hammer blow per wheel when the axle makes 6 r.p.s K5(15)

10) The following data refer to two cylinder locomotive with cranks at 90° : Reciprocating mass per cylinder = 300 kg ; Crank radius = 0.3 m ; Driving wheel diameter = 1.8 m ; Distance between cylinder centre lines = 0.65 m ; Distance between the driving wheel central planes = 1.55 m. Determine : 1. the fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 km. p.h. ; 2. the variation in tractive effort ; and 3. the maximum swaying couple. K6(18)