

BITS PILANI, DUBAI CAMPUS
Dubai International Academic City, Dubai

Second Semester 2010-2011

III Year Mechanical
Time: 180 min.

Comprehensive Examination
ME C382 Computer aided design

Date: 02-06-2011

Weightage: 35%
Marks: 70

Answer all the questions sequentially
Assume suitable data, if required

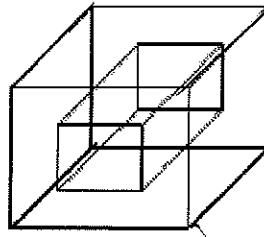
Part I (11x2=22 Marks)

1. State the basic equations used for conduction, convection and radiation for heat transfer problems in 1D finite element analysis
2. State the functional representation of Galerkin's formulation for 1D pin fin heat transfer problem with the tip insulated
3. Differentiate model coordinate system, working coordinate system and screen coordinate system
4. List the various uses of transformation
5. Define data structure and data base in CAD
6. List the standard file formats for 2D drawings and 3D modeling for file transfer between different CAD software
7. Define lofted surface and coons patch with simple sketches
8. Construct a bilinear surface and list its drawbacks
9. Briefly explain the wire frame model and specify its advantages and disadvantages
10. List the steps involved in bottom-up approach in assembly with sketch example
11. Compare different types of continuity in curves.

Part II (4x5=20 Marks)

12. Consider a triangle with three points (3,5,0), (10,6,0) and (1,1,0), rotated about a point (6,-2,0) ccw by an angle of 30° in Z axis. Determine the final position of the body.
13. The vertices of a square are given as follows: (5,2,0),(9,2,0),(5,6,0) and (9,6,0). The square is first reflected about the x axis and again reflected about y axis. Determine the final position matrix for the square.
14. A triangle with vertices (9,3,-5),(12,8,2) and (5,7,3) is projected on the x-y plane. The centre of projection is at 10 along Z. Determine the position of the vertices of the triangle after projection.

15. Check the validity of boundary representation for the above model using Euler's Poincare law. (Hole is through both the faces).

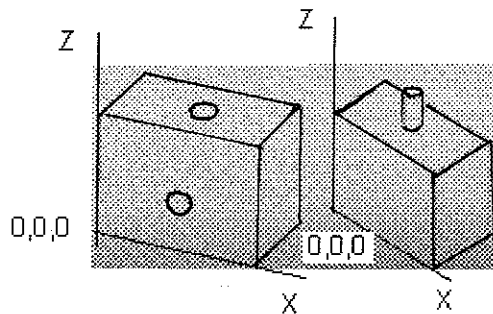


Part III (4x7=28 Marks)

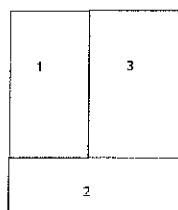
16. The coordinates of four control points are given by $P_0(0,0,0)$, $P_1(2,3,0)$, $P_2(3,3,0)$ and $P_3(3,2,0)$. Find the equation of the resulting Bezier curve. Also, find the slope of the curve at $t=0.5$

17. A cubic Bezier curve is defined by the control points: $P_1(1,0,3)$, $P_2(3,0,5)$, $P_3(2,0,7)$, $P_4(5,0,8)$. Find the surface of revolution obtained by revolving the curve about z axis and calculate the point on the surface at $t=0.5$, $\theta=45^\circ$.

18. The pin in part B is to be assembled in to the holes (front & top) provided in part A. Determine the corresponding transformation matrices using WCS method. The hole size is same as the pin (Length=2, Diameter=0.5). The holes and the pin are located in the centre of the respective planes. Both cuboids are having the dimensions: Length (along X) =6 Breadth (along Z) =4 and thickness=2.



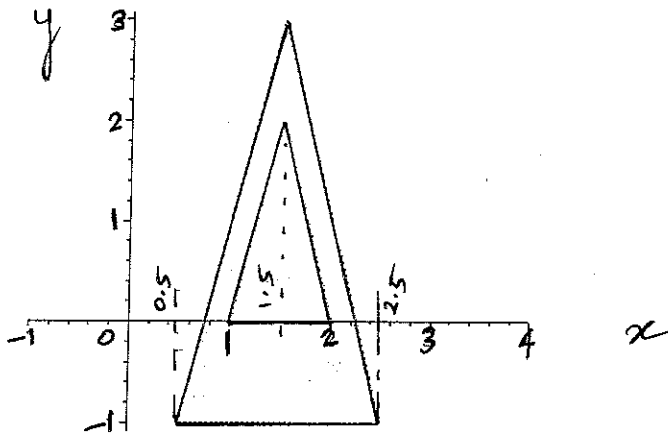
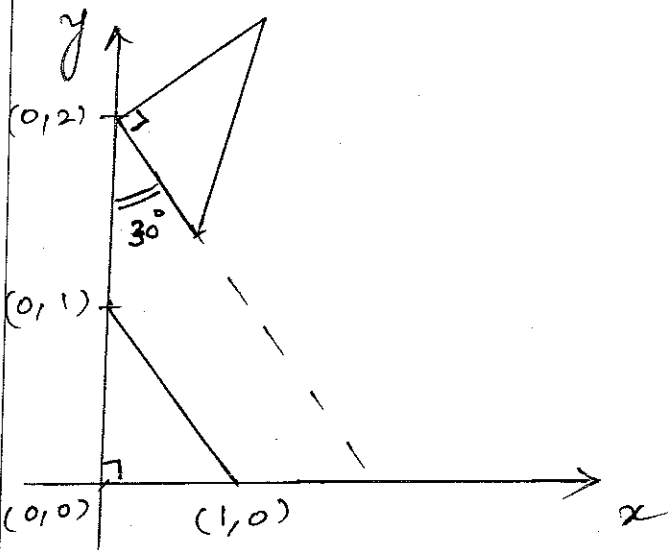
19. A composite wall consists of three materials, as shown in the figure below. Left end temperature is 200°C and the right end is exposed to air at 50°C with a convection coefficient of $h = 10 \text{ W/(m}^2\cdot\text{K)}$. Find the temperature along the composite wall. Thermal conductivity of the materials = 70, 40 and 30 W/mK . Thickness = 25, 20 and 30mm. (assume unit area for all elements)



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Test 2 Open book
 Date: 17-04-2011
 Weightage: 15%
 Marks:30

#	Answer all questions Assume suitable data, if required Handwritten class notes and text book are permitted	Marks
1	 <p>The inner triangle is transformed into the outer triangle as shown in fig. Determine the position matrix after transformation.</p>	7
2	<p>Determine the position matrix for the following rotational transformation.</p> 	7

3 For the object shown below, construct the hierarchy database and relational database.

8

4 Determine the nodal temperatures for the following composite slab. Convection heat transfer coefficient = $0.1 \text{ W/m}^2\text{K}$
 $q = 340 \text{ W/m}^2$, $K_1 = 2.0 \text{ W/m}^2\text{K}$, $K_2 = 2.5 \text{ W/m}^2\text{K}$,
 $L_1 = 0.04 \text{ m}$, $L_2 = 0.02 \text{ m}$, $A = 2 \text{ m}^2$ and $T_a = 20^\circ\text{C}$

8

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III Year Mechanical
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Time: 50 min.

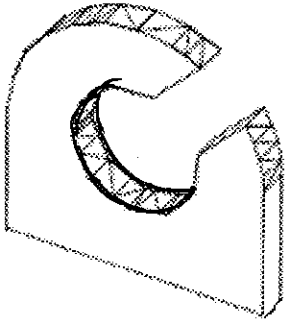
Test 1
Date: 27-02-2011
Weightage: 15%
Marks:30

#	Answer all questions Assume suitable data, if required	Marks
1	Explain the implementation of CAD with a flow chart.	4
2	Describe the formulation of Rayleigh Ritz method for a cantilever beam with axial load of 10 units at free end. Assume $E = A = 1$ unit. $L = 2$ units Divide the beam in to two elements.	8
3	Determine the nodal displacements for the structure shown below using direct stiffness method. $E=200$ GPa. $k=1 \times 10^5$ N/m. <div style="text-align: center;"> </div>	9
4	Determine the nodal displacements for the truss structure shown below. $E = 200 \times 10^9$ Pa. $A = 0.0001$ m ² (dimensions in the figure are in mm) <div style="text-align: center;"> </div>	9

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Name:
III Year Mechanical Quiz 2 A
ME C382 Computer aided design
Time: 20 min.

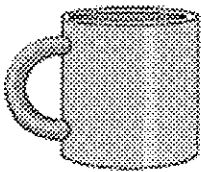
ID No.
Date: 04-05-2011
Weightage: 5%

#	Answer all questions	Marks
1	For the following model, construct the CSG tree (rough sketch). 	3
2	Determine the positions of point A (4,4,0) by orthogonal projection (front, top and right views) after rotation of 45deg. ccw about Z axis.	4
3	Determine the position vector of P (x=3, y= 3, z = 6, d = 8) by perspective projection on z=0 plane (COP is along z axis).	3

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Name:
III Year Mechanical Quiz 2 B
ME C382 Computer aided design
Time: 20 min.

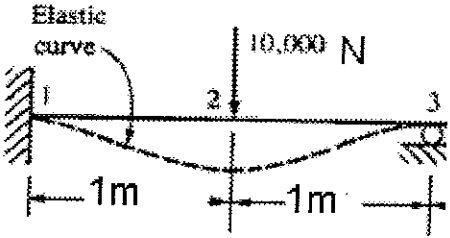
ID No.
Date: : 04-05-2011
Weightage: 5%

#	Answer all questions	Marks
1	Construct the CSG tree for the cup shown below (rough sketch). 	3
2	Determine the positions of point A (2,3,0) by orthogonal projection (front, top and right views) after rotation of 30deg. ccw about Z.	4
3	Determine the position vector of P (x=3, y= 3, z = 4, d = 6) by perspective projection on z=0 plane (COP is along z axis).	3

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Quiz 1 A
Date: 23-03-2011
Weightage: 5%
Marks:10

#	Answer all questions Assume suitable data, if required	Marks
1	<p>Consider the beam shown below. Assume $E = 200 \times 10^9$ pa and $I = 5 \times 10^{-4} \text{ m}^4$ are constant throughout the beam. Determine the final global stiffness matrix for the beam after applying boundary conditions.</p> 	8
2	Differentiate plane stress and plane strain conditions.	2