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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- Sept 2017

B.Tech VII / M.Tech I Semester

COURSE CODE: 13M1WCE131

MAX. MARKS:15

COURSE NAME: Finite Element Methods

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.*

1. Solve the ordinary linear differential equation

$$\frac{d^2u}{dx^2} + 10x^2 = 0 \quad 0 < x < 1$$

Subject to boundary conditions  $u(0) = 0, u(1) = 0$ .

Use *Galerkin* method with *Two-parameter* approximation function.

[8 Marks]

2. Consider the strong form of a boundary value problem:

$$10x^2 \frac{d^2y}{dx^2} + 5x^3y = \sin x \quad \text{in } 0 < x < L$$

Subject to  $y|_{x=0} = 0, \frac{dy}{dx}|_{x=L} = -1$

a) Derive the weak form from the given strong form.

b) Does a functional  $\pi$  exist which can be extremized to solve this problem? If so, get  $\pi$  from the weak form.

[7 Marks]