

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- September 2016

M.Tech I Semester

COURSE CODE: 13M1WCE131

MAX. MARKS: 15

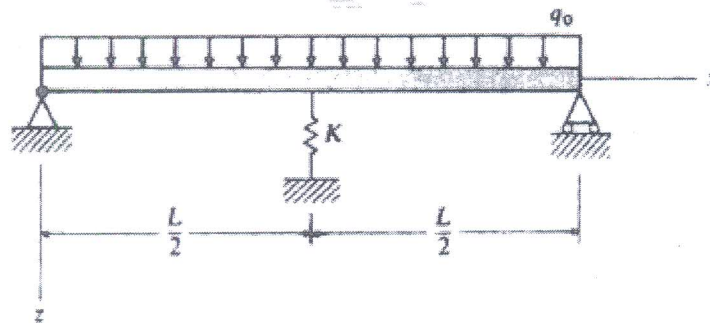
COURSE NAME: Finite Element Methods

COURSE CREDITS: 03

MAX. TIME: 1Hr

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

1. Derive the weak form for a classical beam bending problem. [4 MARKS]
2. A simply-supported beam of length  $L$  and uniform  $EI$  is subjected to a uniform distributed loading  $q_0$  and an additional elastic support is provided at its mid span as shown in the following figure. Determine the deflection profile for the beam using *two-parameter Rayleigh-Ritz* approximation. [6 MARKS]



3. Find a *one-parameter Galerkin* solution of the following nonlinear differential equation.

$$-2u \frac{d^2 u}{dx^2} + \left( \frac{du}{dx} \right)^2 = 4 \quad \text{for } 0 < x < 1$$

Subjected to the boundary conditions  $u(0) = 0$  and  $u(1) = 0$ .

[5 MARKS]