

Roll No \_\_\_\_\_

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKE-UP EXAMINATION - 2018

B.Tech VIII / M.Tech II Semester

COURSE CODE: 12M1WCE213

MAX. MARKS: 25

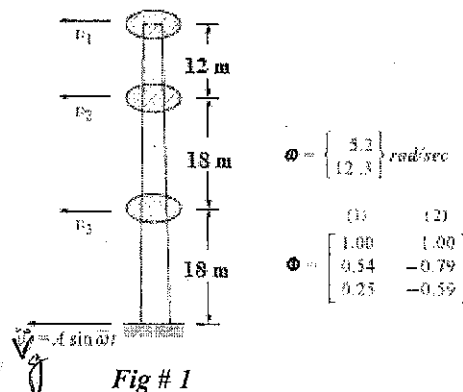
COURSE NAME: Earthquake Resistant Design of Structures

COURSE CREDITS: 3

MAX. TIME: 1.5 HRS.

**Notes:** All questions are compulsory. Carrying mobile phone during examinations will be treated as case of unfair means. For any missing data or information, you are free to make whatever simplifying assumptions that you wish, provided you supply a credible justification. IS1893 (I)-2016 is allowed in examination hall.

- Q1 The service platform for a space rocket is idealized as a lumped mass tower as shown in Fig # 1. Also shown are the shapes and frequencies of its first two modes of vibration. Determine the maximum moment developed at the base of this tower due to a harmonic horizontal ground acceleration  $\ddot{v}_g = A \sin(\bar{\omega}t)$ , where  $A = 1.52 \text{ m/sec}^2$  and  $\bar{\omega} = 8 \text{ rad/sec}$ . Consider only the steady-state response of the first two modes, and neglect damping. The weights lumped at the top, central and lowest levels are 65, 155 and 290 kN respectively.



- Q2 For the previous problem calculate 3<sup>rd</sup> natural frequency and associated mode shape using *Stodola* Method.
- Q3 State the Gram-Schmidt Orthogonalization scheme to obtain orthonormal set of basis vectors.
- Q3 Explain the following terms related to Earthquake Engineering
- SRSS and CQC
  - Response Reduction Factor
  - Modal Participation Factor