

Test paper 7 Dynamics of Ocean Structures

Tutorial for self assessment

1. A harmonic motion has amplitude of 0.3cm and a period of 0.2s. Find the maximum velocity and acceleration.
2. An accelerometer indicates that a structure is vibrating harmonically at 90cps with a maximum acceleration of 50g. Find the amplitude of vibration
3. A harmonic motion has a frequency of 10cps and its maximum velocity of 4.57m/s. Find its amplitude, its period and maximum acceleration
4. Explain what is called a beating phenomenon. How critical is this in terms of structural response. Find the sum of two harmonics of equal amplitudes but of slightly different frequencies.
5. Determine the Fourier series for a rectangular wave shown in Fig 1
6. If the origin of the square wave shown in Fig. 1 is shifted to the right by $\frac{\pi}{2}$, determine the Fourier series
7. Determine the Fourier series of a series of rectangular pulses shown in Fig. 2. Plot c_n and ϕ_n vs. n when $k=2/3$
8. Write the equation of displacement (x) of the piston in the crank-piston mechanism shown in Fig. 3. Determine harmonic components and their relative magnitudes. If $\frac{r}{\ell}$ is 1/3, what is the ratio of second harmonic compared to the first?
9. Determine the mean square of rectangular pulse shown in Fig. 4 for $k=0.1$. If the amplitude is A , what would be the rms, a voltmeter read?
10. The calibration curve of a piezoelectric accelerometer is shown in Fig. 5, where the ordinate is in decibels. If the peak is 32Db, what is the ratio of resonance response to that at some low frequency, say 1000 cps?

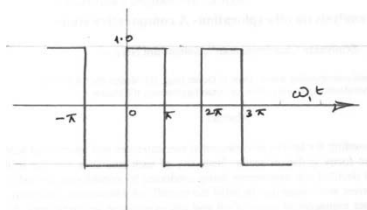


Fig. 1 problem 5

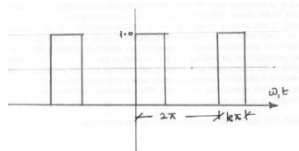


Fig. 2 Problem 7

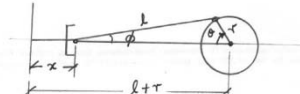


Fig. 3 Problem 8

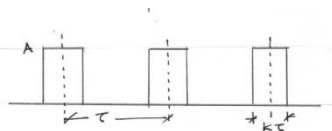


Fig. 4 Problem 9

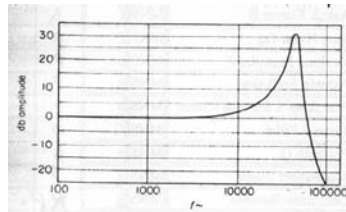


Fig. 5 Problem 10