Prof Sourav

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION, Dec. 2017

M.Tech. (Structural Engineering) 1st Semester

COURSE CODE: **11M1WCE114** MAX. MARKS: 35

COURSE NAME: Modelling, Simulation and Computer Applications

COURSE CREDITS: 3 MAX. TIME: 2 HRS.

Note: *All questions are compulsory. Assume missing data suitably, if any.*
Marks are indicated against questions.
Carrying of mobile phone during examinations will be treated as case of unfair means.

1. It has been decided to shift sand from a river bed to a batching plant in an open rectangular box of length x_1 meters, width x_2 meters, and height x_3 meters (**Fig. 2**). The bottom, sides, and the ends of the box cost, respectively, Rs. 8000, 1000, and 2000 per square meter area. It costs Rs. 100 for each round trip. Assuming that the box will have no salvage value, find the minimum cost of transporting 80 m^3 of sand. **(10)**

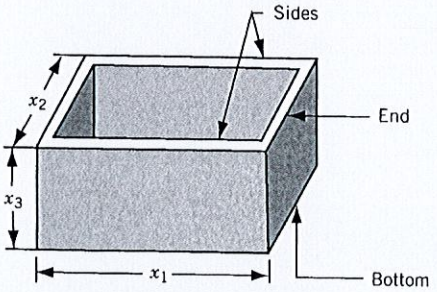

Figure 1.

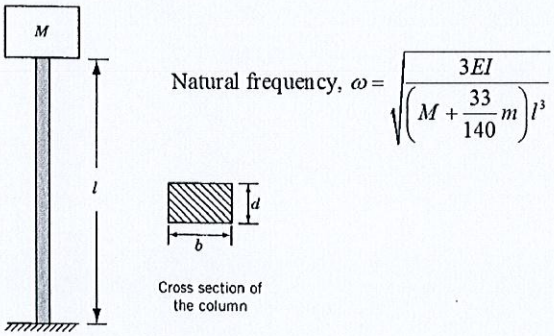

Figure 2.

2. A uniform column of rectangular cross section is to be constructed for supporting a water tank of mass M (**Fig. 2**). It is required (i) to minimize the mass of the column for economy. **(5)**

3. A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter $2a$. The beam has to be used as a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity. **(5)**

4. Derive the orthogonality condition for the solution of an unconstrained geometric programming problem using differential calculus. Hence find the expression for Hessian matrix. **(10)**

5. The number of times structural models failed in lab. test (X) and their probabilities are given by

x_i	0	1	2	3	4	5	6
$p_X(x_i)$	0.02	0.15	0.22	0.26	0.17	0.14	0.04

Find the mean and standard deviation of X. **(5)**

x------x