Session 2. M&CRP, PAC and Inventory Management.

Key Terms :

- M&CRP : MRP Mechanics, Keep the plan current, Capacity Planning.
- Production Activity Control : Manufacturing Process & PAC, PAC Techniques.
- Inventory Management : Aggregate & Individual Inventory Management, Order Quantity & Safety Stock.

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Part 1. Material & Capacity Requirement Planning.

1. Orders which are automatically replanned by the computer are called :
   A) Firm orders. B) Scheduled receipts.
   C) Net requirements. D) Planned orders.

2. Net requirements are :
   A) Scheduled receipts - available inventory - forecast.
   B) Forecasts - scheduled receipts - customer orders.
   C) Forecasts - customer orders and scheduled receipts.
   D) Gross requirements - scheduled receipts - available inventory.

3. Which of the following BEST describes the use of bills of material in planning systems ?
   A) For the engineering design. B) For lot sizing.
   C) The process to make the item. D) How the product is built.

4. _____ is the process of placing the exploded requirements in their proper periods based on leadtime. It is a basic MRP technique.

A) Releasing. B) Pegging. C) Offsetting. D) Grossing.

5. A low level code is BEST defined as the :

A) First work center in which the part is processed.
B) Lowest level on which a part resides in the BOM.
C) Product family which the part belongs to.
D) The most accurate forecast level.

6. A where-used report provides a list of :

A) All work centers where a part is run.
B) All parents where a component is used.
C) All components where a parent is used.
D) All planning bills.

7. Which of the following BEST describes an exception message ?

A) A message to the planner that a problem needs attention.
B) A message that the MRP system is done running.
C) A message that the system is in balance.
D) A message to order within leadtime.

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8. Which of the following are major objectives of MRP ?

Ⅰ. Leveling capacity.
Ⅱ. Determining capacity.
Ⅲ. Determining material requirements.
Ⅳ. Keeping priorities(orders) current.

A) Ⅰ and Ⅱ only. B) Ⅱ and Ⅲ only. C) Ⅲ and Ⅳ only D) All

9. Material requirements planning (MRP) schedules a planned order receipt when

A) A gross requirement exists. B) A net requirement exists.
C) An exception is generated. D) Safety stock is zero.

10. All of the following conditions will trigger an exception message EXCEPT :

A) Changes in timing of a scheduled receipt
B) Changes in the inventory on hand balance due to cycle count adjustment
C) Changes in the forecast
D) Changes in the assigned planner

11. Which of the following is the responsibility of a planner ?

Ⅰ. Reschedule due date of open order as required.
Ⅱ. Schedule planned order.
Ⅲ. Reconcile errors.

A) Ⅰ only B) Ⅲ only C) Ⅰ, Ⅲ only D) Ⅰ, Ⅱ, Ⅲ

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12. Which of the following statement correctly describes about the firm planned order ?

Ⅰ. It means the system won't use the normal lead time offset from the net requirement for the order.

Ⅱ. It is defined as a firm requirement that can be frozen in quantity and time.

Ⅲ. It is one of method to reduce system nervousness.

A) Ⅲ only B) Ⅱ, Ⅲ only C) Ⅰ, Ⅲ only D) All

13. System nervousness is caused by :

A) The inability of the planner to remain calm

B) Requirements changing rapidly

C) Constant demands by manufacturing for long production runs

D) Purchased materials which do not arrive on time

14. If a purchased part order is late, which of the following would be the most likely source to determine which customer order would be affected ?

A) Where-used report. B) Planning bill.

C) Routing. D) Pegging report.

15. A manufactured component is going to be late. Which of the following would a planner review to ensure a customer will not be affected ?

A) Indented bill of materials B) Pegging inquiry screen

C) Open purchase order report D) Work order routing

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16. All of the following statements are correct about bottom-up replanning EXCEPT ?
A) Action to correct for changed conditions should occur as low in the product structure.
B) It use pegging data.
C) This process is accomplished by the computer system.
D) Potential solutions include compressing LT.

17. If priority plans have to be adjusted at any of the planning levels because of capacity problems, those should be reflected in the levels above. Thus, there must be feedback throughout the system so that the planning can be valid at all times. This so called ?
A) Feedback system.
B) Auditing system.
C) Backflush.
D) Closed loop MRP.

18. In buyer-planner concept, which of the following is NOT true ?
A) The person who has the responsibilities of buyer's job and planner's job handles more components than either a buyer or a planner.
B) The planner/buyer is responsible for determining material requirements.
C) The planner/buyer is responsible for handling all the activities associated with the buying and production planning functions.
D) There is a smoother flow of information and material between the supplier and the factory.

19. Which of the following BEST describes the advantage of a planner/buyer position ?
Ⅰ. Smooth flow of information between supplier and the factory
Ⅱ. Improved coordination of factory requirements and the supplier
Ⅲ. Improved flow of materials through the factory
Ⅳ. Ability to match material requirements with suppliers capability

A) I, II ,and III
B) I, III, and IV
C) II, III, and IV
D) I, II, and IV

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20. Available capacity can be BEST described as :
A) The ability of a resource to produce a quantity of output for a particular period
B) The amount of resource needed to produce the necessary output for a specified time period
C) The amount of released work to a facility during a specified time period
D) The amount of load on a work center to produce the output necessary

21. Which of the following is used to determine the feasibility of the material requirements plan ?
A) Resource requirements planning
B) Rough-cut capacity planning
C) Capacity requirements planning
D) Work center capacity control

22. Which of the following will affect available capacity ?
Ⅰ. Product specifications
Ⅱ. Product mix
Ⅲ. Quantity of customer order
Ⅳ. Work pace

A) I, II, and III
B) I, II, and IV
C) II, III, and IV
D) I, III, and IV

23. Which of the following best describes the term "load" ?
A) Sum of the required times for all actual orders to be run at a work center for a specified time frame
B) Sum of the required times for all planned orders to be run at a work center for a specified time frame
C) Sum of the required times for all planned and actual orders to be run at a work center for a specified time period
D) Sum of the required times for all forecasted orders to be run at the work center for a specified time period

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24. If a variety of products are made in a factory, the most common unit of capacity is :
A) Machine turns B) Inventory turns C) Time D) Dollars

25. Which of the following describes the strategic advantage of capacity planning?
A) It improves the flow of materials through the factory.
B) It improves scheduling performance and reduces cost.
C) It improves the scheduling of materials from suppliers.
D) It provides more realistic due dates to customers.

26. Which of the following best defines THROUGHPUT ?
A) The number of bottlenecks slowing production
B) The total capacity which a factory can produce
C) The speed of a work center to produce
D) The total volume of production passing through a facility

27. In most cases, the fastest way to increase capacity to meet a short-term requirement is to
A) Hire additional workers
B) Use overtime
C) Acquire more equipment
D) Subcontract work

28. A manufacturer makes tables consisting of a top, 4 legs, and 4 top trims. Demand for the tables is 600 per week. The capacity for the tops is 700 per week, the capacity for legs is 2,000 per week, and the capacity for the trim is 2,500 per week. What is the capacity to produce tables ?
A) 400 B) 500 C) 600 D) 1000

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29. A work center has 300 available hours, a utilization rate of 80% and an efficiency rate of 90%. What is the rated capacity of the work center ?

A) 216 hours B) 240 hours

C) 270 hours D) Not enough information to determine

※ The following information for a single work center.

- Number of machines = 4, Number of shifts = 1
- Shift length = 40 hours,
- Utilization = 90%, Efficiency = 90%
- Actual output :

  Week 1 = 160 hours, Week 2 = 140 hours

  Week 3 = 150 hours, Week 4 = 150 hours

30. Which of the following is the rated capacity for the work center?

A) 130 hours B) 144 hours C) 150 hours D) 160 hours

31. Which of the following is the demonstrated capacity for the work center ?

A) 130 hours B) 144 hours C) 150 hours D) 160 hours

32. A bill of materials contains :

Ⅰ. Components used to make a product.

Ⅱ. Labor needed to build the product.

Ⅲ. Assemblies at various stages of production.

Ⅳ. Safety stock by item.

A) I and II B) I and III C) II and III D) III and IV

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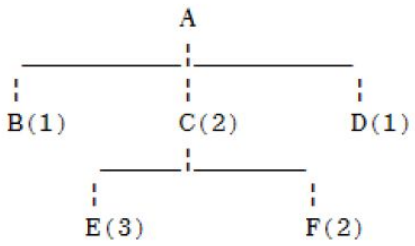
33. Based on the following product structure how many E's are needed for 100 A's?



A) 100 B) 300 C) 400 D) 600

34. The Bill of Materials is used quite frequently in manufacturing. All of the following are uses of the BOM EXCEPT :

A) Product costing.
B) Planning.
C) Calculating capacity.
D) Engineering change control.

35. All of the following are benefits of subcontracting EXCEPT:

A) Excess capacity is not left unused.
B) Companies can produce at minimum levels, reducing facilities cost.
C) Cost can be minimized.
D) Overtime can be reduced.

36. The MRP system has given you, the planner, the message, " Expedite Order 45367" which happens to be for a purchased part. You should :

A) Immediately change the order to the recommended date.
B) Move the order to a later date.
C) Contact the supplier to see if they can meet the new delivery date.
D) Leave the order as is.

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37. Capacity requirements planning (CRP) is concerned with which of the following?

Ⅰ. Labor hours for a product family.
Ⅱ. Individual orders and individual work centers.
Ⅲ. Calculating work center loads.
Ⅳ. Validating the capacity for the master production schedule.

A) I and II B) I and III C) II and III D) III and IV

38. Planning bills can be BEST described as :

A) Indented bill of materials. B) Products which the factory plans to build.
C) Grouping like items together for planning. D) Phantom bill of materials.

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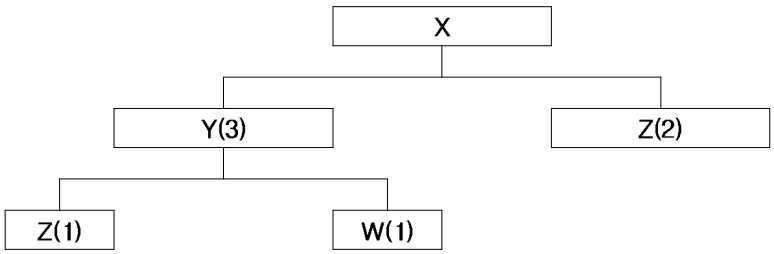
39. Given the following product tree, complete the MRP records for parts X, Y, Z. Note that parts X and Y have specified order quantities.



Week		1	2	3	4	5
	Gross Requirements.	15	5	15	10	15
Part X	Scheduled Receipts					
Lead Time : 1주.	Projected Available 10					
Lot Size : 20	Net Requirements					
Level code : 0	Planned Order Receipts					
	Planned Order Release					
	Gross Requirements.					
Part Y	Scheduled Receipts					
Lead Time : 2주.	Projected Available 30					
Lot Size : 50	Net Requirements					
Level code : 1	Planned Order Receipts					
	Planned Order Release					
	Gross Requirements.					
Part Z	Scheduled Receipts					
Lead Time : 2주.	Projected Available 30					
Lot Size : L4L	Net Requirements					
Level code : 2	Planned Order Receipts					
	Planned Order Release					
	Gross Requirements.					
Part W	Scheduled Receipts					
Lead Time : 2주.	Projected Available 20					
Lot Size : 50	Net Requirements					
Level code : 2	Planned Order Receipts					
	Planned Order Release					

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40. Generate the pegging report for Part Z.

Period	1	2	3	4	5
Gross Requirement					
Parent X					
Parent Y					

41. Complete the following MRP record. The leadtime is four weeks, and the lot size is 200. What will happen if the gross requirement in week 3 are increased to 150 units ? As a planner, what actions can you take ?

Intial MRP

Week		1	2	3	4	5
Part A Lead Time : 4주. Lot Size : 200	Gross Requirements.	50	125	100	60	40
	Scheduled Receipts		200		200	
	Projected Available 100					
	Net Requirements					
	Planned Order Receipts					
	Planned Order Release					

Revised MRP

Week		1	2	3	4	5
Part A Lead Time : 4주. Lot Size : 200	Gross Requirements.					
	Scheduled Receipts					
	Projected Available 100					
	Net Requirements					
	Planned Order Receipts					
	Planned Order Release					

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42. It is Monday morning, and you have just arrived at work. Complete the following MRP record as it would appear Monday morning. Lead time is two weeks, and the lot size is 100.

Intial MRP

Week			1	2	3	4	5
Part B Lead Time : 2주. Lot Size : 100	Gross Requirements.		70	40	80	50	40
	Scheduled Receipts		100				
	Projected Available	50	80	40	60	10	70
	Net Requirements				40		30
	Planned Order Receipts				100		100
	Planned Order Release		100		100		

During the week, the following events occur. Enter them in the MRP record.

- The planned order for 100 in week 1 is released.
- Thirty of the scheduled receipts for week 1 are scrapped.
- An order for 20 is received for delivery in week 3.
- An order for 40 is received for delivery in week 6.
- The gross requirement of 70 in week 1 is issued.

43. A work center consisting of seven machines is operated 16 hours a day for a five-day week. Utilization is 80%, and efficiency is 110%. What is the rated weekly capacity in standard hours ?

44. A firm wishes to determine the efficiency and utilization of a work center composed of three machines each working 16 hours per day for five days a week. A study undertaken by the materials management department found that over the past year the work center was available for work 12,000 hours, work was actually being done for 10,440 hours, and work was performed 11,480 standard hours. Calculate the utilization, efficiency, and demonstrated weekly capacity. Assume a 50-week year.

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Part 2. Production Activity Control.

1. The goal of the Theory of Constraints is to improve throughput by identifying and eliminating manufacturing bottlenecks. Which of the following best describes a constraint ?

A) The area in the plant where inventory backs up.
B) The machine with the longest set up time.
C) The supplier with a capacity issue.
D) The resource that limits throughput of manufacturing.

2. Of all the times associated with manufacturing lead times, which generally takes the most time in intermittent manufacturing ?

A) Run time B) Setup time C) Queue time D) Move time

3. A shop packet will contain all of the following EXCEPT :

A) Engineering drawings B) Bill of materials
C) Route sheets D) Customer information

4. Final assembly scheduling usually occurs when :

A) A customer order is received B) Planning a build schedule
C) The MPS is established D) Capacity is constrained

5. A part made on a work center has a setup time of 50 minutes and run time of two minutes per piece. An order for 600 parts needs to be processed on two machines at the same time. The machines can be set up at the same time. The elapsed operation time will be :

A) 600 B) 650 C) 1200 D) 1250

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6. Which of the following defines the sequence of operations to be performed to manufacture a part ?

A) Item master B) Bill of material C) Routing D) Shop calendar

7. The last operation is first scheduled for completion on the due date. Other previous operations are scheduled so that the due date can be met. This describes :

A) Backward scheduling B) Master scheduling
C) Capacity scheduling D) Forward scheduling

8. Bottlenecks can be BEST defined as :

A) Work stations where available capacity is greater than required capacity
B) Work stations where measured capacity is greater than required capacity
C) Work stations where required capacity is greater than available capacity
D) Work stations where the demonstrated capacity is greater than the measured capacity

9. The primary reason to use operation splitting is:

A) Utilize machinery more effectively B) Increase manpower efficiency
C) Reduce the maintenance costs D) Reduce leadtime

10. Which of the following is used to manage queues and lead times ?

A) Forward scheduling B) Rough-cut capacity planning
C) Material requirements planning D) Input/output control

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11. Utilization of a non-bottleneck resource is determined by :

A) Multiplying the utilization times the efficiency.
B) The required capacity.
C) Another constraint in the system.
D) The load at the workcenter.

12. The function of selecting and sequencing available jobs to be run at each work center is called :

A) Sequencing
B) Prioritizing
C) Dispatching
D) Cycling

Today's date is 20

Order	DUE DATE	LT REMAINING
A	30	10
B	40	15
C	35	20
D	45	20

13. Which of the following statement means the CR of order B ?

A) The order B is behind schedule.
B) The order B is an schedule.
C) The order B is ahead of schedule.
D) The order B is already late.

14. The objective of scheduling is to :

A) Ensure work centers are properly loaded
B) Meet delivery dates
C) Provide capable to promise information
D) Meet cost targets

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15. Managing bottlenecks is extremely important to the throughput of the production facility. All of the following should be done to manage bottlenecks EXCEPT :

A) Change the schedule frequently to meet customer promises
B) Maintain a time buffer before each bottleneck
C) Control the feed rate of material to the bottleneck
D) Increase the bottleneck capacity as much as possible

16. If the critical ratio is less than 1, an order is :

A) Ahead of schedule
B) On schedule
C) Behind schedule
D) Already late

17. Which of the following is TRUE regarding job priority ?

A) It refers to the ability of the plan to meet the demand
B) It refers to the capacity to meet production
C) It refers to Purchasing's ability to get raw materials in a timely manner
D) It refers to maintaining the correct due dates on orders

18. In a forward scheduling process, the scheduler is trying to determine the :

A) Completion date. B) Start date. C) Preflush dates. D) Backflush points.

19. A company needs to increase production in the current week to meet a customer request. The quickest way to accomplish this is to :

A) Work overtime.
B) Hire more workers.
C) Hire temporary workers.
D) Subcontract the work.

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20. In order to back schedule, which of the following information is necessary ?

Ⅰ. Quantity and due dates.
Ⅱ. Bill of materials sequence.
Ⅲ. Setup and run times for each operation.
Ⅳ. Queue, wait, and move times.

A) I, II, and III B) I, III, and IV C) II, III, and IV D) I, II, and IV

21. When the next operation is allowed to begin before the entire lot is completed on the previous operation, this is called :

A) Operation splitting. B) Operation overlapping.
C) Work center overlapping. D) Work center splitting.

22. All of the following are principles of bottlenecks EXCEPT :

A) Using a non-bottleneck 100% of the time does not produce 100% utilization.
B) The capacity of the production process depends on the capacity of the bottleneck.
C) Time saved at the bottleneck saves nothing.
D) Capacity and demand must be considered together.

23. Which of the following would BEST describe the term standard time ?

A) Time which operators put in each day.
B) The cost of the labor to produce the part.
C) Time it takes a qualified operator to make a part.
D) The number of hours per day working at the rated efficiency.

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※ An order for 100 of a product is processed on operation A and operation B. The setup time on A is 70 minutes, and the run time per piece is 12 minutes. The setup time on B is 20 minutes, and the run time is 4 minutes per piece. It takes 20 minutes to move a lot between A and B. Since this is a rush order, it is give top priority (president's edict) and is run as soon as it arrives at either workstation.

It is decided to overlap the two operations and to split the lot of 100 into two lots of 60 and 40. When the first lot is finished on operation A, it is moved to operation B where it is set up and run. Meanwhile, operation A completes the balance of the 100 units (40) and sends the units over to operation B. These 40 units should arrive as operation B is completing the first batch of 60 ; thus, operation B can continue without interruption until all 100 are completed.

24. Calculate the total manufacturing lead time for operation A and for B without overlapping.

25. Calculate the manufacturing lead time if the operations are overlapped. How much time is saved ?

26. Calculate the critical ratio for the following orders and establish in what order they should be run. Today's date is 75.

Order	Due Date	Lead Time Remaining (days)	Actual Time Remaining (days)	CR
A	87	12		
B	95	25		
C	100	20		

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Part 3. Inventory Management.

1. Which of the following are objectives of inventory management ?

Ⅰ. Maximize customer service
Ⅱ. Efficient transaction
Ⅲ. Low cost plant operations
Ⅳ. Minimum inventory investment

A) I, II, and III B) I, III, and IV C) I, II, and IV D) II, III, and IV

2. Inventory help make a manufacturing operation more productive. Which of the statement is NOT correct ?

A) Inventories allow operations with different rates of production to operate separately and more economically.
B) Inventories allow manufacturing to purchase in larger quantities.
C) Inventories allow manufacturing to run shorter production runs.
D) Inventories allow unexpected sale in the peak periods.

3. An income statement of a company will show which of the following ?

A) Inventory levels
B) Long term debt
C) Cost of products sold
D) Net cash available

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4. The balance sheet for a firm shows which of the following ?
   A) Profit or loss for the period
   B) Sources and uses of funds
   C) Long - and short - term debt
   D) Cost of products sold

5. Which of the following best shows firm's ability to pay back debt ?
   A) Income statement.
   B) Cash flow.
   C) Balance sheet.
   D) Inventory turns.

6. Work-in-process inventory serves to decouple which of the following ?
   A) Production from suppliers
   B) Finished good inventory from customer demand
   C) An operation from succeeding operations
   D) Production from distribution channels

7. Which of the following best describes MRO inventory ?
   A) Raw materials used in production
   B) Office supplies used in administrative functions
   C) Inventory in the distribution network
   D) Items used in production but are not part of the product

8. Which of the following is the safety stock ?
   A) Anticipation inventory.
   B) Fluctuation inventory.
   C) Lot-size inventory.
   D) Transportation inventory.

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9. Companies purchase hedge inventory because :
   A) They receive quantity discounts
   B) Supply and demand fluctuates randomly
   C) Prices fluctuate in worldwide markets
   D) Transit lead times impact operations

10. All of the following would be reasons for anticipation inventory EXCEPT :
   A) Inventory built ahead of the peak season
   B) A potential strike
   C) Vacation shutdown
   D) Price breaks

11. The inventory turns ratio measures :
   A) The amount of inventory needed to support sales growth
   B) Obsolete inventory as a percent of sales
   C) How effectively inventory is being used
   D) The amount of space needed to store inventory

12. If the annual revenue is $750,000, the annual cost of goods sold is $500,000 a year and the average inventory is $100,000. What will be the inventory turn ratio ?
   A) 7.5 B) 2.5 C) 5 D) 4

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Raw material : $100
WIP : $ 50
MRO : $250
Finished good inventory : $300

13. Inventory turns is 4. What's cost of good of sold ?
A) $1000 B) $2000 C) $2500 D) $2800

14. Aggregate inventory management is concerned with :
A) Managing inventory items and how they are used
B) Establishing the production plan
C) The cost and benefits of carrying the different classes of inventory
D) The distribution network and the movement of inventory

15. Which of the following best describes the ABC approach to inventory control ?
A) Maintain a high inventory of "A" parts
B) Have plenty of "C" parts
C) Keep the "B" parts to a minimum level
D) Always keep plenty of inventory

16. Which of the following is most consistent with ABC analysis and control ?
A) All items should have the same level of control.
B) A small number of items account for a large portion of annual usage value.
C) Items need tight control.
D) Perpetual inventory records are required for all items.

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17. Which of the following is characteristics of cycle counting ?

Ⅰ. It usually check C items in ABC classification frequently, and find out error and correct.

Ⅱ. Some items are counted each day.

Ⅲ. It reduces partially lost production.

Ⅳ. It is a system of counting inventory continually throughout the year.

A) Ⅰ, Ⅱ only B) Ⅱ, Ⅲ, Ⅳ only C) Ⅰ, Ⅳ only D) Ⅰ, Ⅱ, Ⅲ, Ⅳ

18. If a company is going to establish a cycle count program, a primary objective should be to :

A) Correct the inventory records.

B) Reduce the headcount.

C) Identify the causes of inventory errors.

D) Eliminate the physical inventory.

19. Which of the following statements is the characteristics of floating location system ?

A) This system makes it possible to store and retrieve items with a minimum of record keeping.

B) In some small, manual systems, no records are kept at all.

C) This system requires accurate and up-to-date information on item location.

D) This system improve cube utilization and accessibility concurrently.

20. Inventory areas should be locked except for during normal business hours because :

A) People are apt to steal

B) Storeroom personnel know where parts are stored

C) Transactions might not be completed

D) It's the right thing to do

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21. A company has its warehouse divided so order pickers only pick in their area. This warehouse is operating under which of the following systems ?

A) Zone system
B) Area system
C) Consolidated pick system
D) Modified pick system

22. A company orders from supplier once every ten days delivery takes three days, average demand for SKUs is 100 units per week(five working day). They has determined that safety stock is held at one day's supply, inventory on hand 10 units, in periodic review system, which of the following is target level ?

A) 250 B) 260 C) 270 D) 280

23. Sometimes a periodic review system is the most effective method to manage inventory. For which of the following conditions would this method be used?

Ⅰ. Raw materials required in production
Ⅱ. Small issues from inventory and transactions are expensive
Ⅲ. Order costs are small
Ⅳ. Many items are ordered together

A) I, II, and III B) I, III, and IV C) II, III, and IV D) I, II, and IV

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24. Which of the following is characteristics of inventory management that uses the periodic review system ?

Ⅰ. The interval between orders varies depending on the actual usage.
Ⅱ. Order quantity is allowed to vary.
Ⅲ. It requires a larger safety stock than continuous review system.

A) Ⅱ only B) Ⅰ, Ⅱ only C) Ⅱ and Ⅲ only D) Ⅰ, Ⅱ, Ⅲ

25. Which of the following would be included in the cost of carrying inventory ?

Ⅰ. Heating and lighting a warehouse
Ⅱ. Obsolete inventory
Ⅲ. Labor to move material
Ⅳ. Damaged inventory

A) I, II, and III B) II, III, and IV C) I, III, and IV D) I, II, III, and IV

26. Which of the following are included in the cost of ordering ?

Ⅰ. Receivers who take in material
Ⅱ. Setup costs
Ⅲ. Cost of material planners
Ⅳ. Cost of buyers

A) I, II, and III B) I, III, and IV C) II, III, and IV D) I, II, III, and IV

27. According to the EOQ formula, if the ordering costs for an item are greatly reduced, what is the likely impact on the quantity ordered ?

A) Order multiples will increase B) Order quantities will increase
C) Order multiples will decrease D) Order quantities will decrease

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28. All of the following statement are correct related to lot-for-lot EXCEPT ?
A) It is ordered only amount required.
B) It is used usually C items in ABC classification.
C) It is used for dependent demand items.
D) It is used in JIT environment

29. Which of the following conditions will cause the EOQ concept to be invalid ?
Ⅰ. Products that are made to order
Ⅱ. Short shelf life products
Ⅲ. Length of production run is unlimited
Ⅳ. Raw materials which are on MRP

A) I, II, and III B) I, III, and IV C) II, III, and IV D) I, II, III, and IV

30. Given the following annual costs, calculate the cost of creating one order .
- Purchasing department salaries= $200,000
- Operating expenses= $50,000
- Number of people in department= 5
- Number of orders per year= 5000

A) $25 B) $50 C) $75 D) $100

31. The safety stock required depends on all the following factor EXCEPT ?
A) SKUs. B) Frequency of ordering.
C) Service level. D) Length of the lead time.

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32. For the particular item, the annual demand is 5,200 units, it is ordered in quantities of 825, and the MAD during the leadtime is 50 unit. LT is 4 weeks. Which of the following is nearest order point for this item ? (safety factor = 1.95)

A) 450. B) 460. C) 480. D) 500.

33. Which of the following best describes a normal distribution ?

A) Most values clustered near a central point.
B) Warehouses centrally located to markets.
C) Values accumulated at six sigma.
D) A critical ratio of 1.0.

34. Which of the following are causes of inventory record inaccuracy?

Ⅰ. Withdrawal of inventory without authorization.
Ⅱ. Transaction errors in recording inventory issues.
Ⅲ. Poor training of personnel.
Ⅳ. Secured stockroom.

A) I, II, and III B) II, III, and IV C) I, III, and IV D) I, II, III, and IV

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35. If the transit time is ten days and the annual demand for an item is 10,000 units, what is the average annual inventory in transit ?

※ If the annual cost of goods sold is $10 million and the average inventory is $2.5 million :
36. What is the inventory turns ratio ?

37. What would be the reduction in average inventory if, through better materials management, inventory turn were increased to 10 times per year ?

38. If the cost of carrying inventory is 20 % of the average inventory, what is the annual saving ?

※ A company decides to establish an EOQ for an item. The annual demand is 100,000 units, each costing $8, ordering costs are $32 per order, and inventory-carrying costs are 20%. Calculate the following.

39. The EOQ in units.

40. Number of orders per year.

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41. Cost of ordering, cost of carrying inventory, and total cost.

42. A company is presently ordering on the basis of an EOQ. The demand is 10,000 units a year, unit cost is $30, and the cost ratio of carrying inventory is 20%. The supplier offers a discount of 3% on orders of 1000 units or more. What will be the saving (loss) of accepting the discount ? (Where the ordering cost is 200$)

43. Management has stated that it will tolerate one stockout per year. The forecast of annual demand for a particular SKU is 100,000 units, and it is ordered in quantities of 10,000 units. The lead time is two weeks. Sales history for the past ten weeks follows. Calculate the order point considering statistical safety stock.

Week	1	2	3	4	5	6	7	8	9	10
Actual Demand	2100	1700	2600	1400	1800	2300	2200	1600	2100	2200

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■ Solutions.

Part 1. Material & Capacity Requirement Planning.

1	2	3	4	5	6	7	8	9	10
D	D	D	C	B	B	A	C	B	D
11	12	13	14	15	16	17	18	19	20
C	C	B	D	B	C	D	A	D	A
21	22	23	24	25	26	27	28	29	30
C	B	C	C	B	D	B	B	A	A
31	32	33	34	35	36	37	38		
C	B	D	C	C	C	C	C		

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38.

Week			1	2	3	4	5
Part X Lead Time : 1주. Lot Size : 20 Level code : 0	Gross Requirements.		15	5	15	10	15
	Scheduled Receipts		20				
	Projected Available	10	15	10	15	5	10
	Net Requirements				5		10
	Planned Order Receipts				20		20
	Planned Order Release			20		20	
Part Y Lead Time : 2주. Lot Size : 50 Level code : 1	Gross Requirements.			60		60	
	Scheduled Receipts			50			
	Projected Available	30	30	20	20	10	10
	Net Requirements					40	
	Planned Order Receipts					50	
	Planned Order Release			50			
Part Z Lead Time : 2주. Lot Size : L4L Level code : 2	Gross Requirements.			90		40	
	Scheduled Receipts			90			
	Projected Available	30	30	30	30	30	30
	Net Requirements					40	
	Planned Order Receipts						
	Planned Order Release			40			
Part W Lead Time : 2주. Lot Size : 50 Level code : 2	Gross Requirements.			50			
	Scheduled Receipts			50			
	Projected Available	20	20	20	20	20	20
	Net Requirements						
	Planned Order Receipts						
	Planned Order Release						

39.

Period	1	2	3	4	5
Gross Requirement		90		40	
Parent X		40		40	
Parent Y		50			

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40.

Intial MRP

Week			1	2	3	4	5
Part A Lead Time : 4주. Lot Size : 200	Gross Requirements.		50	125	100	60	40
	Scheduled Receipts			200		200	
	Projected Available	100	50	125	25	165	125
	Net Requirements						
	Planned Order Receipts						
	Planned Order Release						

Revised MRP

Week			1	2	3	4	5
Part A Lead Time : 4주. Lot Size : 200	Gross Requirements.		50	125	150	60	40
	Scheduled Receipts			200	200		
	Projected Available	100	50	125	175	115	75
	Net Requirements						
	Planned Order Receipts						
	Planned Order Release						

※ Planner should reschedule(expedite) the scheduled receipts of week 4 into week 3.

41.

Revised MRP

Week			1	2	3	4	5
Part B Lead Time : 2주. Lot Size : 100	Gross Requirements.		70	40	100	50	40
	Scheduled Receipts		70		100		
	Projected Available	50	50	10	10	60	20
	Net Requirements					40	
	Planned Order Receipts					100	
	Planned Order Release			100			

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MRP Record at the end of week 1

Week			2	3	4	5	6
Part B Lead Time : 2주. Lot Size : 100	Gross Requirements.		40	100	50	40	40
	Scheduled Receipts			100			
	Projected Available	50	10	10	60	20	80
	Net Requirements				40		20
	Planned Order Receipts				100		100
	Planned Order Release		100		100		

42.

- Available time = 7 × 16 × 5 = 560
  - : No. of machine = 7.
  - : Work hours for day = 16 hours.
  - : No. of work days for week = 5.
- The rate capacity = Available time × Utilization × Efficiency
  = 560 × 0.8 × 1.1 = 492.8

43.

- Utilization = $\frac{\text{Hours actually worked}}{\text{Available Time}} = \frac{10,440}{12,000} \times 100 = 87\%$
- Efficiency = $\frac{\text{Standard hours of work}}{\text{Hours actually worked}} = \frac{11,480}{10,440} \times 100 = 110\%$
- The rated capacity = Available Time × Utilization × Efficiency
  = 3 × 16 × 5 × 0.87 × 1.1 = 229.7 hours.
- The demonstrated capacity = 11,480 / 50 = 229.6 hours.

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Part 2. Production Activity Control.

1	2	3	4	5	6	7	8	9	10
A	C	D	A	B	C	A	C	D	D
11	12	13	14	15	16	17	18	19	20
C	C	C	B	A	C	D	A	A	B
21	22	23	24	25	26	27	28	29	30
B	C	C							

※

23. · **70 + 12×100 + 20 + 20 + 4×100 = 1710 minutes.**

24. · **70 + 12×60 + 20 + 20 + 4×100 + 220 (delay time) = 1450 minutes.**

25. Calculate the critical ratio for the following orders and establish in what order they should be run. Today's date is 75.

Order	Due Date	Lead Time Remaining (days)	Actual Time Remaining (days)	CR
A	87	12	87 - 75 = 12	12 / 12 = 1
B	95	25	95 - 75 = 20	20 / 25 = 0.8
C	100	20	100 - 75 = 25	25 / 20 = 1.25

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Part 3. Inventory Management.

1	2	3	4	5	6	7	8	9	10
B	C	C	C	B	C	D	B	C	D
11	12	13	14	15	16	17	18	19	20
C	C	D	C	B	B	B	C	C	C
21	22	23	24	25	26	27	28	29	30
A	D	C	C	D	D	D	B	D	B
31	32	33	34						
A	D	A	A						

35.

· The average annual inventory in transit $= \frac{\text{Annual demand} \times \text{Transit time}}{365} = \frac{10 \times 10{,}000}{365} \fallingdotseq 274$ units

36.

· Inventory turns ratio $= \frac{\text{Cost of goods sold}}{\text{Annual Demand}} = \frac{\$\ 10 \text{ million}}{\$\ 2.5 \text{ million}} = 4$ turns

37.

· Annual inventoy $= \frac{\text{Cost of goods sold}}{\text{Inventory Turns}} = \frac{\$\ 10 \text{ million}}{10 \text{ turns}} = \$\ 1$ million

※ The reduction in average inventory = $ 1.5 million.

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38. · The annual saving = $ 1.5 million × 0.2 = $ 0.3 million.

39.

· A (Annual Demand) = 100,000 units.
· S (Ordering costs) = $ 32.
· C (Units costs) = $ 8.
· *i* (Inventory-carrying costs) = 20%
· EOQ = $\left(\frac{2A \times S}{C \times i} \right)^{1/2}$ = 2,000 units

40. · Number of Orders per year = A / EOQ = 50 turns.

41. · Annual ordering costs = No. of Ordering × Ordering cost per order
= 50 × $ 32 = $ 1,600
· Annual inventory carrying costs
= Average inventory for carrying × Carrying cost per unit
= 1,000 × 8 × 0.2 = $ 1,600
· Total cost = Annual ordering costs + Annual inventory carrying costs = $ 3,200

42.

· Total Cost for considering EOQ.

: EOQ = $\left(\frac{2A \times S}{C \times i} \right)^{1/2}$ ≒ 334 units

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: Total Cost (EOQ) =

$$\frac{10,000}{334} \times \$200 + \frac{334}{2} \times \$6 + 10,000 \times \$30 \fallingdotseq \$306,990$$

· Total Cost for considering discount quantity.

: Total Cost (1000) =

$$\frac{10,000}{1,000} \times \$200 + \frac{1,000}{2} \times \$5.82 + 10,000 \times \$29.1 \fallingdotseq \$295,900$$

43.

· Annual Demand = 100,000 units.
· Lot Size = 10,000 units.
· No. of Orders = 10 turns.
· Service Level = (10 - 1) / 10 × 100% = 90%
· Service Factor = 1.28
· Demand for week (Assume a 50 week year) = 100,000 / 50 = 2000 units.
· Standard Deviation(σ) = 1.25 × MAD = 375.

※ Reorder Point = Demand During Lead Time + Safety Stock

$$= \text{DDLT} + \text{Safety Factor} \times \sigma \times \left(\frac{\text{Lead Time Interval}}{\text{Forecasting Interval}} \right)^{1/2}$$

$$= 2 \times 2000 + 1.28 \times 375 \times 1.414 \fallingdotseq 4679 \text{ units.}$$

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