

[Total No. of Questions - 9] [Total No. Printed Pages - 2]  
(2126)

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**B. Tech 8th Semester Examination**  
**Computer Aided Design and Manufacturing (NS)**  
**ME-422**

**Time : 3 Hours**

**Max. Marks : 100**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all, selecting one each from Sections A, B, C & D. Question No. 9 of Section E is compulsory.

**SECTION - A**

1. (a) Explain the different phases of design process. Discuss the role of CAD-CAM in designing and manufacturing of mechanical component. (10)  
(b) Write briefly on the historical development of CAD-CAM. Explain the importance of CAD-CAM in industry. (10)
2. (a) How do you classify modeling package? Discuss the hardware required for a PC based drafting environment. (10)  
(b) What are the commands and their sequence to create 2D and 3D wire frame models of the following components (i) a bevel and (ii) worm gear? (10)

**SECTION - B**

3. (a) Find the equation of a cubic B-spline curve defined by the control points  $P_0 = [2 \ 2 \ 0]^T$ ,  $P_1 = [2 \ 3 \ 0]^T$ ,  $P_2 = [3 \ 3 \ 0]^T$ , and  $P_3 = [3 \ 2 \ 0]^T$ . How does the curve compare with the Bezier curve? (10)  
(b) Given a point  $P(1, 3, -5)$  find: (i) the transformed point  $P^*$  if  $P$  is translated by  $d = 2i + 3j - 4k$  and then rotated by  $30^\circ$  about the  $Z$  axis, (ii) Same as in (a) but point  $P$  is rotated first, then translated, (iii) Is the final point  $P^*$  the same in both (i) and (ii)? Explain your answer. (10)
4. (a) A point set  $S$  that defines a solid in  $E^3$  is a set of ordered triples. Find the three sets whose Cartesian product produces  $S$ . (10)

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- (b) Develop the translational transformation equation for a Hermite bicubic spline surface, a bicubic Bezier surface, and a bicubic B-spline surface. How can you extend the results to a cubic hyperpatch? (10)

**SECTION - C**

5. Choose two machine parts (one component and one assembly) of reasonable complexity:  
(a) Discuss the topological and geometrical aspects of the components in a coherent manner (point wise).  
(b) Discuss steps to create the component by B-rep method.  
(c) Discuss steps to create the components by constructive solid geometry (CSG).  
(d) Suggest the list of some available solid modelers to create the components. (20)
6. (a) Explain how surfaces can aid in creating solid models, that is, when must you use surfaces in solid modeling. (10)  
(b) What is the difference between NC, CNC, and DNC? Discuss the benefit of using tool offset in NC programming. (10)

**SECTION - D**

7. (a) Explain the concept of cellular manufacturing. List out the advantages of group technology. (10)  
(b) What makes an automated manufacturing system flexible? Name some of the IMS software and control functions. (10)
8. (a) Explain the production flow analysis. What do you mean by machine cell design? (10)  
(b) Write down the steps in variant process planning. Also explain the concept of planning for CAPP. (10)

**SECTION - E (Compulsory Question)**

9. Explain the following:  
(a) Hardware for drafting Packages  
(b) Blending functions reparametrization  
(c) Combined transformation  
(d) Types of CAPP  
(e) Planning for FMS

(4×5=20)