SET C

End Term Exam-IBM 311 (Spring 2025)

Duration: From 2:15 p.m to 5:30 p.m. Maximum Marks: 95.

- Standard normal table is provided at the end of the question paper.
- All questions carry 1 mark and have one third negative marking. Unanswered questions will not be marked.

1. In the Hungarian method, what is the first step when solving a minimization problem?
   (a) Assign zeroes to jobs
   (b) Subtract row minimums
   (c) Add dummy rows
   (d) Subtract column minimums
2. Which of the following is primarily used to help design products that will connect product attributes with customer desires?
   (a) Concurrent Engineering
   (b) Value Analysis
   (c) House of Quality Matrix
   (d) System level design
3. In FMEA, a high RPN indicates:
   (a) The product is ready for launch
   (b) A failure mode needs urgent attention
   (c) The design is optimal
   (d) Customer satisfaction is guaranteed
4. A company follows a mixed strategy: Regular 200 (max 600) Overtime 250 (max 150) Sub- contract 300 (unlimited) Inventory holding 10/unit/month Initial inventory 50 units Demand in April 800 units What is the minimum cost for April?
   (a) 156000
   (b) 162000
   (c) 158000
   (d) 160000
5. In a pure chase strategy, if demand decreases, what happens?
   (a) Production remains constant
   (b) Overtime increases
   (c) Layoffs increase
   (d) Inventory increases
6. Which condition would invalidate use of a level strategy?
   (a) Storage cost is negligible
   (b) Workforce is inflexible
   (c) Demand is stable
   (d) Backordering is allowed
7. The closer the smoothing constant, alpha, is to 1.0 the
   (a) more accurate the forecast.
   (b) greater the dampening, or smoothing, effect
   (c) greater the reaction to the most recent demand
   (d) less accurate the forecast.
8. A Gantt chart helps primarily in
   (a) Resource levelling
   (b) Capacity Planning
   (c) Monitoring progress of a schedule
   (d) Strategic decision making
9. Consider 4 jobs scheduled by DDATE. The average tardiness will be:
   (a) Maximized
   (b) No change
   (c) Minimized
   (d) Same as FCFS
10. Using exponential smoothing with alpha = 0.5, and a forecast for period 1 of 100. Given actuals: [100, 120, 130], what is the forecast for period 3?
    (a) 120
    (b) 110
    (c) 115
    (d) 118
11. A part has lot size = 100 units. Its net requirement is 230 units. What is the planned order release using Lot-for-Lot and Fixed Order Quantity methods?
    (a) L4L = 200, FOQ = 200
    (b) L4L = 300, FOQ = 230
    (c) L4L = 230, FOQ = 300

(d) LAL = 230, FOQ = 250

12. In Johnson's Rule, if the shortest processing time is on machine 2, how should that job be scheduled?
    (a) Randomly
    (b) In the middle
    (c) As early as possible
    (d) As late as possible
13. Which of the following statements is incorrect: 1. DDATE does not yield the minimum tardiness. 2. Slack rule schedules activities with minimum slack first 3. FIFO is the optimal rule for sequencing 4. SPT will always yield the lowest mean completion time
    (a) Only 1 and 4
    (b) Only 1 and 3
    (c) Only 2 and 4
    (d) Only 1 and 2
14. The House of Quality is primarily used in:
    (a) Inventory control
    (b) FMEA implementation
    (c) Product testing
    (d) Translating customer needs into design requirements
15. QFD and FMEA are typically used during which phase of product development?
    (a) Market launch
    (b) Inventory management
    (c) Early design and planning
    (d) Production scheduling
16. Arrival to a system is Poisson distribution with mean rate of 3 per hour, and service time of 6 minutes, the expected queue length will be
    (a) 0.3
    (b) 1.29
    (c) 1.129
    (d) 0.129
17. In MRP, the time-phased logic means:
    (a) Releasing all orders at the beginning of the horizon
    (b) Scheduling order releases based on lead time offsets
    (c) Ordering items based on economic cost
    (d) Aligning demand forecasts with seasonal variation
18. In the context of the Bullwhip Effect, latency refers to:
    (a) The time delay between order placement and order delivery
    (b) The total inventory held at each node
    (c) The duration between order batching cycles
    (d) The time delay between observed demand change and upstream reaction
19. After subtracting the row and column minimums in the Hungarian method, what comes next?
    (a) Draw minimum number of lines to cover all zeroes
    (b) Multiply diagonals
    (c) Add all remaining cells
    (d) Assign jobs based on max values
20. Generally, which of the following O&SC processes add the highest value 1. Marketing and Branding 2. Manufacturing 3. Design 4. Assembly
    (a) Only 2 and 3
    (b) Only 1, 2 and 3
    (c) Only 1 and 3
    (d) Only 1
21. Which statements are false? 1: Item master file is in input to the Material Requirement Planning. 2: Load profile is an output of the Capacity Requirement Planning.
    (a) Both A and B
    (b) Only B
    (c) Only A
    (d) Neither A nor B
22. A component has 30 units on hand, with future net requirements as: Week 1: 40, Week 2: 30, Week 3: 50. Lead time = 1 week. FOQ = 100. What are the planned order releases?
    (a) Week 0: 100; Week 2: 100
    (b) Week 1: 100; Week 2: 100
    (c) Week 0: 100; Week 1: 0
    (d) Week 1: 100; Week 2: 0
23. A product requires 2 units of component A, and A requires 3 units of B. If 100 units of the product are required in Week 10, what is the gross requirement for B in Week 8 assuming lead time for A and B is 1 week each?
    (a) 900
    (b) 600
    (c) 300
    (d) 200
24. Over-forecasting consistently can lead to
    (a) Reduced lead times

(b) Excess inventory and carrying costs
(c) Lower safety stock
(d) High stockouts

25. What is the correct hierarchy of the planning activities in descending order of planning horizon
(a) Aggregate Production Planning, Capacity Expansion, Capacity Requirement Planning, Scheduling.
(b) Capacity Requirement Planning, Capacity Expansion, Aggregate Production Planning, Scheduling
(c) Scheduling, Capacity Expansion, Aggregate Production Planning, Capacity Require- ment Planning.
(d) Capacity Expansion, Aggregate Production Planning, Capacity Requirement Planning, Scheduling.

26. A measurement has a mean value of 0.5 meters with a standard deviation of 0.002 meters. What is the probability that observed measurement will be greater than 0.501 m?
(a) Approximately 40%
(b) Approximately 31%
(c) Approximately 17%
(d) Approximately 23%

27. Using SPT rule, calculate the average tardiness for the following jobs: Job Processing Time A 6 B 2 C 4 D 8
(a) 2.6
(b) 2.5
(c) 2.3
(d) 2.8

28. In FMEA, RPN is calculated as
(a) Severity × Frequency
(b) Severity × Occurrence × Detection
(c) Severity + Occurrence + Detection
(d) Occurrence × Detection

29. Which of the following statements is true for demand per period which is independent and normally distributed
(a) The variance for the aggregate demand during the lead time is the product for the demands per period
(b) The standard deviation for the aggregate demand during the lead time is the product for the demands per period
(c) The standard deviation for the aggregate demand during the lead time is the sum for the demands per period.
(d) The variance for the aggregate demand during the lead time is the sum for the de- mands per period.

30. Which scheduling rule minimizes the completion time in a single-machine system?
(a) SLACK
(b) DDATE
(c) FCFS
(d) SPT

31. Forecasted demand: 400, 600, 900 (next 3 months). Production: 100/unit Hiring: 1,000/worker 1 worker = 100 units/month Initial workforce = 5; no layoffs allowed. What is the hiring cost?
(a) 2000
(b) 4000
(c) 3000
(d) 5000

32. In FMEA, which score is best ?
(a) Severity = 10, Occurrence = 2, Detection = 5
(b) Severity = 7, Occurrence = 4, Detection = 4
(c) Severity = 9, Occurrence = 5, Detection =
(d) Severity = 3, Occurrence = 3, Detection = 3

33. Which distribution is usually used to model the inter-arrival rate, if the arrival follows poisson distribution
(a) Normal
(b) Deterministic
(c) Poisson
(d) Exponential

34. A scheduling rule causes long jobs to wait if short jobs keep arriving. Which rule is being used?
(a) LPT
(b) SLACK
(c) SPT
(d) DDATE

35. In Critical Ratio (CR) scheduling, which job is given highest priority?
(a) One with lowest CR
(b) One with CR < 1
(c) One with CR = 1
(d) One with CR > 1

36. Which of the following statements is not correct:
(a) Tracking signal is used to monitor forecasts
(b) Upper and lower limits on the control chart are fixed numbers and not multiples of standard deviation of the error
(c) The control limits are multiples of MAD

(d) Control chart is used for monitoring of forecasts

37. The Bullwhip Effect refers to:
   (a) Delays in customer shipments caused by lean inventory
   (b) The increase in order quantities as you move downstream in a supply chain
   (c) The amplification of demand variability upstream in the supply chain
   (d) The reduction in demand variability in upstream supply chain stages
38. In Quality Function Deployment (QFD), the "House of Quality" matrix links:
   (a) Market trends to product price
   (b) Customer requirements to engineering characteristics
   (c) Manufacturing processes to suppliers
   (d) Technical requirements to design validation
39. Which method assumes that future demand will closely mirror past demand patterns with no random variation?
   (a) Linear regression
   (b) Naive forecasting
   (c) Moving average
   (d) ARIMA
40. Which of the following statement is incorrect
   (a) Efficiency is the ratio of output and input.
   (b) Efficiency and utilization are the same thing
   (c) Load leveling is done to even out the utilization.
   (d) Scheduling aims to maximize the utilization
41. The demand for an electronic component is normally distributed with an average daily de- mand of 500 units and a standard deviation of 50. The lead-time for the component is 9 days. If a service level of 95% is desired then the company's reorder point for this compo- nent is approximately
   (a) 4627
   (b) 3785
   (c) 2747
   (d) 5000
42. A firm plans over 6 months. Total demand = 16,000 units. Starting inventory = 3,000. Target ending inventory = 2000. Find the monthly production (level strategy).
   (a) 2,200 units
   (b) 2,300 units
   (c) 2,400 units
   (d) 2,500 units
43. The main output of a QFD process is:
   (a) Process capability index
   (b) Bill of materials
   (c) Control chart
   (d) Prioritized list of technical specifications
44. Perceptual Maps are used in which stage of design process:
   (a) Ideation
   (b) None of the above
   (c) Feasibility anslysis
   (d) Prototyping
45. In a single server queuing system, the utilization factor (Rho) is given by:
   (a) 1 minus lambda/mu
   (b) mu/lambda
   (c) lambda*mu
   (d) lamba/mu
46. Which of the following best describes a Bill of Materials (BOM)?
   (a) A comprehensive list of components and quantities needed to manufacture a product
   (b) A list of financial transactions related to production
   (c) A document outlining safety procedures in the workplace
   (d) A report detailing employee performance metrics
47. Customer arrives at a clinic at the rate of 5 per hour and the mean service time of the doctor is 10 minutes . The probability that there is no queue
   (a) 0.44
   (b) 0.167
   (c) 0.305
   (d) 0.25
48. BWE manifests as distortions in _____of the demand signal as it propagates up- stream. 1: Amplitude 2: Phase Angle 3: Oscillations
   (a) Only 1 and 2
   (b) All 1,2 and 3
   (c) Only 1
   (d) Only 2 and 3
49. Arrival rate at a service counter is poisson distributed with mean lambda. What fraction of the arrivals will arrive before the mean inter arrival time
   (a) 0.37

(b) 0.63
(c) 1/lambda
(d) lambda

50. Which limitation of APP cannot be resolved by improving forecasts?
(a) Workforce inflexibility
(b) Bullwhip effect
(c) Capacity underutilization
(d) Inventory buildup

51. The key difference between Holt's and Holt-Winters' method is:
(a) Holt requires historical data, Holt-Winters doesn't
(b) Holt is only for short-term, Holt-Winters for long-term
(c) Holt handles only trend, Holt-Winters includes seasonality
(d) Holt assumes zero mean, Holt-Winters doesn't

52. What is the forecast for week 5 using a 3-week weighted moving average with weights 0.6 (most recent), 0.3, 0.1, and demand: 100, 120, 130, 140?
(a) 130
(b) 134
(c) 120
(d) 126

53. Which supply chain decision problem can be solved using multiple linear regression
(a) Sequential dynamic pricing in the face of demand uncertainty and depleting inventory
(b) Predict future demand based on historical sales data, seasonality, marketing efforts, and other relevant factors
(c) Market segmentation based on consumer features, such as demographic information, gender, spending score, etc
(d) Supplier's default probability prediction

54. A component has 30 units on hand, with future net requirements as: Week 1: 40, Week 2: 30, Week 3: 50. Lead time = 1 week. FOQ = 100. What are the planned order releases?
(a) Week 0: 100; Week 1: 0
(b) Week 1: 100; Week 2: 0
(c) Week 1: 100; Week 2: 100
(d) Week 0: 100; Week 2: 100

55. In project scheduling, the slack time of an activity is defined as:
(a) Delay in resource availability
(b) Time required to complete the task
(c) Delay allowed without affecting total project duration
(d) Time saved due to crashing

56. The scheduling rule that minimizes the makespan time for a set of jobs that must be pro- cessed through a two-step system where every job follows the same sequence through the two processes is
(a) the shortest processing time
(b) the minimal slack rule.
(c) Johnson's Rule.
(d) the assignment method.

57. Probability of an Idle System for a single stage single channel queue is
(a) 1 minus Rho
(b) Rho
(c) 1 plus Rho
(d) lambda/mu

58. The demand for an electronic component is normally distributed with an average daily de- mand of 500 units, and a standard deviation of 50. The lead time for the component is 9 days. If the company sets a reorder point of 4,650 for this component, then its service level is approximately
(a) 98 percent
(b) 84 percent
(c) 92 percent
(d) 50 percent

59. A shopkeeper serve 5 customer/hour and remain idle during 30 percent of time . The average waiting time of customer in the system is.....minutes.
(a) 35
(b) 30
(c) 40
(d) 45

60. Which of the following is a prerequisite for a functioning MRP system?
(a) Short lead times
(b) Real-time demand feedback
(c) Accurate Bill of Materials
(d) ABC classification

Paragraph 1

A manufacturing firm has been offered a particular component part it uses according to the following discount pricing schedule provided by the supplier.

Quantity	Price
1-199	65
200-599	59
600+	56

The manufacturing company uses 700 of the components annually, the annual carrying cost is 14 per unit, and the ordering cost is 275.

61. What is the EOQ?
a) 165 b) 155 c) 175 d) 200

62. What is the optimal order size?
a) 250 b) 200 c) 600 d) 300

63. What is the total optimal cost of procuring this item?
a) 47000 b) 43600 c) 45000 d) 50000

64. What is the total procurement cost for an order size of 600?
a) 43600 b) 43700 c) 43800 d) 47821

Paragraph 2

The Wetski Water Ski Company is the world's largest producer of water skis. As you might suspect, water skis exhibit a highly seasonal demand pattern, with peaks during the summer months and valleys during the winter months. Given the following costs and quarterly sales forecasts, use the transportation method to design a production plan that will economically meet demand. What is the cost of the plan?

Quarter	Sales Forecast
1	50000
2	150000
3	200000
4	52000

Inventory carrying cost:	$3.00 per pair of skis per quarter
Production per employee:	1000 pairs of skis per quarter
Regular workforce:	50 workers
Regular capacity:	50,000 pairs of skis
Overtime capacity:	50,000 pairs of skis
Subcontracting capacity:	40,000 pairs of skis
Cost of regular production:	$50 per pair of skis
Cost of overtime production:	$75 per pair of skis
Cost of subcontracting:	$85 per pair of skis

k= thousands

65. What is the cost of the plan of period 1?
a) 2500k b) 3500k c) 4500k d) 5500k

66. What is the cost of the plan of period 2?
a) 10130k b) 10140k c) 10150k d) 10160k

67. What is the cost of the plan of period 3?
a) 14890k b) 14990k c) 14980k d) 19490k

68. What is the cost of the plan of period 4?
a) 2620k b) 2630k c) 2640k d) 2650k

69. What is the Total cost of the plan?
a) 30290k b) 31290k c) 32290k d) 33390k

Paragraph 3

The QuickParts Assembly Plant has six jobs to be processed through two machines, Machine A and Machine B, in the same order (A → B). The processing times (in hours) are given below:

Job	A (hrs)	B (hrs)
1	5	7
2	6	6
3	4	9
4	7	4
5	5	5
6	3	8

70. What is the optimal job sequence using Johnson's Rule?
a) 6–3–1–5–4–2
b) 6–3–1–4–2–5
c) 6–3–1–2–4–5
d) 6–3–5–1–2–4

71. What is the minimum total elapsed time (makespan)?
a) 40 hours b) 42 hours c) 46 hours d) 36 hours

72. What is the total idle time on Machine A?
a) 0 hours b) 6 hour c) 3 hours d) 12 hours

73. What is the total idle time on Machine B?
a) 0 hours b) 6 hour c) 3 hours d) 12 hours

Paragraph 4

Four tasks (T1, T2, T3, T4) must be assigned to four workers (W, X, Y, Z). The time (in minutes) each worker takes to complete each task is given below:

Task ↓ / Worker →	W	X	Y	Z
T1	9	2	7	8
T2	6	4	3	7
T3	5	8	1	8
T4	7	6	9	4

74. If management assigns tasks to workers to minimize total time, Task 1 is assigned to:
a) Worker W b) Worker X c) Worker Y d) Worker Z

75. Task 3 is assigned to:
a) Worker X b) Worker Y c) Worker Z d) Worker W

76. Time to complete Task 2 is:
a) 3 min b) 4 min c) 6 min d) 7 min

77. Total minimum time to complete all tasks is:
a) 18 min b) 17 min c) 13 min d) 15 min

Paragraph 5

The following set of jobs are to be processed on a single machine.

Jobs	A	B	C	D	E	F
Processing Time	6	9	5	7	10	4
Due Date	20	18	25	30	22	16

78. Which of the following is correct sequence using SPT.
a) F—A—D—C—B—E b) F—C—A—D—E—B
c) F—C—D—A—B—E d) F—C—A—D—B—E

79. What is the average tardiness using DDATE sequencing?
a) 3.5 b) 4.5 c) 5 d) 3.33

80.What is the average tardiness using FCFS scheduling?
a) 5 b) 6.33 c) 6.5 d) 6.67

81. Number of tardy jobs. Using DDATE
a) 4(A,B,E,F) b)3 (E,A,D) c) 4 (E,D,A,B) d) 3 (E,C,D)

Paragraph 6

A local building products store has accumulated sales data for 2*4 lumber and the number of building permits in its area for the past 10 quarters

Quarter	Permits	Lumber sales
1	8	12.6
2	12	16.3
3	7	9.3
4	9	11.5
5	15	18.1
6	6	7.6
7	5	6.2
8	8	14.2
9	10	15
10	12	17.8

82. What is the lumbar sales using linear regression for 11 permits?
a) 14 b) 15 c) 16 d) 17

83. What is the correlation coefficient?
a) 0.7 b) 0.8 c) 0.85 d) 0.9

84. What is the value of regression coefficient representing the slope?
a) 0.75 b) 1.25 c) 1.5 d) 1.75

85. Is there a strong relationship?
a) Yes b) No c) Can's be determined d) Data is insufficient

Paragraph 7

The EcoFresh Juice Company produces seasonal organic juices using fresh fruits in four regions. The demand for juice is highly seasonal, peaking during summer and fall when fruit harvests are abundant, and people consume more beverages. The company wants to evaluate different production strategies.

Quarter	Sales Forecast (litres)
Spring	60,000
Summer	1,00,000
Fall	50,000
Winter	1,10,000

Hiring = 150
Inventory = 0.6
Begin Workforce = 80
Firing = 400
Regular = 1.8
(1000L/W)

86. What is the cost of Level production Strategy?
a) 606000 b) 610000 c) 615000 d) 619000

87. Using Level production strategy, what is the inventory at the end of Fall?
a) 20000 b) 30000 c) 40000 d) 50000

88. What is the cost of Chase Demand Strategy?
a) 606000 b) 610000 c) 615000 d) 619000

89. Using Chase demand strategy, how many workers are fired in Fall season?
a) 20 b) 30 c) 40 d) 50

Paragraph 8

A company uses MRP to schedule its production. Due to the current recession, the company has decided to target inventory as the prime area for cost reduction without altering the customer service level. Demand and inventory data for a cabinet is given below.

Period	1	2	3	4	5
Demand	30	20	35	15	25

Ordering cost:100 per order
Holding cost: 2 per cabinet per period
Lead time: 1 period
Beginning Inventory: 30

90. What is the total cost from Lot for Lot Sizing technique?
a) 400 b) 360 c) 320 d) 420

91. What is the total cost from EOQ Lot Sizing technique?
a) 400 b) 360 c) 320 d) 420

92. What is the total cost from POQ Lot Sizing technique?
a) 400 b) 360 c) 320 d) 420

93. Which Lot Sizing technique is best for this given question?
a) LOL b) EOQ c) POQ d) None of these

94. Using the Lot-for-Lot sizing technique, what is the planned order releases in period 2?
a) 25 b) 35 c) 45 d) 55

95. Using the POQ Lot sizing technique, what is the planned order releases in period 3?
a) 40 b) 50 c) 45 d) 55