CHAPTER 16: JUST-IN-TIME AND LEAN PRODUCTION SYSTEMS

TRUE/FALSE

1. Green Gear Cycling makes extensive use of JIT principles, an example of which is the use of work cells where work-in-process inventory is only one bike.
2. Green Gear Cycling's use of JIT includes effective collaboration with suppliers, creative work cells, small reorder quantities, and improved quality.
3. Product storage is an example of waste, in the sense that no value is added.
4. In a JIT system, product inspection adds value by identifying defective items.
5. Customer demand will always remain an unknown, so it is not considered a source of variation.
6. Variability in manufacturing can occur because engineering drawings or specifications are incomplete or inaccurate.
7. A push system means providing the next station with exactly what is needed when it is needed.
8. Waste is anything that does not add value, such as storage or inspection of items; waste also includes any activity that does not add value from the consumer's perspective.
10. JIT brings about competitive advantage by faster response to the customer regardless of cost.
11. One goal of JIT partnerships is the elimination of in-plant inventory, in the form of raw materials, parts, or components; failure to meet this goal is a sign that suppliers are undependable.
12. Many suppliers feel that having a variety of customers is better than being tied to long-term contracts with one customer.
13. JIT suppliers have concerns that the JIT firm's demands for small lot sizes are simply a way of transferring holding cost from manufacturer firm to the supplier firm.
14. Reducing distance is a common JIT goal, both inside and outside facilities. Outside, it manifests itself in attempts to get suppliers closer to facilities; inside, it is a common layout tactic.
15. Cross-training is a common JIT tactic to improve flexibility.
16. JIT systems carry inventory just in case something goes wrong.
17. Hidden problems are generally uncovered during the process of reducing inventory.
18. Lower average inventory is feasible only if setup times are short.
19. If setup times and costs can be reduced enough, the JIT ideal of "Lot Size = 1" can be achieved.
20. A scheduler may find that freezing the portion of the schedule closest to the due dates allows the production system to function and the schedule to be met.
21. The first step in reducing setup times is the separation of setup into preparation activities and actual setup, so that as much work as possible can be done while the machine or process is operating.
22. Level scheduling means producing at a constant rate, regardless of customer demands.
23. With level schedules, a few large batches, rather than frequent small batches, are processed.
24. The number of kanbans decreases as safety stock is increased.
25. A kanban system requires little variability in lead time because shortages have their impact on the entire productive system.
26. Inventory has only one positive aspect, which is availability; inventory has several negatives, including increased material handling, obsolescence, and damage.
27. The quality management tool called poka-yoke is not relevant to JIT systems.
28. Employee empowerment is unnecessary in lean production, because automation and powerful information systems reduce the need for employee creativity and decision making.
29. The Toyota Production System requires that activities have built-in, automatic tests so that gaps between expectations and actuality are immediately evident.
30. The 5S's—sort/segregate, simplify/straighten, shine/sweep, standardize, and sustain/self discipline—are important to lean production because they lead to improved job safety.
31. Because JIT and lean production root out activities that add no value in production or to the consumer, they are socially responsible practices.
32. Because most services cannot be inventoried, there is little place for JIT to help service organizations achieve competitive advantage.

**MULTIPLE CHOICE**

33. Which of the following JIT and lean production techniques is not in use at Green Gear Cycling?
   a. Minimal work-in-process inventory, and no finished goods inventory, is maintained.
   b. JIT deliveries are achieved by collaboration with suppliers.
   c. Machine setups have been minimized or eliminated.
   d. Kanban cards trigger reorders of parts in small quantities.
   e. All of these are practiced at Green Gear.

34. Which of the following is generally found in most JIT environments?
   a. a push or pull system, depending upon the rate of demand
   b. a push system for high margin items and a pull system for low margin items
   c. a push system for purchased parts and a pull system for manufactured parts
   d. push systems
   e. pull systems

35. Which one of the following is not a benefit of the implementation of JIT?
   a. cost reduction
   b. variability increase
   c. work in process reduction
   d. quality improvement
   e. delay reduction

36. Which of the following is not a reason for variability?
   a. Employees, machines, and suppliers produce units late.
   b. Customer demand is unknown.
   c. Employees, machines, and suppliers produce units that conform to standards.
   d. Engineering drawings are inaccurate.
   e. Production personnel try to produce before drawings or specifications are complete.

37. The implementation of JIT offers several advantages, including
   a. reduced throughput
   b. increase in variability to better respond to variable demand
   c. decreased profit margins
   d. support for lean production
   e. increased work in process inventory
38. Which of the following illustrates an activity that does **not** add value?
   a. training employees
   b. ordering parts from a supplier
   c. making a part
   d. accumulating parts in front of the next work center
   e. delivering the product to the customer

39. Which of the following statements regarding a pull system is **true**?
   a. Large lots are pulled from upstream stations.
   b. Work is pulled to the downstream stations before it is actually needed.
   c. Manufacturing cycle time is increased.
   d. Problems become more obvious.
   e. None of the above is true of a pull system.

40. Manufacturing cycle time is best defined as the
   a. length of the work shift, expressed in minutes per day
   b. time it takes a unit to move from one workstation to the next
   c. time between the start of one unit and the start of the next unit
   d. sum of all the task times to make one unit of a product
   e. time from raw materials receipt to finished product exit

41. If the goals of JIT partnerships are met, which of the following is a result?
   a. For incoming goods, receiving activity and inspection are outsourced.
   b. In-transit inventory falls as suppliers are located closer to facilities.
   c. The number of suppliers increases.
   d. In-plant inventory replaces in-transit inventory.
   e. All of the above are consequences of meeting the JIT partnership goals.

42. Which one of the following is a characteristic of a JIT partnership?
   a. large number of suppliers
   b. maximal product specifications imposed on supplier
   c. active pursuit of vertical integration
   d. steady output rate
   e. frequent deliveries in large lot quantities

43. Characteristics of JIT partnerships with respect to quantities include
   a. short-term contracts to ensure flexibility
   b. suppliers package in exact quantities
   c. variable output rate
   d. suppliers determine the quantities to be delivered based on their own production schedules
   e. suppliers increase production lot sizes in order to achieve economies of scale

44. Characteristics of JIT partnerships with respect to suppliers include
   a. competitive bidding encouraged
   b. buyer plant pursues vertical integration to reduce the number of suppliers
   c. support suppliers so they become or remain price competitive
   d. most suppliers at considerable distance from purchasing organization
   e. All of the above are characteristics of JIT partnerships.
45. Characteristics of just-in-time partnerships do **not** include
   a. scheduling inbound freight
   b. large lot sizes to save on setup costs and to gain quantity discounts
   c. long-term contracts
   d. few suppliers
   e. buyer helps supplier to meet the quality requirements

46. A characteristic of JIT partnerships with respect to shipping is to
   a. use company-owned or contract shipping to gain control
   b. use only full trucks to minimize freight costs
   c. use only air freight to speed up deliveries
   d. use public transportation to minimize costs
   e. impose maximum product specifications on supplier

47. Which of the following is **not** a goal of JIT partnerships?
   a. elimination of unnecessary activities
   b. elimination of in-plant inventory
   c. elimination of in-transit inventory
   d. elimination of engineering changes
   e. All of the above are goals of JIT partnerships.

48. A characteristic of JIT partnerships with respect to quality is to
   a. help suppliers meet quality requirement
   b. inspect all incoming parts
   c. maintain a steady output rate
   d. impose maximum product specifications on the supplier
   e. draw up strict contracts ensuring that all defectives will be immediately replaced

49. Which of the following is **not** a goal of JIT partnerships?
   a. elimination of unnecessary activities
   b. elimination of in-plant inventory
   c. elimination of in-transit inventory
   d. elimination of poor suppliers
   e. All of the above are goals of JIT partnerships.

50. Which one of the following is a concern expressed by suppliers?
   a. elimination of in-plant inventory
   b. delivery to the point of use
   c. production with zero defects
   d. large lot sizes
   e. customers' infrequent engineering changes

51. Reduction of in-transit inventory can be encouraged through use of
   a. supplier location near plants
   b. low setup costs
   c. low carrying costs
   d. use of trains, not trucks
   e. low-cost, global suppliers
52. In JIT partnerships, suppliers have several concerns. Which of the following is not such a concern?
   a. desire for diversification
   b. poor customer scheduling
   c. small lot sizes
   d. proximity
   e. customers' infrequent engineering changes

53. Which of the following is not a concern of suppliers as they prepare to enter into JIT partnerships?
   a. Suppliers feel that they would be less at risk if they contracted with more than one customer.
   b. Suppliers are concerned that customers will present frequent engineering changes with inadequate lead time to deal with them.
   c. Suppliers feel that their processes are suited for larger lot sizes than the customer wants.
   d. Suppliers are concerned that frequent delivery of small quantities is economically prohibitive.
   e. All of the above represent JIT supplier concerns.

54. Just-in-time systems make demands on layouts, including
   a. distance reduction
   b. increased flexibility
   c. reduced space and inventory
   d. cross-trained, flexible employees
   e. All of the above are JIT influences on layout.

55. Which one of the following is not a layout tactic in a JIT environment?
   a. work cells for families of products
   b. fixed equipment
   c. minimizing distance
   d. little space for inventory
   e. poka-yoke devices

56. Which of the following is the author of the phrase "Inventory is evil"?
   a. Poka Yoke
   b. Pat "Keiretsu" Morita
   c. Kanban Polka
   d. Shigeo Shingo
   e. none of the above

57. Which one of the following statements is true regarding JIT inventory?
   a. It exists just in case something goes wrong.
   b. It is the minimum inventory necessary to keep a perfect system running.
   c. It hides variability.
   d. It is minimized with large lot production.
   e. It increases if setup costs decrease.
58. A firm wants to develop a level material use schedule based on the following data. What should be the setup cost?

<table>
<thead>
<tr>
<th>Desired lot size:</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual demand:</td>
<td>40,000</td>
</tr>
<tr>
<td>Holding cost:</td>
<td>$20 per unit per year</td>
</tr>
<tr>
<td>Daily production rate:</td>
<td>320</td>
</tr>
<tr>
<td>Work days per year:</td>
<td>250</td>
</tr>
</tbody>
</table>

a. $0.45  
b. $4.50  
c. $45  
d. $450  
e. $500

59. A product has annual demand of 100,000 units. The plant manager wants production to follow a four-hour cycle. Based on the following data, what setup cost will enable the desired production cycle? d=400 per day (250 days per year), p=4000 units per day, H=$40 per unit per year, and Q=200 (demand for four hours, half a day).

a. $2.00  
b. $7.20  
c. $18.00  
d. $64.00  
e. $1,036.80

60. Which of the following is not a benefit of small production lots?
   a. Work-in-process inventory is smaller;  
   b. There are fewer setups.  
   c. Workstations can be placed closer together.  
   d. Manufacturing cycle time is shorter.  
   e. Better product distribution (i.e., mix) is available for customer demand.

61. Which of the following is true regarding the steps to reducing setup times?
   a. The first step involves performing as much setup preparation as possible while the process/machine is operating.  
   b. The cycle of steps is repeated until setup time is reduced to under a minute.  
   c. Standardize tooling and standardize training are included in the same step.  
   d. Improved material handling and move material closer are done before operator training.  
   e. All of the above are true.

62. Factory X is trying to use level use scheduling. If their first target were to cut the current lot size in half, by what proportion must setup cost change?
   a. Setup cost must be cut to one fourth its current value.  
   b. Setup cost must also be cut in half from its current value.  
   c. Setup cost must double from its current value.  
   d. cannot be determined  
   e. none of the above
63. The technique known as level schedules  
   a. requires that schedules be met without variation  
   b. processes many small batches rather than one large one  
   c. is known as "jelly bean" scheduling  
   d. is based on meeting one day's demand with that day's production  
   e. All of the above are true regarding level scheduling.  

64. Which one of the following statements is true about the kanban system?  
   a. The quantities in the containers are usually large to reduce setup costs.  
   b. It is associated with a push system.  
   c. It is useful to smooth operations when numerous quality problems occur.  
   d. The supplier workstation signals the customer workstation as soon as a batch is completed.  
   e. The customer workstation signals to the supplier workstation when production is needed.  

65. Kanban is associated with all of the following except  
   a. small lot sizes  
   b. signals, such as cards, lights, or flags  
   c. moving inventory only as needed  
   d. increased material handling  
   e. reductions in inventory  

66. The word "kanban" means  
   a. low inventory  
   b. employee empowerment  
   c. card  
   d. continuous improvement  
   e. lot size of one  

67. Which one of the following scenarios represents the use of a kanban to reduce inventories?  
   a. A supervisor tells the operators to stay busy and start producing parts for next month.  
   b. A "supplier" work center signals the downstream workstation that a batch has been completed.  
   c. A supervisor signals to several work centers that the production rate should be changed.  
   d. A "customer" work center signals to the "supplier" workstation that more parts are needed.  
   e. An operator asks the next station's operator to help him fix his machine.  

68. If a casual-dining restaurant is attempting to practice JIT and lean production, which of the following would not be present?  
   a. close relationship with the restaurant's suppliers of food, utensils, and equipment  
   b. food preparation in large batches  
   c. a kitchen set up to minimize wasteful movements  
   d. lean inventories of food  
   e. All of the above should be present.
69. The number of kanbans is
   a. one
   b. the ratio of the reorder point to container size
   c. the same as EOQ
   d. one full day's production
   e. none of the above

70. Which of the following is false regarding the links between JIT and quality?
   a. Inventory hides bad quality; JIT immediately exposes it.
   b. JIT reduces the number of potential sources of error by shrinking queues and lead times.
   c. As quality improves, fewer inventory buffers are needed; in turn, JIT performs better.
   d. If consistent quality exists, JIT allows firms to reduce all costs associated with inventory.
   e. All of the above are true.

71. Which of the following is an illustration of employee empowerment?
   a. UPS drivers are trained to perform several motions smoothly and efficiently.
   b. Unionization of the work place brings better morale and therefore better quality.
   c. "No one knows the job better than those who do it."
   d. all of the above
   e. none of the above

72. Which of the following is not an attribute of lean producers?
   a. eliminating almost all inventory through just-in-time techniques
   b. minimizing space requirements by reducing the distance a part travels
   c. pushing responsibility to the highest level possible through centralized decision making
   d. educating suppliers to accept responsibility for helping meet customer needs
   e. All of the above are attributes of lean producers.

73. The 5S's
   a. have the "flavor" of a housekeeping list
   b. are a checklist for lean production
   c. have become a list of seven items in American practice
   d. can be used to assist with necessary changes in organizational culture
   e. All of these are true.

74. The list of 5S's, although it looks like a housekeeping directive, supports lean production by
   a. identifying non-value items and removing them, in the "sort/segregate" item
   b. reducing wasted motion, in the "standardize" item
   c. increasing variability through standardized procedures, in the "standardize" item
   d. eliminating wasted motion through ergonomic studies, in the "support" item
   e. building good safety practices, in the "shine/sweep" item

75. In the quest for competitive advantage, which of the following is a JIT requirement?
   a. small number of job classifications
   b. reduced number of vendors
   c. reduced space for inventory
   d. quality by suppliers
   e. All of the above are JIT requirements.
76. Which one of the following does **not** exemplify JIT used for competitive advantage?
   a. Acme Foods decides to decrease the number of its suppliers to just a few.
   b. Ajax, Inc. is proud to announce that incoming goods are delivered directly to the point of use.
   c. Ardoyne Builders has a scheduled preventive maintenance program.
   d. Cheramie Trucking trains workers to specialize and become very efficient in one job.
   e. Cajun Contractors has reduced the amount of space for inventory.

77. Which one of the following is **not** a requirement of JIT systems?
   a. quality deliveries on time
   b. low setup time
   c. training support
   d. strong job specialization
   e. employee empowerment

78. Great Lakes Barge and Baggage Company makes, among other things, battery-operated bilge pumps. Which of the following activities is **not** part of JIT? They
   a. communicate their schedules to suppliers
   b. produce in long production runs to reduce the impact of setup costs
   c. use a pull system to move inventory
   d. continuously work on reducing setup time
   e. produce in small lots

79. Which one of the following is an example of JIT being used for competitive advantage?
   a. Jones Company has decreased the number of job classifications to just a few.
   b. Lafourche Metals increases the number of its suppliers to be less dependent on just a few.
   c. Houma Fabricators is proud to announce that incoming goods are inspected.
   d. Acme Company tells its maintenance department to intervene only if a machine breaks down.
   e. Caro Specialty Metals, Inc. has built a new, huge warehouse to store inventory.

80. A manufacturer took the following actions to reduce inventory. Which of these is generally **not** accepted as a JIT action?
   a. It used a pull system to move inventory.
   b. It produced in ever smaller lots.
   c. It required deliveries directly to the point of use.
   d. It picked the supplier that offered the lowest price based on quantity discounts.
   e. It worked to reduce the company's in-transit inventory.

81. Which of the following is **not** one of the Seven Wastes?
   a. overproduction
   b. transportation
   c. assignment
   d. defective product
   e. motion
82. Transportation is an element of the Seven Wastes because
   a. all movement of material between plants is waste
   b. movement of equipment or people that adds no value is waste
   c. the transportation method of linear programming reduces travel requirements
   d. moving material between plants, between work centers, and handling more than once is waste
   e. transportation of any kind is a waste

83. Which of the following statements regarding JIT in services is true?
   a. Restaurants do not use JIT layouts because they interfere with creation of a good servicescape.
   b. Excess customer demand in services such as air travel is met by dipping into safety stocks.
   c. All of the JIT techniques for dealing with suppliers, layout, inventory, and scheduling are used in services.
   d. Scheduling is not relevant to effective use of JIT in services.
   e. All of the above are false.