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ME 1818OE21

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Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 8th Semester End-Term Examination

NOISE AND VIBRATION CONTROL

(New Regulation (w.e.f. 2017-2018) & New Syllabus w.e.f. 2018-2019)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following questions : (10 × 1 = 10)

(i) The reflection coefficient (R) is zero for ———— termination.

(ii) The reflection coefficient (R) is one for ———— termination

(iii) Human ear can pickup pressure fluctuations of (sound wave) the order of 10^{-5} pascal to ———— pascal.

(iv) Sound intensity level decreases by ———— dB when the measured distance from source is doubled.

(v) The ratio of upper level frequency to lower level frequency in case of 1 Octave band is————

(vi) The ratio of upper level frequency to lower level frequency in case of $\frac{1}{3}$ Octave band is ————

(vii) For industrial area ambient air quality standards in respect of noise, in our country, is———— dBA during day time and ————dBA at night.

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(viii) For commercial area ambient air quality standards in respect of noise, in our country, is ————dBA during day time and ————dBA at night.

(ix) For residential area ambient air quality standards in respect of noise, in our country, is ———— dBA during day time and ———— dBA at night.

(x) For silence zone ambient air quality standards in respect of noise, in our country, is ———— dBA during day time and ———— dBA at night.

2. (a) Explain the concept of (i) Reflection coefficient, (ii) Sound intensity and (iii) Acoustic power flux. (5)

(b) Sound pressure levels at four points around a machine are 86,93,92 and 88 dB when the machine is on. The ambient SPL at the four points is 82 dB. Calculate the average SPL of the machine and ambient together and the machine alone. (10)

3. What is dynamic vibration absorber? Write the demerits of dynamic vibration absorber. Also write the difference between the vibration absorber and vibration isolator. (2+5+8=15)

4. A machine runs at 5000 RPM. Its forcing frequency is very near to its natural frequency. If the nearest frequency of the machine is to be at least 20% from the forced frequency. Design a suitable vibration absorber for the system. Assume mass of the machine as 30 kg. (15)

5. (a) What is the characteristic of the sound field of a closed space (room)? Draw a schematic diagram to represent the sound field of a room. (5)

(b) How sound pressure level '$L_p(r,f)$' at a particular frequency f and at a distance r from the sound source can be obtained for (i) a normal room, (ii) an anechoic room and (iii) a large room where r is large enough. (10)

6. A machine is located at the middle of the floor of the unoccupied and unfurnished room of length 15m, width 10m and height 5m. The floor, walls and ceiling of the room is made of varnished wood joints, bricks and mineral tiles respectively. The sound absorption coefficient at 500 Hz for different surfaces is as follows: Bare varnished wood joints floor is 0.1, Brick wall is 0,03 and of tile ceiling is 0.65. In the 500 Hz frequency band, evaluate the following:

(a) Average absorption coefficient of bare room

(b) Reverberation time of the room

(c) The distance at which the direct field would be as strong as the diffuse field (15)

7. (a) Justify the statement: 'Noise is controlled more often in the path than at source'. (10)

(b) How noise can be controlled at the receiver end? (5)