Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Winter Examination-2019

Subject Name: Dynamic of Machines

Subject Code: 4TE05DOM1 **Branch: B.Tech (Mechanical)**

Semester : 5 **Date : 25/11/2019** **Time : 10:30 To 01:30** **Marks : 70**

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions.** **(14)**

a) What is equivalent spring stiffness?
b) Define damping ratio.
c) Define the term "Dynamic balancing".
d) Define torsional equivalent shaft.
e) Why radial engines are preferred for high speed applications?
f) Name any two methods for analysis of multi degree of freedom systems.
g) Define period and cycle of vibration.
h) When do you say a vibrating system is under damped?
i) What are the conditions to be satisfied for complete balancing of in-line engine?
j) Define node in torsional vibration.
k) What is tractive force?
l) Write full form of FFT analyzer.
m) Define steady state and transient vibrations
n) Define cam dynamics.

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions**

(a) What is meant by torsionally equivalent length of a shaft as referred to a stepped shaft? Derive the expression for the equivalent length of a shaft which has several steps. **(07)**

(b) Explain: (1) Variation in tractive force; 2) Swaying couple. **(07)**

Q-3 **Attempt all questions**

(a) Discuss with neat sketches the longitudinal, transverse and torsional free vibrations. **(07)**

(b) Derive an expression for logarithmic decrement.

Q-4 **Attempt all questions**

(a) Write short note on Primary and secondary balancing. **(07)**

(b) The three cranks of a three cylinder locomotive are all on the same axle and are **(07)**

set at 120°. The pitch of the cylinders is 1 m 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, find :
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.

Q-5 **Attempt all questions**

(a) Explain the method of balancing a number of masses rotating in different planes. **(07)**

(b) The four masses m_1, m_2 m_3 and m_4 having their radii of rotation as 200 mm, 150 mm, 250 mm and 300 mm are 200 kg, 300 kg, 240 kg and 260 kg in magnitude respectively. The angles between the successive masses are 45°, 75° and 135° respectively. Find the position and magnitude of the balance mass required, if its radius of rotation is 200 mm. Use analytical method. **(07)**

Q-6 **Attempt all questions**

(a) Write a short notes on : **(07)**
a) Frequency Response Curve b) Vibration Isolation

(b) Establish an expression for the natural frequency of free transverse vibrations for a simply supported beam carrying a number of point loads, by Energy method **(07)**

Q-7 **Attempt all questions**

(a) Explain Holzer's method to determine natural frequencies of multi-rotor system **(07)**

(b) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find: 1. critical damping coefficient, 2. damping factor, 3. logarithmic decrement, and 4. ratio of two consecutive amplitudes. **(07)**

Q-8 **Attempt all questions**

(a) Explain the terms: (1) Under damping (2) critical damping (3) Over damping. **(07)**

(b) A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft. **(07)**