

ROLL NO \_\_\_\_\_

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- Dec 2017

B.Tech VII / M.Tech I Semester

COURSE CODE: 13M1WCE131

MAX. MARKS: 35

COURSE NAME: Finite Element Methods

COURSE CREDITS: 3

MAX. TIME: 2 Hrs.

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

1. Derive the governing partial differential equation (PDE) of 3D Heat conduction problem. [7]
2. Using the PDE obtained in the previous question and assuming admissible boundary conditions derive the weak form and subsequent element level matrix equation for steady state heat transfer problem. Use 4-noded linear isoparametric elements. [8]
3. Determine the linear interpolation functions for the given (a) linear triangular element and (b) linear quadrilateral element shown in Fig #1 and Fig #2 respectively. [4+4]
4. Derive the interpolation functions for a 3-noded linear element. [4]
5. Use 2 x 2 Gauss quadrature to approximate  $I$  over the rectangular domain shown in Fig #3. [8]

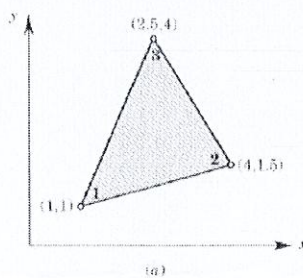


Fig #1

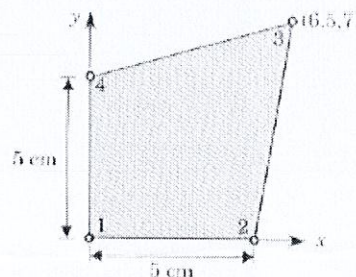


Fig #2

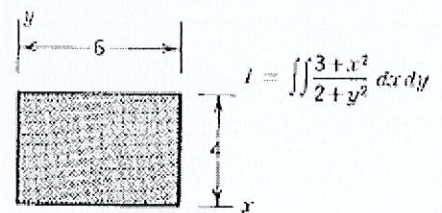


Fig #3