Seat No. | | | | | | |

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मास - 017

Mechanical Vibration
(1030)

P. Pages : 3

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any five** questions.
5. Figures to the right indicate full marks.

1. By means of influence numbers determine the three natural frequencies for the system shown in fig. Q. 1 could you have predicated these three natural frequencies ? **20**

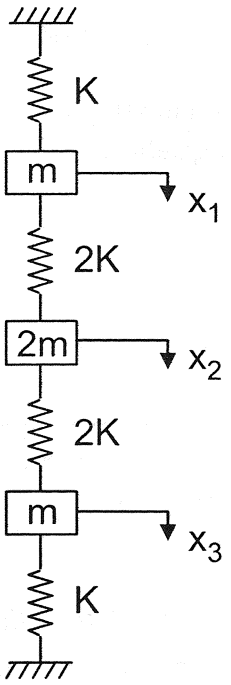
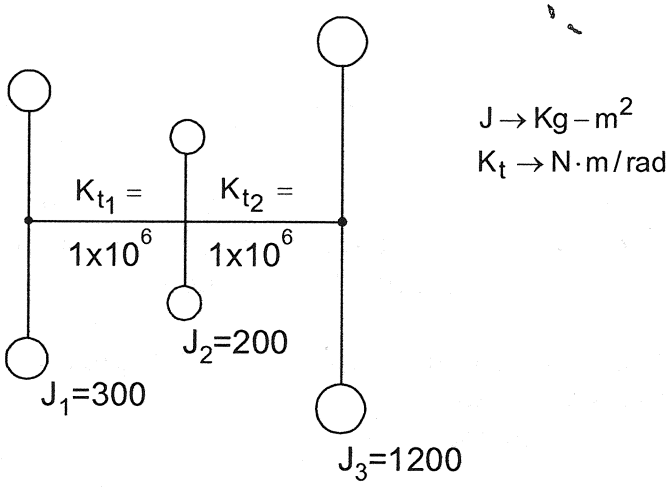


Fig. Q. 1

2. a) Fig. Q. 2 shows a torsional system consisting of three rotors. Make an estimate of the first natural frequency and starting with this value perform Holzer's calculations to determine the first natural frequency. **10**



b) Explain method of matrix iteration. **10**

3. a) Estimate the influence of a constant axial force on the natural frequency of a uniform bar having longitudinal vibration. **10**

b) Write short notes on any two noise measuring equipments. **10**

4. An undamped spring-mass system is subjected to a saw-tooth pulse shown in Fig. Q. 3 obtain the response equation. **20**

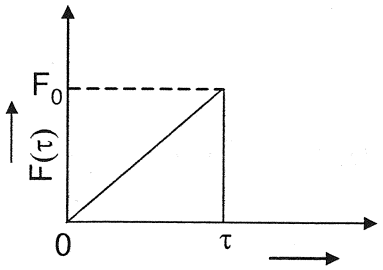


Fig. Q. 3

5. a) For the system represented by the differential equation $m\ddot{x} + x + \beta x^3 = 0$ obtain a plot of the time period against amplitude of vibration when

i) $\beta = +1/3$ (hard spring)

ii) $\beta = -1/3$ (soft spring). **12**

b) Sketch the phase plot of a simple pendulum. **8**

6. a) Proceeding from first principles, derive relationship between the autocorrelation function of a signal and its spectral density. Given an actual random signal explain how you would go about obtaining its spectral density and autocorrelation function in the laboratory. **12**

b) Calculate the temporal mean value and mean square value of the function. **8**

$$x(t) = A \sin \frac{2\pi}{0.5} t$$

7. Write short notes on **any four.** **20**

a) Vibration control by damping.

b) Dynamic balancing.

c) Vibration isolators.

d) FFT - analyzers.

e) Machine conditioning and monitoring.

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