Reg. No.

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (MECHANICAL ENGINEERING)
END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: COMPUTER AIDED DESIGN [MME 301]
REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:
- ❖ Answer **ANY FIVE FULL** the questions.
- ❖ Missing data may be suitable assumed, stating the same.

1A. With a sketch, obtain the mathematical formulation of Bresenham's circle algorithm. **(06)**

1B. A ruled surface is defined between a Bezier curve and a Hermite cubic spline curve. The Bezier curve is defined by control points $[4\ 7\ 2]^T$, $[6\ 9\ 2]^T$, $[8\ 9\ 2]^T$ and $[10\ 8\ 2]^T$. Hermite cubic spline curve has $[2\ 4\ 2]^T$ and $[3\ 6\ 2]^T$ as position vectors and tangent vectors at these points are $[2\ 5\ 2]^T$ and $[3\ 6\ 2]^T$ respectively. Compute the coordinates of the point on the resultant surface at u=0.65, v=0.45. **(04)**

2A. Compute the points on an ellipse for third quadrant with major axis 20 units and minor axis 12 units whose centre is at (-4,6) using recursive relation for an incremental angle of 22.5^0. **(05)**

2B. With a neat sketch, obtain an expression for position vector and tangent vector for a Bezier curve defined by 6 control points. **(05)**

3A. Compute and plot the coordinates of the pixels to display a line from (1,-3) to (-1,2) using Bresenham's algorithm. **(05)**

3B. Explain plane stress and plane strain and write their stress-strain matrix. **(04)**

3C. Mention the different types of Local Area Network configurations. **(01)**

4A. A triangle is defined by vertices A (-4, 2), B (-9, 2) and C (-6, 4). Perform the following geometric transformations using denotation principle.
i) Rotate the triangle about the midpoint of AB by 37° clockwise.
ii) Scale the transformed triangle by a factor of 1.5 in X direction and 0.6 in Y direction about its centroid. **(05)**

4B. With a neat sketch, explain the direct beam refresh display technique of **(04)** displaying images on graphics terminal.

4C. Explain concatenation principle of geometric transformation. **(01)**

5A. For the system shown in figure 5A, determine the unknown displacement and **(06)** rotations at nodes 2 and 3.

Figure 5A

Within the figure:
20 N/mm

$E = 200$ GPa
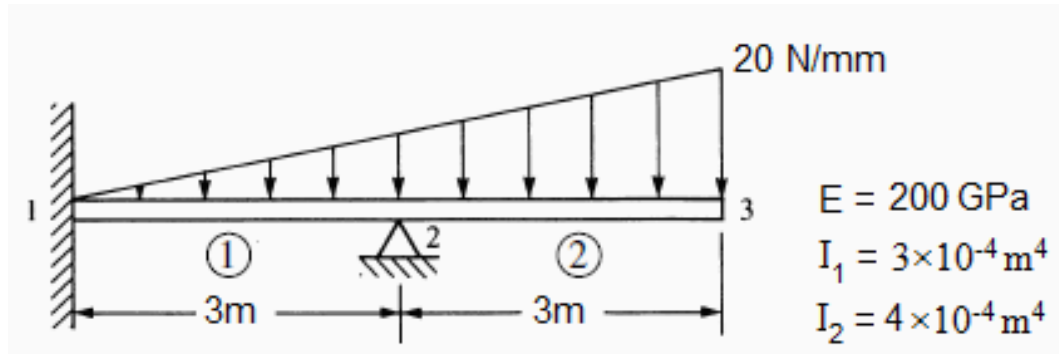$I_1 = 3 \times 10^{-4} m^4$
$I_2 = 4 \times 10^{-4} m^4$

3m — 3m

5B. Explain the application of computers in the Engineering Design. **(04)**

6A. For the plane truss supported by the spring at node 1 shown in figure 6A, **(06)** determine the unknown displacements. The Modulus of Elasticity of truss members is 210 GPa and the diameters of first and second truss members are 20 mm and 25 mm respectively.
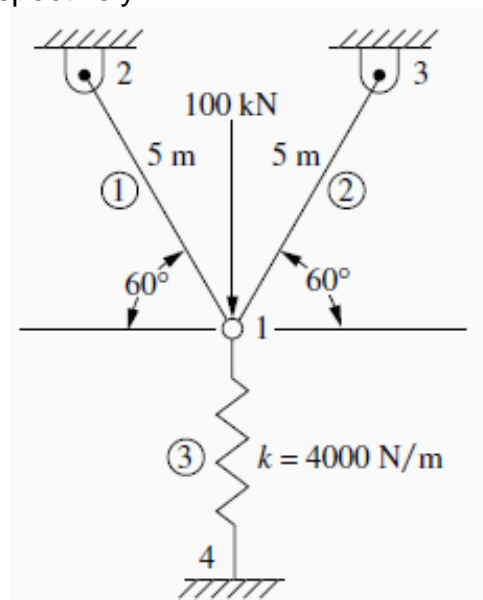

Within the figure:
100 kN
5 m   5 m
60°   60°
$k = 4000$ N/m

Figure 6A

6B. Explain Hermite Bicubic surface with a sketch and its parametric equations. **(04)**