Dr. Saurav.

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- SEP- 2018

M.TECH 1ST Sem

COURSE CODE: Modelling, Simulations and Computer Applications MAX. MARKS: 15

COURSE NAME: 11M1WCE114

COURSE CREDITS: 3 MAX. TIME: One Hr

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q1. Find the second order Taylor's Series approximation of the function (4), CO1.

$$f(x_1,x_2,x_3) = x_2^2 x_3 - x_1 e^{(x_3)} \text{ at the point } X^* = \{1,0,-2\}^T$$

Q2. Fig. 1 shows two frictionless rigid bodies (carts) A and B connected by three linear elastic springs having spring constants k_1, k_2, and k_3. The springs are at their natural positions when the applied force *P* is zero. Find the displacements x_1 and x_2 under the force *P* by using the principle of minimum potential energy. (3), CO1.

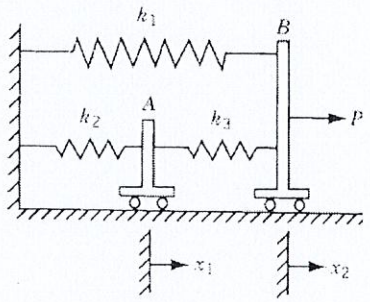

Fig. 1

Q3. 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. (3) CO1.

Q4. Explain the following (3) CO2

a) Saddle point

b) Admissible variations

Q5. If the velocity of flow of water through a small hole is $0.6(2gy)^{0.5}$ where y is the height of water level above the hole. Find the time required to empty the tank having the shape of a right circular cone of base "a" and height "h" filled completely with water and having a hole of area A_0 in the base. (2), CO2