CMR INSTITUTE OF TECHNOLOGY

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Internal Assesment Test – 3

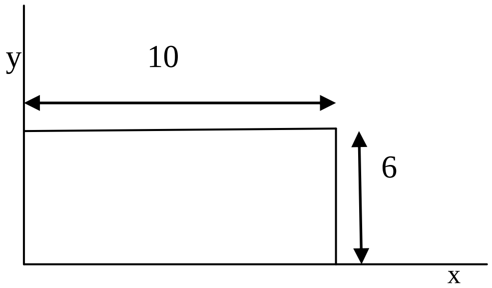
| Sub: Computer Integrated Manufacturing | | | | Code: 15ME62 |
|---|---|---|---|---|
| Date: 13/05/2018 | Duration: 90 mins | Max Marks: 50 | Sem: 6 | Branch (sections): ME (A,B) |

Answer any FIVE FULL questions. Good luck!

| | | Marks | OBE CO | OBE RBT |
|---|---|---|---|---|
| 1 | Explain Variant/ Retrieval approach to CAPP with a neat sketch. | [10] | CO1 | L1 |
| 2 | Explain the structure of MRP ( material requirement planning) in detail with a sketch. | [10] | CO1 | L1 |
| 3 | Explain the Computer Aided Design Process with a sketch. | [10] | CO1 | L1 |
| 4 | A manual assembly line has to accomplish 10 work elements to complete the assembly . The element times and precedence requirements are listed in the table. The production rate of the line is 60 units per hour. The efficiency of the line is 95% and the repositioning time is 3sec. Use kilbridge and westers method to balance the line and determine the delay and efficiency. 60 units per hour. The efficiency of the line is 95% and the repositioning time is 3sec. Use kilbridge and westers method to balance the line and determine the delay and efficiency. | [10] | CO3 | L3 |

| Element | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Te (min) | 0.3 | 0.4 | 0.3 | 0.2 | 0.4 | 0.1 | 0.5 | 0.6 | 0.4 | 0.6 |
| Precedence | - | - | 1 | 1,2 | 2 | 3,4 | 4 | 5 | 6,7 | 8,9 |

| | | Marks | CO | RBT |
|---|---|---|---|---|
| 5 | List the needs of a graphics software and with a neat sketch explain the software configuration of graphics system. | [10] | CO2 | L1 |
| 6 | A rectangle with a length of 10mm in and having width 6mm has one of its edges lying at the origin and is as shown in the fig. Determine the coordinates if i) translated by a distance of 3 units in x-axis and 4 units in y-axis. ii) it is scaled by a factor of 3 units. iii) it is scaled by a factor of 2 units in x-axis and -1 unit in y axis. iv) it is rotated at an angle of 45° w.r.t. origin. v) it is rotated at an angle of -30° w.r.t. origin. | [10] | CO3 | L3 |

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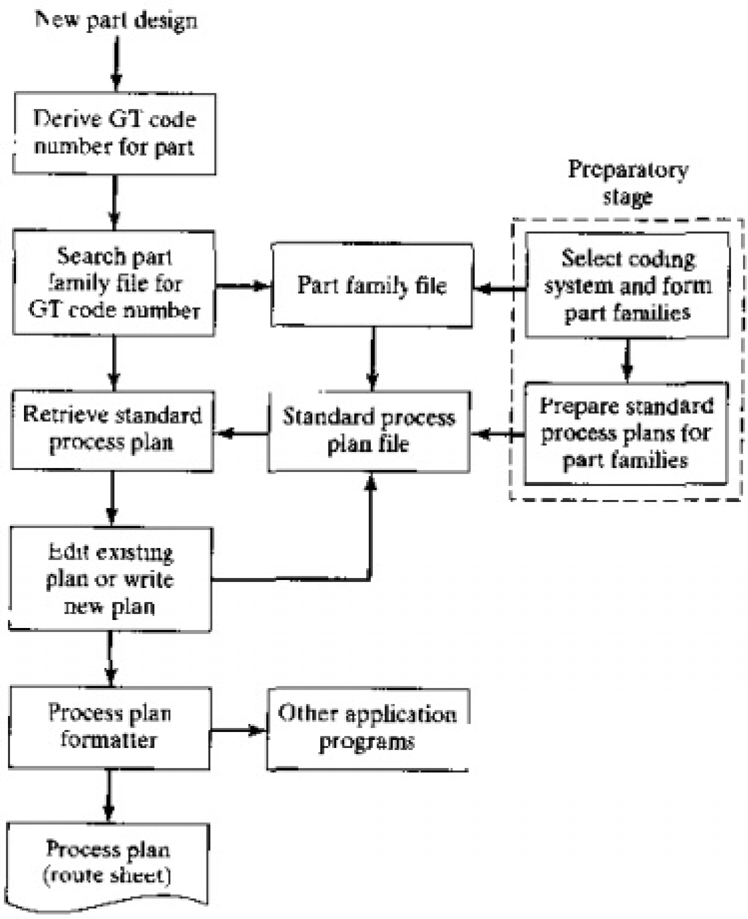
# IAT 3 Solution- May 2019

| | | |
|---|---|---|
| | | |
| [10] | CO2 | L2 |

1)




A *retrieval CAPP* system, also called a *variant CAPP* system, is based on the principles of group technology (GT) and parts classification and coding. In this type of CAPP, a standard process plan (route sheet) is stored in computer files for each part code number. Before the system can be used for process planning, a significant amount of information must be compiled and entered into the CAPP data files. This is the "preparatory phase:' It consists of the following steps:

(1) selecting an appropriate classification and coding scheme for the company,

(2) forming part families for the parts produced hy the company; and

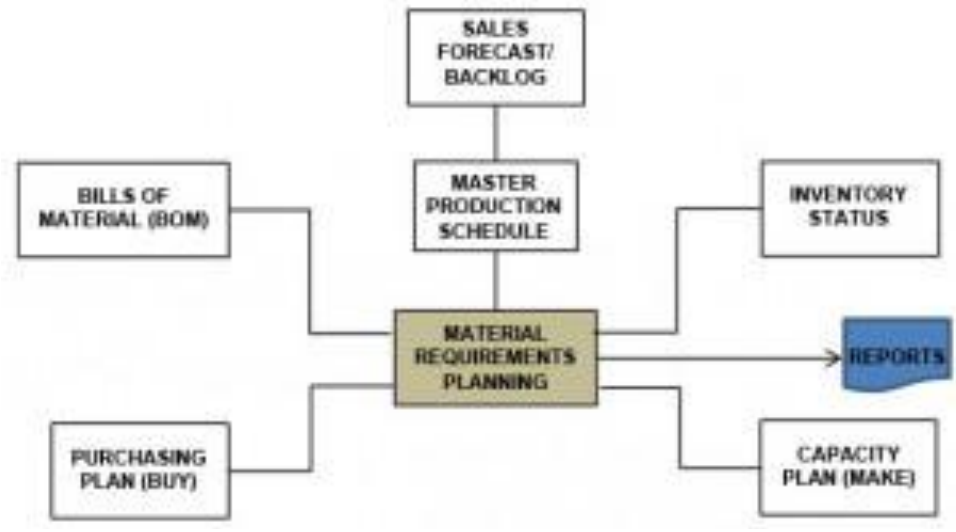
(3) preparing standard process plans for the part families. It should be mentioned that steps (2) and (3) continue as new parts are designed and added to the company's design data base.

After the preparatory phase has been completed, the system is ready for use, For a new component for which the process plan is to be determined. the first step is to derive the GT code number for the part. With this code number, a search is made of the part family, *file* to determine if a standard route sheet exists for/he given part code. If the file contains a process plan for the part it is retrieved and displayed for the user. The standard process plan is examined to determine whether any modifications are necessary. It might be that although the new part has the same code number. there are minor differences in the processes required to make it. The user edits the standard plan accordingly. This capacity to alter an existing process plan is what gives the retrieval system its alternative name: variant CAPP system.

If the file does not contain a standard process plan for the given code number, the user may search the computer file for a similar or related code number for which a standard route sheer does exist. Either by editing an existing process plan, or by starting from scratch, the user prepares the route sheet for the new part. This route sheet becomes the standard process plan for the new part code number

The process planning session concludes with the process plan formatter, which prints alit the route sheet in the proper format. The formatter may call other application programs into use: for example, to determine machining conditions for the various machine tool operations in the sequence. to calculate standard times (or the operations (e.g., for direct labor incentives). or to compute cost estimates for the operations.

2)




**MRP Objectives**

MRP has several objectives, such as:

- **Reduction in Inventory Cost**: By providing the right quantity of material at right time to meet master production schedule, MRP tries to avoid the cost of excessive inventory.
- **Meeting Delivery Schedule**: By minimizing the delays in materials procurement, production decision making, MRP helps avoid delays in production thereby meeting delivery schedules more consistently.
- **Improved Performance**: By stream lining the production operations and minimizing the unplanned interruptions, MRP focuses on having all components available at right place in right quantity at right time.

**MRP System**

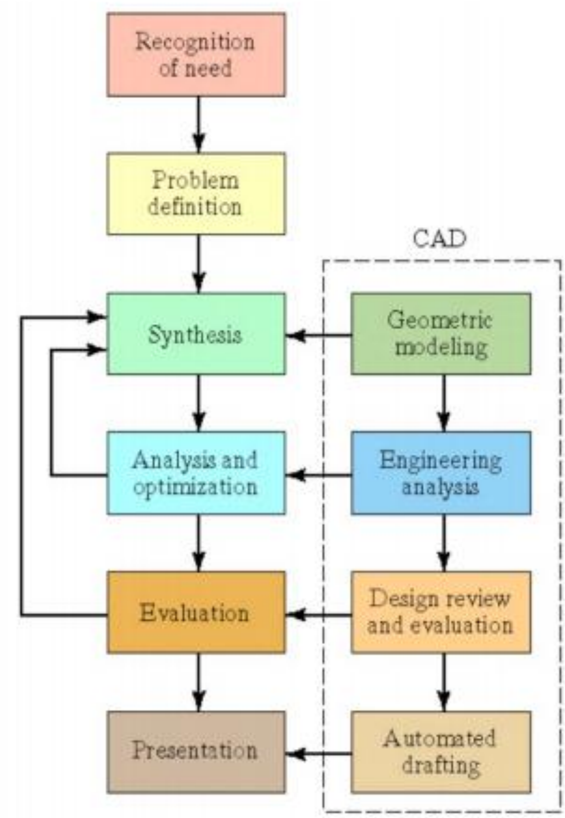
A simple sketch of an MRP system is shown. It can be seen from the figure that an MRP system has three major input components:

- **Master Production Schedule (MPS)**: MPS is designed to meet the market demand (both the firm orders and forecasted demand) in future in the taken planning horizon. MPS mainly depicts the detailed delivery schedule of the end products. However, orders for replacement components can also be included in it to make it more comprehensive.
- **Bill of Materials (BOM) File**: BOM represents the product structure. It encompasses information about all sub components needed, their quantity, and their sequence of buildup in the end product. Information about the work centers performing buildup operations is also included in it.
- **Inventory Status File**: Inventory status file keeps an up-to-date record of each item in the inventory. Information such as, item identification number, quantity on hand, safety stock level, quantity already allocated and the procurement lead time of each item is recorded in this file.

After getting input from these sources, MRP logic processes the available information and gives information about the following:

- **Planned Orders Receipts**: This is the order quantity of an item that is planned to be ordered so that it is received at the beginning of the period under consideration to meet the net requirements of that period. This order has not yet been placed and will be placed in future.
- **Planned Order Release**: This is the order quantity of an item that is planned to be ordered in the planned time period for this order that will ensure that the item is received when needed. Planned order release is determined by offsetting the planned order receipt by procurement lead time of that item.
- **Order Rescheduling**: This highlight the need of any expediting, de-expediting, and cancellation of open orders etc. in case of unexpected situations.

3)




**Recognition of need**—this involves the realisation that a problem or need exists that may be solved by design. This may mean identifying some deficiency in a current machine design by an engineer, or perceiving some new product opportunity by a salesperson. Problem definition—this involves a thorough specification of the item to be designed. Specifications include physical characteristics, function, cost, quality, and operating performance.
**Synthesis**—closely related with the following step, analysis, synthesis refers to the bundling of information that occurs after problem definition, and concurrently during analysis, and after re-analysis.
**Analysis and optimization**—closely related to the previous step, analysis is concerned with the investigation of design specification information, and the optimization of this information, as well as a synthesis of new information, as required.
**Evaluation**—involves measuring the design against the specifications established in the problem definition phase. This evaluation may require the building and testing of prototype models to assess operative performance metrics for the proposed design. This may lead to the re-design of certain or all elements.
**Presentation**—this is the final phase, where the design is documented by means of drawings, material specifications, assembly lists, and so on. Documentation means that the design database is created. ENDLIST

4)

$R_p$ = 60 units/hr

$T = \frac{1}{R_p} = \frac{1}{1}$ = 1 min/unit.

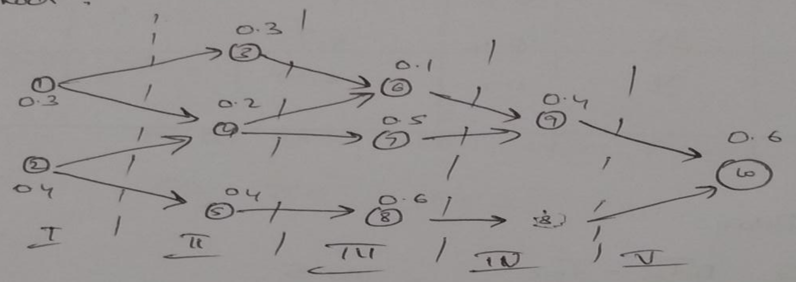
E = 95% . = 0.95

$T_r$ = 3sec = $\frac{3}{100}$ = 0.05 min.

$E = \frac{T_c}{T_p} = T_c = T_p \times E$

= 1×0.95 = 0.95 min .

K&W method .




| Work element | Column | Te (min) | Precedence |
|---|---|---|---|
| 2 | I | 0.4 | – |
| 1 | I | 0.3 | – |
| 5 | II | 0.4 | 2 |
| 3 | II | 0.3 | 1 |
| 4 | II | 0.2 | 1,2 |
| 8 | III, IV | 0.6 | 5 |
| 7 | III | 0.5 | 4 |
| 6 | III | 0.1 | 3,4 |
| 9 | IV | 0.4 | 6,7 |
| 10 | V | 0.6 | 8,10 |

Station table :-

| Work element | Column | $T_{ej}$ | Precedence | Station | Total station time |
|---|---|---|---|---|---|
| 2 | I | 0.4 | - | 1 | 0.9 |
| 1 | I | 0.3 | - | | |
| 4 | II | 0.2 | 1,2 | | |
| 5 | II | 0.4 | 2 | 2 | 0.8 |
| 3 | II | 0.3 | 1 | | |
| 6 | II | 0.1 | 3,4 | | |
| 8 | III, IV | 0.6 | 5 | 3 | 0.6 |
| 7 | III | 0.5 | 4 | 4 | 0.9 |
| 9 | IV | 0.4 | 6,7 | | |
| 10 | V | 0.6 | 8,10 | 5 | 0.6 |

Balance Delay :-

$$D_b = \frac{nT_{si} - T_{wc}}{nT_{si}} \qquad n = 5$$

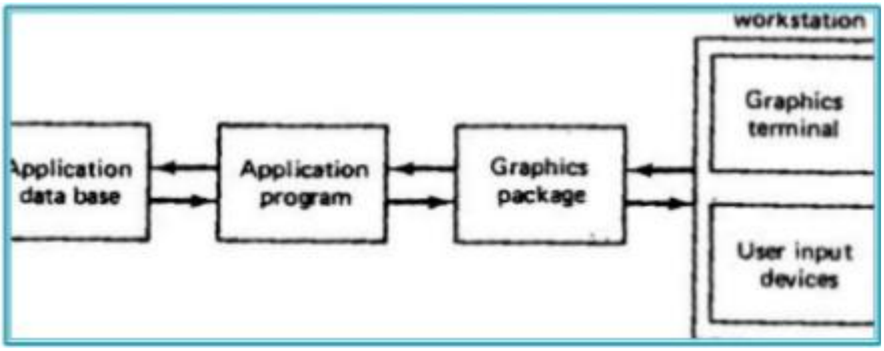
$$\therefore \; D_b = \frac{5 \times 0.9 - 3.8}{5 \times 0.9} = 0.15 \approx \underline{15\%}$$

$$E_b = 1 - D_b$$

$$= 1 - 0.15 = 0.85$$

$$\approx \underline{85\%}$$

5)




The graphics software for a particular computer graphics system is very much a function of the type of hardware used in the system. The software must be written specifically for the type of CRT and the types of input devices used in the system. The differences between a storage tube and a refresh tube would also influence the graphics software. To accomplish various types of interaction between the user and the system. It includes Programmers to generate images on the CRT screen. The graphics software: is the collection of programs written to make it convenient for a user to operate the computer graphics system.
In THE OPERATION OF THE GRAPHICS SYSTEM BY THE USER, A VARIETY OF ACTIVITIES TAKE PLACE, WHICH CAN BE DIVIDED INTO THREE CATEGORIES:
1. Interact with the graphics terminal to create and alter images on the screen
2. Construct a model of something physical out of the images on the screen. The models are sometimes called application models.
3. Enter the model into computer memory and/or secondary storage.

According to a conceptual model suggested by Foley and Van Dam:
1. The graphics package
2. The application program
3. The application data base

1. Application programs are written for particular problem areas. Problem areas in engineering design would include architecture, construction, mechanical components, electronics, chemical engineering, and aerospace engineering. The application program is implemented by the user to construct the model of a physical entity whose image 'is to be viewed on the graphics-screen it controls the storage of data into and retrieves data out of the application data base. The central module is the application program.
2. The graphics package consists of input subroutines and output subroutines. The input routines: accept input commands and data from the user and forward them to the application program. The output subroutines: control the display terminal and convert the application models into two-dimensional or three-dimensional graphical pictures. It also serves as the interface between the user and the application software. It manages the graphical interaction between the user and the system } It is the software support between the use and the graphics terminal
The contents of the data base can be readily displayed on the CRT or plotted out in hard-copy form. It also includes alphanumeric information associated with the models, such as bills of materials, mass properties, and other data. The data base contains mathematical, numerical, and logical definitions of the application models, such as electronic circuits, mechanical components, automobile bodies, and so forth.
3. Some of the common function sets are: Generation of graphic Elements Transformations Display Control and windowing functions segmenting functions User input functions. To fulfill its role in the software configuration, the graphics package must perform a variety of different functions. These functions can be grouped into function sets. Each set accomplishes a certain kind of interaction between the user and the system.