Student I.D No:----------

BITS, PILANI-DUBAI, INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2009 --2010

Comprehensive Examination

Course Name: Computer Aided Design
Course No. : ME C382

Max Marks: 70
Weightage: 35%

Duration : 3 Hr

Date: 23-05-09

NOTE:
i) Write your ID Number on the top immediately on the receipt of this paper.
ii) ***Maintain the order*** while answering the questions.
iii) Required values, tables & charts are given in the paper.
iv) If any data is missing, assume the suitable value with proper justification.

Q.1 **(Marks: 4+4)**

(a) Describe the various design related task in CAD.

(b) Define the CAD tools, giving the suitable example.

Q.2 **(Marks: 4+4)**

(a) An eight-plane raster display refreshed from a bit map of 256 Kbytes of RAM. Determine:
i) Bit map size per plane.
ii) Reasonable resolution.

(b) Write the names of two software for each of the following:
i) CAD ii) CAM
ii) CAD/CAM iii) CAE

Q.3 **(Marks: 4+4)**

(a) Write the parametric equation for the following
i) A line passing through the point P_1 in a direction defined by the unit vector $\hat{n}$.
ii) A Line that passing through a point P_1 parallel to an existing line and is trimmed by point P_2.

(b) Consider a paradoxically blended curve defined by the points P_1[0 1 0] P_2[2 3 0] P_3[4 1 0] & P_4[5 2 0]. Rotate the curve about x-axis through 360° to obtain the *surface of revolution*. Calculate the point on surface at u = 0.5 & ø= π/3.Also give some is the applications of resulting surface.

Q.4 **(Marks: 4+4)**

(a)

Four points P_0(a, b) P_1(20,50) P_2(40,40) & P_3(70,c) are available for drawing a *B-spline curve* segment. Compute the values of a, b, c such that the curve starts from the point (21,43) & terminates with slope (-1/2).

P.T.O

(b) Find the lofting surface defined by linear blending between the cross-sections shown in following figure-1.

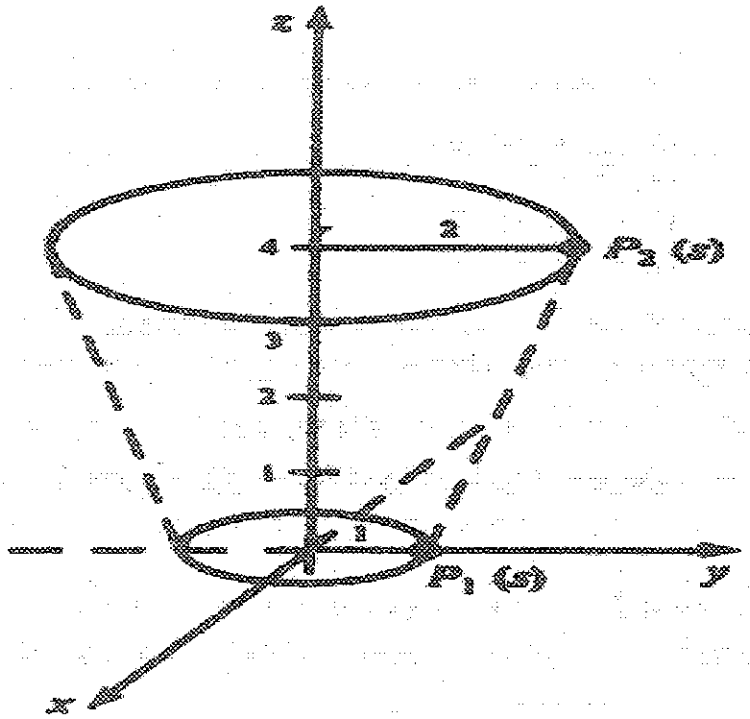

Figure-1

Q.5 **(Marks: 4+4)**

(a) Verify the validity of the following solids S1 & S2 using Euler equation

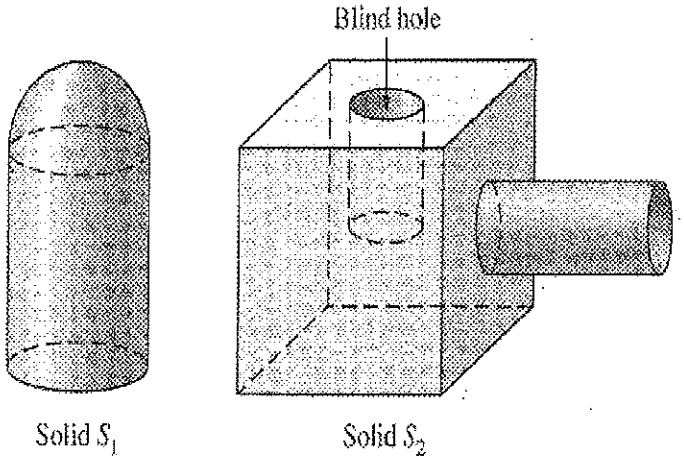

Figure-2

(b) Differentiate between B-rep & C-rep.

Q.6 **(Marks: 4+4)**

(a) Explain the IGES giving the suitable applications.

(b) What are the *colour models*? Describe the RGB colour model giving the colour cube with coordinates.

Q.7 **(Marks: 4+4)**

(a)

Write the Homogeneous Matrix of point P* transformed from point P at an angle θ about an axis parallel to Z- axis. & passing through P1 as shown in figure-3.

Figure-3

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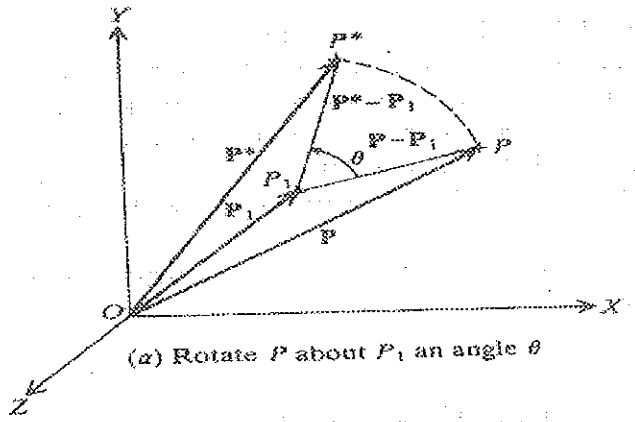
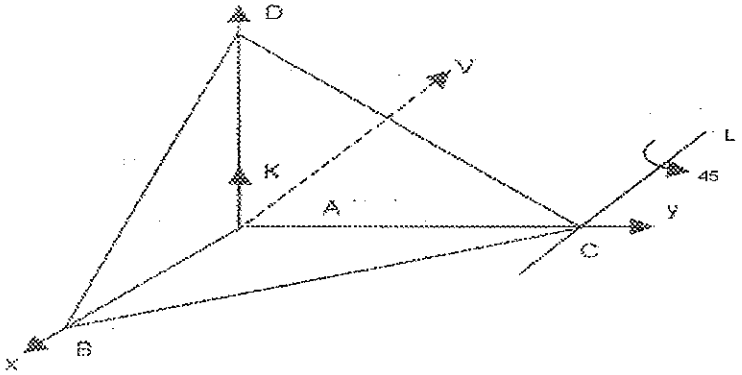


(b) The pyramid defined by coordinates A (0,0,0),B (1,0,0),C(0,1,0) & D (0,0,1) is rotated by 45° about a line L that has the direction V=J+K and passing through point C (0,1,0). Determine the coordinate of rotated figure--4.

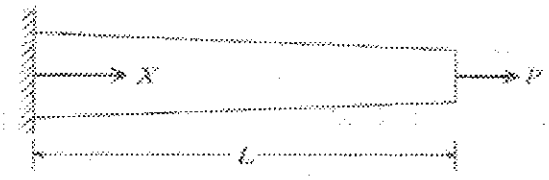
Figure-4



Q.8 **(Marks: 4+4)**

(a) Describe the criterion used for stress calculation in generative structure analysis of CATIA software, also discuss stress variation pattern along with colours.

(b) Derive the functional Π for the A bar of length *L* and variable cross-sectional area *A* is under a concentrated axial load *P* at its free end, as shown in Fig 5.



(a) A uniform bar with uniaxial loading

Fig 5.

The axial displace any point along the bar is governed by the following differential equation

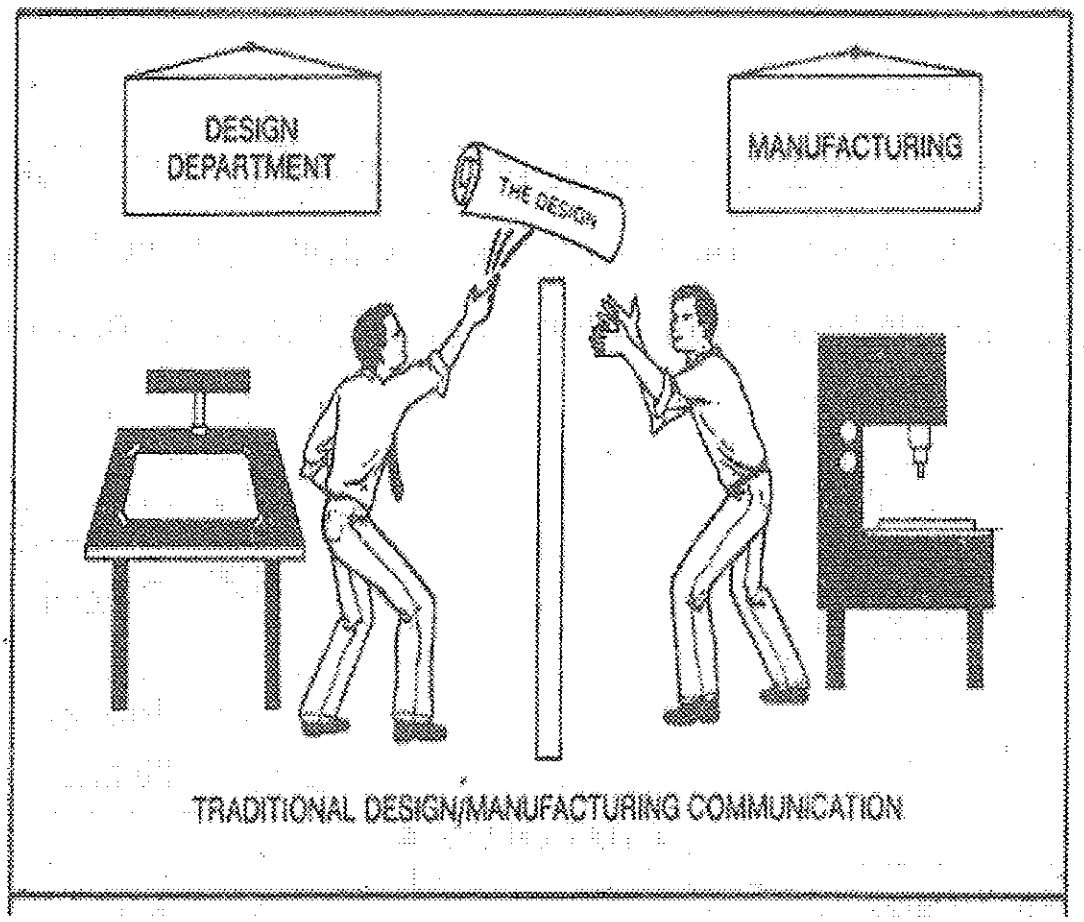
$AEu'' = 0$

Where E is the modulus of elasticity of the bar material and u" = d^2u/dx^2.

Q.9 **(Marks: 3+3)**

(a) Differentiate between CNC & DNC.

(b) Comment on the following Diagrams.



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Student I.D No:----------

BITS, PILANI-DUBAI, INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2009-2010

TEST-2 (Open Book)

Course Name: Computer Aided Design
Course No. : ME C382
Duration : 50 Minutes

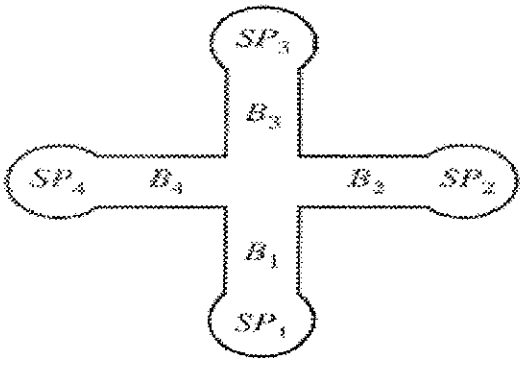
Max Marks: 30
Weightage: 15%
Date: 18-04-2010

NOTE:
i) Write your ID Number on the top immediately on the receipt of this paper.
ii) Maintain the order while answering the questions.
iii) Required values, tables & charts are given in the paper.
iv) If any data is missing, assume the suitable value with proper justification.

Q.1 Deduce the expanded parametric equation for Bezier surface of patch 3X3.Also show the parametric & Cartesian space. ***(Marks:6)***

Q.2 A line segment with end points $P_1[1\ 1\ 0]$ & $P_2[6\ 2\ 0]$ lying in XY plane, Rotating this line about X –axis yields a conical surface. Determine the point on this surface at U = 0.5,Φ= 60°. ***(Marks:6)***

Q.3 Sketch the *Constructive Solid Geometry* tree for the solid S1 shown in following figure & then:
(i) Check the prefect ness of tree.
(ii) Calculate the interior nodes.



Solid S_1

(Marks:2+2+2)

Q.4 The *reflection* along the line y=x is equivalent to the reflection along x-axis followed by counter clockwise rotation of θ degree. Find the value of θ. ***(Marks: 6)***

Q.5 Given a point P (1, 3, -5) using homogeneous transformation:
i) Calculate the transformed point P* if P is translated by d= 2 i + 3 j – 4 K & then rotated by 30° about Z axis.
ii) Calculate the transformed point P* if P is firstly rotated by 30° about Z axis & then translated by d= 2 i + 3 j – 4 K.

(Marks: 3+3)

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Student I.D No:----------

BITS, PILANI-DUBAI, INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2009-2010

TEST-1 (Closed Book)

Course Name: Computer Aided Design
Course No. : ME C382
Duration : 50 Minutes

Max Marks: 40
Weightage: 20%
Date: 07-03-2009

NOTE:
i) Write your ID Number on the top immediately on the receipt of this paper.
ii) Maintain the order while answering the questions.
iii) If any data is missing, assume the suitable value with proper justification.
iv) Attempt all the questions.

Q.1 How computer aided design differs from conventional design? List the benefits & application of CAD. ***(Marks:5)***

Q.2 Briefly describe the Micro Computer based CAD? List the minimum Hardware & software required for CAD station. ***(Marks: 5)***

Q.3 Differentiate between the Analytical & Synthetic Curves. ***(Marks: 5)***

Q.4 Explain C^0, C^1 and C^2 continuity of synthetic curves. ***(Marks: 5)***

Q.5 A line equation is given by $P = \begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix} + u \begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix}$

find the intersection points between the line & a circle at centre (1,2,0) and radius 2. ***(Marks: 10)***

Q.6 Develop the equation for a Bezier curve, find the points on the curve for u = 0.4, U = 0.6 & plot the curve. The coordinates of four control points are given by

P_0= [1,1,0]

P_1= [3,6,0]

P_2= [5,7,0]

P_3= [7,4,0] ***(Marks: 10)***

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BITS, PILANI-DUBAI, INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2009-2010
ME UC 382 Computer Aided Design (QUIZ-1)

MAX MARKS: 10 DURATION: 15 MINUTES WEIGHTAGE: 5%

NAME OF STUDENT: _____ I.D:_____

NOTES: i) Change of answer & overwriting is not permitted.
ii) Answer the question in the given space, no extra sheets are required.

Q.1 Name the CAD tools required for Design communication & documentation.
Ans:

Q.2 How the product cycle starts?
Ans:

Q.3 Who & when invented about orthographic projection?
Ans:

Q.4 List the four computer Aided Design software.
Ans:

Q.5 What is the aspect ratio of an image.
Ans:
Q.6 How many minimum data points are required for generating Cubic Spline?
Ans:

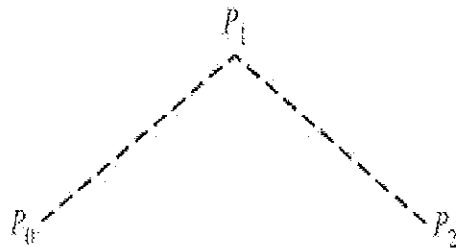
Q.7 What is the basis of Brazier curve?
Ans:

Q.8 How would you generate an ellipse in parametric form?
Answer the question on back side.

Q.9 Draw any object which shows a 2.5D modeling.
Answer the question on back side.

Q.10 Find the equation of hermit cubic spline that connects P_0 and P_2 & that is tangent two line segments shown in figure.

Answer the question on back side



BITS, PILANI-DUBAI, INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2009-2010
ME UC 382 Computer Aided Design (QUIZ-1)

QUIZ-1
ANSWERING SCHEME

Ans.1: Drafting & detailing shaded images.

Ans.2: Need identified based on customer & Market Demand.

Ans.3: French Mathematician Gaspard Monge in 1746

Ans .4: Iron CAD, ANSYS, Solid Edge, Nastron.

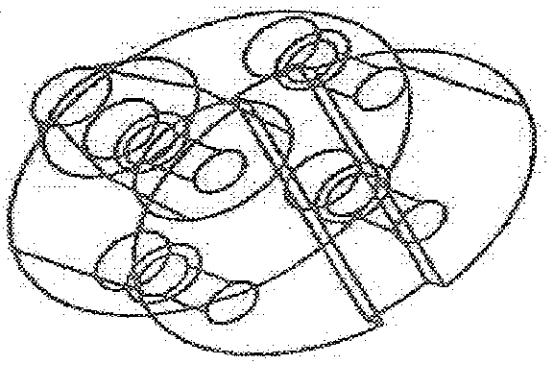
Ans .5: Ratio of horizontal to vertical pixel.

Ans .6: 4

Ans .7: Bernstein Polynomial.

Ans .8: The parametric equation of an ellipse can be written as:
$x = x_c + A \cos u$
$y = y_c + B \sin u \qquad 0 \leq u \leq 2\pi \qquad z = z_c$

Ans .9



Ans .10 :

$\mathbf{P}_0' = \mathbf{P}_1 - \mathbf{P}_0$ and $\mathbf{P}_1' = \mathbf{P}_2 - \mathbf{P}_1$. The two end points are $\mathbf{P}_0$ and $\mathbf{P}_2$. Substituting into Eq. gives

$$\mathbf{P}(u) = (u^3 - u^2 - u + 1)\mathbf{P}_0 - u(u-1)\mathbf{P}_1 + u^2(-u+2)\mathbf{P}_2$$