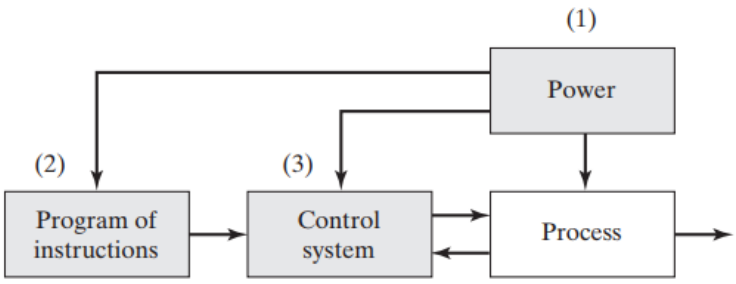
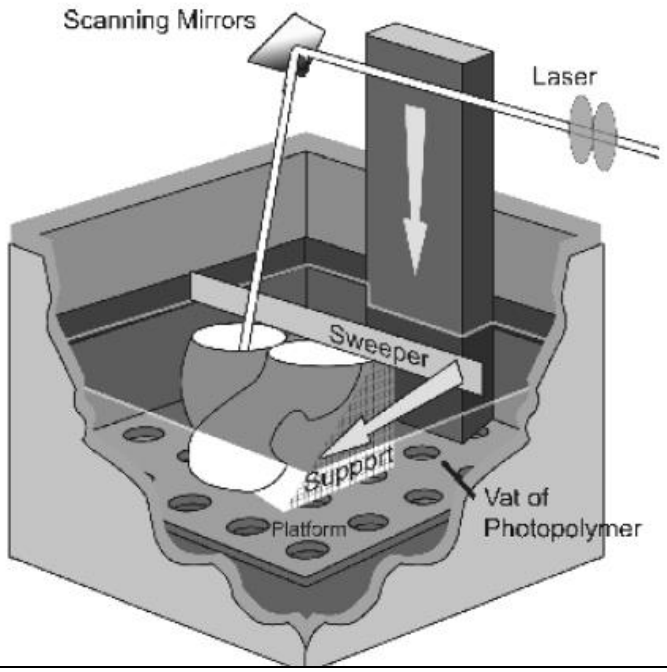
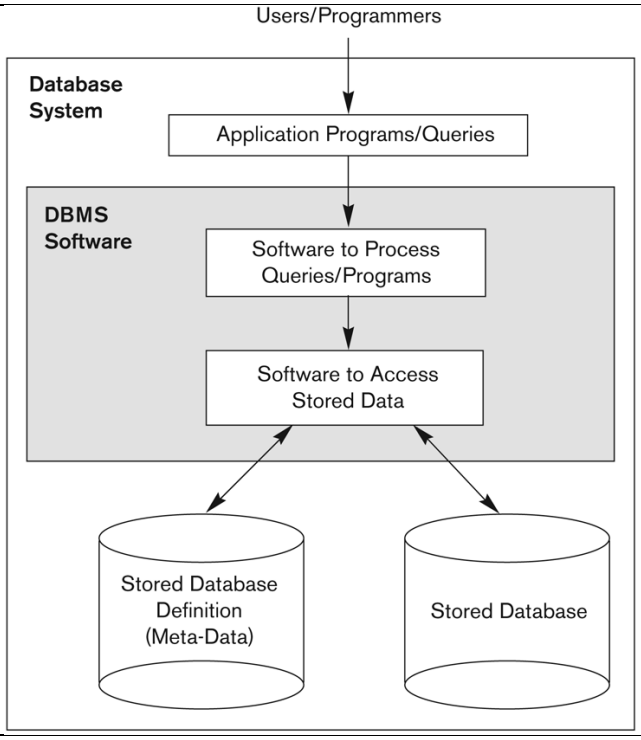
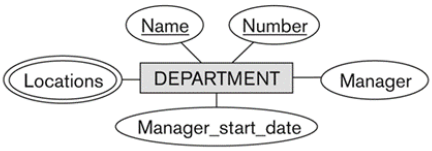
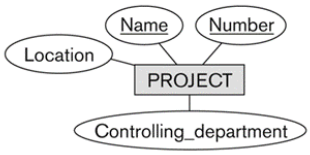
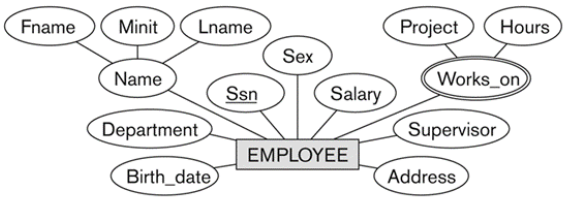
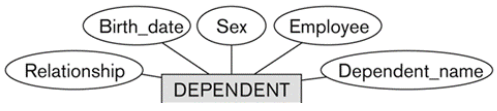
MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

Department of Mechanical and Manufacturing Engineering
I Sem- M. Tech (Industrial Automation and Robotics)
Digital Manufacturing (MTE 5004)
End-semester Examination – Scheme of evaluation
Date: Max Marks: 50 Time: 10.30 AM -11.30 PM

		M	CO	PO	BL
1 a	Explain various vehicle guidance technologies used in automated material handling systems of the smart factories Writing a brief note on any of following four types of technology @ 1 Mark for each point (1) Imbedded guide wires (2) Paint strips (3) Magnetic tape (4) Laser-guided vehicles (5) Inertial navigation	4	1	7	2
1b	Describe the Building blocks of automation Brief discussion of the following elements 	4	1	7	2
1c	Explain four different error recovery strategies **1.** Make adjustments at the end of the current work cycle. 2. Make adjustments during the current cycle. 3. Stop the process to invoke corrective action. 4. Stop the process and call for help.	2	1	7	2
2 a	Discuss the steps involved in cusomisation of product based on ***Leonard and Rayport*** guidelines • **Observation.** Observe individual customers or user groups • **Capturing data.** • **Reflection and analysis.** The data collected are discussed with the wider design team with the aim of identifying all the customers requirements and converting these into design parameters.	4	2	2	2

	• **Generating solutions**. This is achieved using the common set of creative tools available to the designer, e.g**. brainstorming, concept sketches, etc**. • **Prototyping of chosen concepts**. Physical (or virtual) representations of the concepts that appear to meet most closely the customer needs are created. • **Verification of design**. Once again customers are brought in to evaluate the new designs to verify that they are an improvement on existing products.				
2 b	Describe the working of stereolithography and highlight the features of this process • working of stereolithography - 2 M • Neat sketch - 1M • highlight the features - 1 M  	4	2	2	4
2 c	What are the stumbling blocks for Rapid manufacturing methods? Discussion on following relevant issues • Risks • Materials • Defects • Applications	2	2	2	4
3 a	Explain the architecture for a database system	4	3	3	

					
3 b	For the E-R diagram shown below, write the SQL code to create the dabase and apply suitable constraints.     Writing SQL Program for each table 1 M	4	3	3	3

3 c	Define and Differntiate the **primary key** and **foreign key** with suitable example Define - the **primary key** and **foreign key** – 1M Suitable example – 1 M	2	3	3	4
4 a	Discuss the three dimensions of Digital Manufacturing Disucssion on • ***product life cycle*** • ***smart factory*** • ***value chain management***	4	4	8	2
4 b	Explain the technology/tools of Digital manufacturing Note on atleast four of following technologies @ 1M each • **Additive manufacturing:** • **Augmented reality (AR):** • **Digital twins:** • **Industrial Internet of Things (IIoT):** • **Big data and analytics:** • **Automation and Robotics:**	4	4	8	2
4 c	Benefits of Digital Manufacturing Any of these 6 points - • Increased efficiency through automated exchange of data • Avoidance of costly errors due to missed or misinterpreted data • Quicker turnaround at all levels of the value chain • Greater insight at critical decision points • Real-time visibility into the effects of changes to processes, equipment, systems or components • Faster pace of innovation • Lowered cost of production and maintenance.	2	4	8	2
5 a	Explain the generalised process chain of rapid manufacturing process	4	2	2	2

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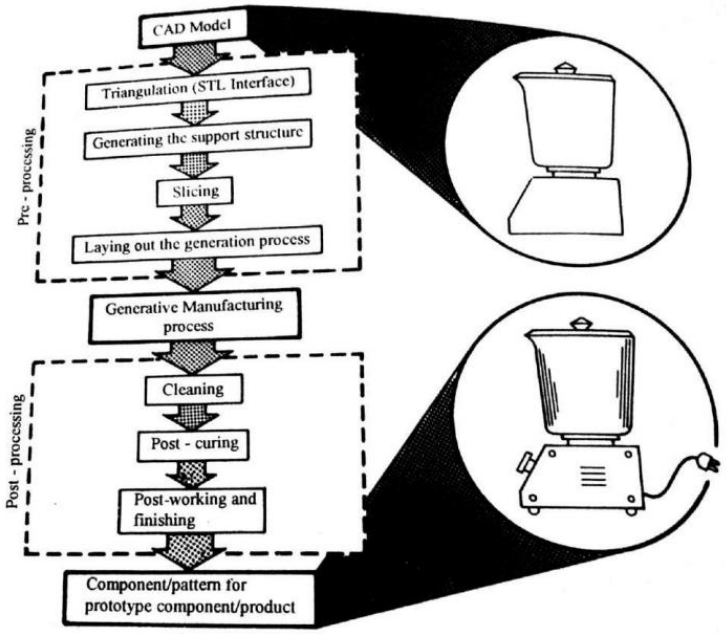
<td> 
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<td>5 b</td>
<td>For the data shown in the following table, write the SQL query for the following

Query for each question 1 Mark
a) Identify the names of students with age greater than 21
b) Determine the average GPA of all students
c) Find the name of student whos name starts with ‘Be’
d) Find the name and address of students whose phone number is not entered in entered in the database
STUDENT
<table>
<tr><th>Name</th><th>Ssn</th><th>Home_phone</th><th>Address</th><th>Office_phone</th><th>Age</th><th>Gpa</th></tr>
<tr><td>Dick Davidson</td><td>422-11-2320</td><td>NULL</td><td>3452 Elgin Road</td><td>749-1253</td><td>25</td><td>3.53</td></tr>
<tr><td>Barbara Benson</td><td>533-69-1238</td><td>839-8461</td><td>7384 Fontana Lane</td><td>NULL</td><td>19</td><td>3.25</td></tr>
<tr><td>Rohan Panchal</td><td>489-22-1100</td><td>376-9821</td><td>265 Lark Lane</td><td>749-6492</td><td>28</td><td>3.93</td></tr>
<tr><td>Chung-cha Kim</td><td>381-62-1245</td><td>375-4409</td><td>125 Kirby Road</td><td>NULL</td><td>18</td><td>2.89</td></tr>
<tr><td>Benjamin Bayer</td><td>305-61-2435</td><td>373-1616</td><td>2918 Bluebonnet Lane</td><td>NULL</td><td>19</td><td>3.21</td></tr>
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<td>4</td>
<td>3</td>
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<td>4</td>
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<tr>
<td>5 c</td>
<td>Explain what is Recursive Relationship Type with an example
Defining the Recursive Relationship – 1M
Example – 1M</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
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