Eighth Semester B. E. (Mech.)/ Sixth Semester B. E. (Mech.) P. T. Examination

COMPUTER AIDED DESIGN

Time : Three Hours] [Max. Marks : 80

N. B. :
(1) All questions carry marks as indicated.
(2) Answer **three** questions from Section A and **three** questions from Section B.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answers wherever necessary with the help of neat sketches.
(6) Use of Machine, Design Data book and Calculator is permitted.

SECTION A

1. (a) Explain the components of C.A.D. system. 6

   (b) Explain working of Raster Display System. Why is it popularly used today ? 4

   (c) Explain about simple color frame buffer. 4

2. (a) Explain and write D.D.A. algorithm for line generation. 5

   (b) Explain and write Bresenham's mid point algorithm for circle generation. 8

3. (a) Determine 3 x 3 homogeneous transformation matrix to transform a square ABCD into

another square A′ B′ C′ D′ as shown in figure. The side of square ABCD is 2 unit and coordinate of point A is (20, 10). Depict the final transformation on graph paper.

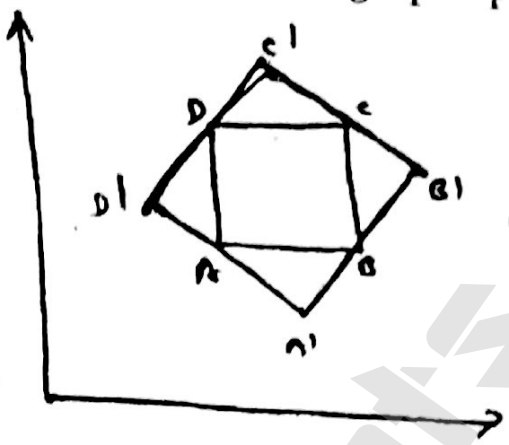

Fig. 3 (a) 6

(b) A triangle ABC is to be reflected about its side BC. Explain the steps required and determine the resultant transformation matrix. A(2, 3), B(10, 8) and (C – 1, 10) 7

4. (a) Write necessary steps and transformation matrix for rotating a point in 3D space about a given 3-D line. 8

(b) How is 3-D solid represented in CSG method ? Explain with suitable example. 5

5. (a) A line PQ was transformed to P′Q′ P^1 (10, 10) and Q^1 (20, 20). Transformation carried out were.

(i) Scaling about origin by 2 units.

(ii) Rotation about origin by 45^0.

Find out the coordinates of end points of original line PQ. 7

(b) Distinguish between wireframe modelling and surface modelling. 3

(c) What do you understand by shear transformations ? Explain its utility. 3

SECTION B

6. (a) Derive the stifness matrix for one dimensional line element defined by natural coordinate.

$$\xi = \frac{2(x - x_1)}{(x_2 - x_1)} - 1$$

having shape functions.

$$N_1 = \frac{1 - \xi}{2} \text{ and } N_2 = \frac{1 + \xi}{2}$$ 9

(b) Explain the principle of minimum potential energy. 5

7. (a) Explain the shape functions for 1-D quadratic bar element. 7

(b) Explain the steps carried out in finite element analysis. 6

8. Derive an expression of element stiffness matrix for two dimensional constant strain triangular element using shape functions. 13

9. For the truss shown in fig. find the displacement of node 1 and reactions at support A and B. Area of

cross-section of each link is 200 mm² and modulus of elasticity E is 200 GPa.

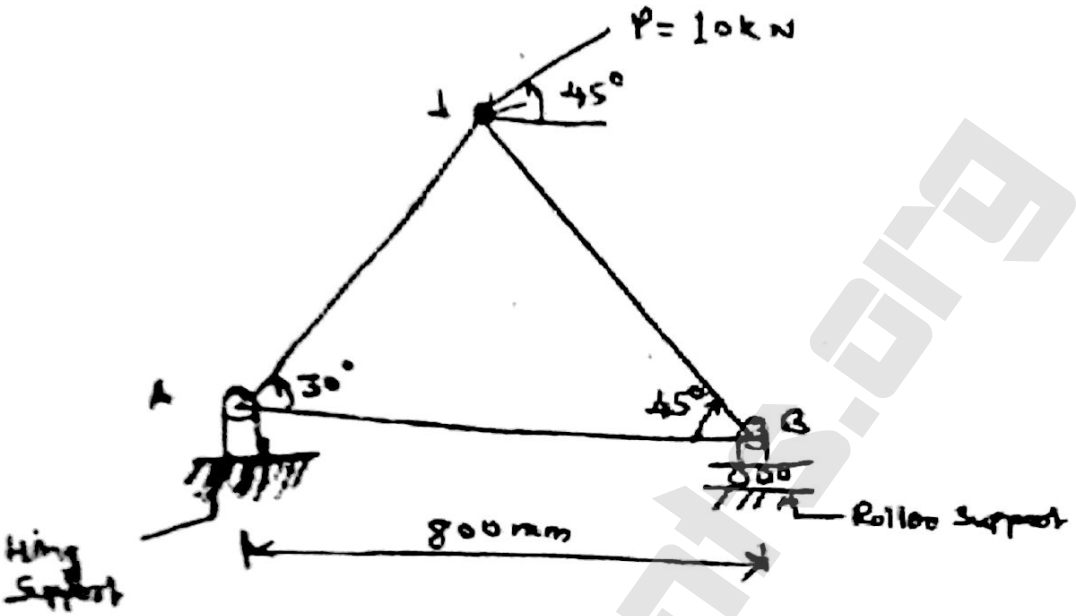

Fig. (9) 13

10. (a) Explain Golden Section Search method for single variable optimization problem. 7

(b) Using Bisection method, minimize

$$f(x) = e^x - x^3$$ 6