



The resultant motion of two harmonic motions having identical amplitudes (X) but slightly different frequencies (
$$\omega$$
 and $\omega + \delta\omega$) is given by Eq. (1.67):

$$x(t) = 2 \times \cos \left[\omega t + \frac{\delta \omega t}{2} \right] \cos \left[\frac{\delta \omega t}{2} \right]$$

Thus the maximum amplitude of the resultant motion is equal to 2X and the beat frequency is equal to $\delta\omega$. From Fig. 1.88, we find that 2X \approx 5 mm or X = 2.5 mm and

$$\frac{\delta \omega}{2} = \frac{2 \pi}{\tau_{\rm best}} = \frac{2 \pi}{\tau_{\rm larger}} = \frac{2 \pi}{2 \left(12.6 - 4.2\right)} = 0.374 \text{ rad/sec}$$

or
$$\delta\omega=0.748$$
 rad/sec and $\omega+\frac{\delta\,\omega}{2}=\frac{2\,\pi}{\tau_{\rm matter}}=\frac{2\,\pi}{1}=6.2832$ rad/sec

Hence $\omega=6.2832$ - 0.3740 = 5.9092 rad/sec. Thus the amplitudes of the two motions = X = 2.5 mm and their frequencies are $\omega=5.9092$ rad/sec and $\omega+\delta\omega=5.9092+0.7480=6.6572$ rad/sec.

(1.59)
$$A = 0.05 \text{ m}$$
. $\omega = 10 \text{ Hz} = 62.832 \text{ rad/sec}$
 $period = \tau = \frac{2\pi}{\omega} = \frac{2\pi}{62.832} = 0.1 \text{ sec}$

maximum velocity = $A\omega = 0.05 \times 62.832 = 3.1416 \text{ m/s}$

maximum acceleration = $A\omega^2 = 0.05 (62.832)^2 = 197.393 \text{ m/s}^2$

Mechanical Vibrations Rao 4th Solution Manual

Tao Wei

Mechanical Vibrations Rao 4th Solution Manual:

Mechanical vibrations Singiresu S. Rao, 1986-06-01 Mechanical Vibration, 5th Edition, Solutions Manual Haym Benaroya, Mark Nagurka, Seon Mi Han, 2022-07-15 No detailed description available for Mechanical Vibration 5th Edition Engineering Vibration Analysis with Application to Control Systems C. Beards, 1995-06-17 Most Solutions Manual machines and structures are required to operate with low levels of vibration as smooth running leads to reduced stresses and fatigue and little noise This book provides a thorough explanation of the principles and methods used to analyse the vibrations of engineering systems combined with a description of how these techniques and results can be applied to the study of control system dynamics Numerous worked examples are included as well as problems with worked solutions and particular attention is paid to the mathematical modelling of dynamic systems and the derivation of the equations of motion All engineers practising and student should have a good understanding of the methods of analysis available for predicting the vibration response of a system and how it can be modified to produce acceptable results This text provides an invaluable insight into both Structural Vibration C. Beards, 1996-05-31 Many structures suffer from unwanted vibrations and although careful analysis at the design stage can minimise these the vibration levels of many structures are excessive In this book the entire range of methods of control both by damping and by excitation is described in a single volume Clear and concise descriptions are given of the techniques for mathematically modelling real structures so that the equations which describe the motion of such structures can be derived This approach leads to a comprehensive discussion of the analysis of typical models of vibrating structures excited by a range of periodic and random inputs Careful consideration is also given to the sources of excitation both internal and external and the effects of isolation and transmissability A major part of the book is devoted to damping of structures and many sources of damping are considered as are the ways of changing damping using both active and passive methods The numerous worked examples liberally distributed throughout the text amplify and clarify the theoretical analysis presented Particular attention is paid to the meaning and interpretation of results further enhancing the scope and applications of analysis Over 80 problems are included with answers and worked solutions to most This book provides engineering students designers and professional engineers with a detailed insight into the principles involved in the analysis and damping of structural vibration while presenting a sound theoretical basis for further study Suitable for students of engineering to first degree level and for designers and practising engineersNumerous worked examplesClear and easy to follow Vehicle Vibrations Reza N. Jazar, Hormoz Marzbani, 2024-01-10 Vehicle Vibrations Linear and Nonlinear Analysis Optimization and Design is a self contained textbook that offers complete coverage of vehicle vibration topics from basic to advanced levels Written and designed to be used for automotive and mechanical engineering courses related to vehicles the text provides students automotive engineers and research scientists with a solid understanding of the principles and application of vehicle vibrations from an applied viewpoint Coverage includes everything you need to know to analyze and

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