B.TECH. SEM -VII MECHANICAL 2014 COURSE (CBCS) : SUMMER - 2018

SUBJECT: MECHANICAL VIBRATION

Day : **Monday** | **S-2018-2514** | Time : **02.30 PM TO 05.30 PM**
Date : **21/05/2018** | Max. Marks: 60

N. B.:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** Marks.
3) Use non-programmable **CALCULATOR** is allowed.
4) Assume suitable data, if necessary.

Q.1 **a)** Explain causes of vibration with its advantages & limitations. **(06)**

b) Explain basic steps involve in vibration analysis **(04)**

OR

a) Explain free, damped & forced vibration in brief **(06)**

b) Define : 1. Phase difference 2.Amplitude **(04)**

Q.2 **a)** Explain energy method for finding equation of motion of vibration system **(06)**

b) Spring mass system had spring stiffness K kg/cm of weight of mass W kg. It has natural frequency 12 cps. An additional 2 kg weight is coupled to W & natural frequency reduces by 2 cps. Find K & W **(04)**

OR

a) A spring mass system (K_1, m_1) has frequency F_1. Find value of K_2 of another spring when connected in parallel, increases the frequency by 30%. **(06)**

b) Explain transverse vibration system with figure **(04)**

Q.3 **a)** Horizontal vibration system with 5 kg mass attach to spring with stiffness 980N/m. if coefficient of damping vibration is 0.025. Find 1. Frequency of force vibration 2. Number of cycles corresponding to 50% reduction in amplitude if initial amplitude is 5 cm. 3.Time taken to achieve 50% reduction in amplitude. **(06)**

b) Explain physical significance of different values of damping factor **(04)**

OR

a) Derive expression for displacement in under damped vibration system using vibration parameters. **(10)**

Q.4 A vertical shaft 12.5 mm diameter rotates in sleeve bearing & disc of mass 15 kg attached to shaft at mid span. Span of shaft between bearings is 0.5 m. mass centre of disc is 0.5 mm from axis of shaft. Find critical speed of shaft & What is speed range in which bending stress in shaft will exceed 125 N/mm^2. $E = 2 \times 10^5$ N/mm^2 **(10)**

OR

Explain the following terms: **(10)**
1. Vibration Isolation 2. Force transmissibility 3. Motion transmissibility

P.T.O.

Q.5 Short Note : **(10)**

1. Rayleigh Method
2. Dunkerley's Method For critical speed of shaft carrying multiple rotors.

OR

A motor running at 1500 rpm drives pump through gearing. Pump runs at 500 rpm. The motor armature has mass moment of inertia 400 kgm^2 & pump impeller has 1400 kgm^2 respectively. Motor shaft is 45 mm in diameter & 180 mm long. Pump shaft is 90 mm diameter & 450 mm in length. Find 1. Equivalent system having uniform shaft diameter 45 mm & speed of 1500 rpm. 2. Natural frequency of vibration. Neglecting inertia of gears. Take G = 84 GPa **(10)**

Q.6 **a)** Explain FFT analyzer in details with block diagram. **(06)**

b) How the vibration instruments are classified? **(04)**

OR

Short Note : **(10)**

1. Industrial Noise control
2. Condenser microphone

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