



MTH601-Operational
Research
(Solved MCS's)
LECTURE FROM
(23 to 45)



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- The cost matrix in assignment problem is always diagonal matrix:
 - Square matrix
 - Identify matrix
 - Zero matrix
- we go in probabilistic replacement model when period between installation failure is:
 - varying exponentially
 - varying linearly
 - constant
 - is not constant
- if the mean arrival and mean service rates are 4 and 7 respectively in queue then expected time in the system is.
 - $\frac{1}{3}$
 - 3
 - 28
 - $\frac{7}{4}$
- In a bank ,every 15 mint one customer arrive for the cash the cheque . The staff in the payment takes only 10 mint for the serving a customer on an average , then the services rate " μ " = ----- .
 - 6 per hour
 - 4 per hour
 - 10 per hour
 - $\frac{1}{6}$
- Which of the following binary operation in assignment problem among all the given profit form the highest element of matrix:
 - Subtraction
 - Addition
 - Multiplication
 - Division
- The present worth of a rupee to be spent after a year is denoted by v and given by:
 - $V=1/(1+r)$
 - $V=(1+r)$
 - $V= (1+r)/10$
 - $V(1/r)$
- In game theory, the outcome or consequence of a strategy is referred to as the
 - Payoff.
 - Penalty.

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8. Operations research is the application of _____ methods to arrive at the optimal solutions to the problems.

- economical
- **scientific**
- a and b both
- None

9. The degeneracy in the transportation problem indicates that

- Dummy allocation(s) needs to be added
- None of all
- The problem has no feasible solution
- **The multiple optimal solution exist**

10. The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that

- The solution be optimal
- **The rim conditions are satisfied**
- The solution not be degenerate
- All of the above

11. The method of finding an initial solution based upon opportunity costs is called _____.

- the northwest corner rule
- **Vogel's approximation**
- Johansson's theorem
- None

12. A repairman services three machines. For each machine the time between services requirement is 8 hours following exponential. The time of repair also has the same distribution with a mean of 2 hours. Then the mean services time " μ " is.

- **$\frac{1}{2}=0.5$**
- 4
- $\frac{1}{4}=0.5$
- 2
-

13. MAD ----- S.D:

- **$\sqrt{\frac{2}{3}}$**
- $\sqrt{\frac{3}{2}}$

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➤ $\sqrt{\frac{27}{3}}$

➤ $\sqrt{\frac{37}{2}}$

14. Standard Deviation (S.D)=----- M.D

➤ $\sqrt{\frac{37}{2}}$

➤ $\sqrt{\frac{27}{3}}$

➤ $\sqrt{\frac{7}{2}}$

➤ $\sqrt{\frac{2}{7}}$

15. Zero valued artificial variables may appears as ----- variables in the final solution, when one or more of the original constrict equation is redundant:

➤ Non Basic

➤ **Basic**

➤ Slacks

➤ Surplus

16. In the big .M method , if the introduced ----- variables do not the basic is in the final iteration, then this indicates that the give linear programming problem cannot be optimized.

➤ Entering

➤ Positive

➤ Negative slack

➤ **Artificial**

17. During a replacement if the values of money decreases ate rate of 3% then the present wroth factor of unit amount to be spent after one year is given by :

➤ 0.25

➤ 0.333

➤ **0.9708**

➤ 4

18. In linear programming problem (LPP), which of the following must be hold?

➤ Only objection function is linear

➤ Only constraints need to be leaner

➤ **Both objective function and constraints are linear**

19. Solution region for the constraint $y < 0$ is the

➤ Half plane below y-axis

➤ Half plane below the line $y=0$

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- All are equivalent
 - Set of all those point where ordinates are non positive
20. Degeneracy in a transportation problem occurs when the number of occupied cell is less than.
- 20 but greater than 10
 - 10
 - Zero
 - Infinity
21. For any activity backward pass compilation provides its:
- Earliest start times
 - Latest start time
 - Moderate start times
 - Completion time
22. If the money carries a rate of interest of 12 % per year, the present worth factor of one rupee due in one year is :
- 0.08333
 - 0.89285
 - 0.0769
 - 13
23. In sequencing problem, the Johnson algorithm in finding the optimal ordering of n jobs through 3 machine can applied, if the problem is converted into following number of machine problem:
- $3n$
 - $3n!$
 - $2 \times 3 = 6$
 - 2
24. The problem of replacement is felt when job performing units fail _____.
- suddenly and gradually
 - gradually
 - suddenly
 - neither gradually nor suddenly
25. Float analysis is useful for _____.
- total float
 - free float
 - independent float
 - variance of each float
26. The difference between free float and tail event slack is _____
- total float
 - independent float
 - interference float

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- slack

27. The average arrival rate in a single server queuing system is 10 customers per hour and average service rate is 15 customers per hour. The average time that a customer must wait before it is taken up for service shall be _____minutes.

- 6
- 8
- 10
- 12

28. Best possible time estimate that a given activity would take under normal condition which often exists, is called

- Most likely time estimate
- Pessimistic time estimate
- Smallest time estimate
- Activity time estimate

29. Formula for a geometric series “ $X + VX + V^2X + \dots + V^{N-1}X$ ” IS:

➤ $P(n) = x \frac{1 - v^n}{1 - v}$

➤ $P(n) = \frac{1 - v^n}{1 - v}$

➤ $P(n) = x \frac{1 - v}{1 - v^n}$

➤ $P(n) = \frac{1 - v}{1 - v^n}$

30. Product of ‘item cost’ and ordered item’ its :

- Crash cost
- Cost period
- Set up cost
- Shortage cost

31. Any cost of negative allocations ($X_{ij} > 0$) which satisfies the row and column sum is called ----- solution:

- Feasible
- Non basic feasible
- Basic infeasible
- Optimal

32. We go in probabilistic replacement model when period between installation and failure:

- Varying exponentially
- Varying linearly
- Constant

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- Is not constant
33. To convert the transpiration problem into a maximization model we have to _____
- Write the inverse of the coefficient matrix
 - Multiply the feasibility condition by- 1
 - Multiply the coefficient condition by- 1
 - **We cannot convert the transportation problem as it is basically a minimization problem**
34. If “ N_i ” be the number of replacement made at the end of the i^{th} week and “ p_j ” by the probability the i^{th} week, then $N_i =$ _____
- **$N_0 P_1$**
 - $N_1 P_1$
 - $N_0 P_0$
 - $N_1 P_2$
35. If a basic feasible solution contain less than “ $m+n-1$ ” (Here m is the number of row, n is the number of column in transportation problem) non negative allocation, then it said to be:
- **Degenerate**
 - Multiple solution
 - Non degenerate
 - Alternative optima
36. The inequality $2x+3y \geq 18$ is to equality to:
- $2x+3y \geq -18$
 - $-2x+3y \geq 18$
 - $-2x-3y \geq -18$
 - **$-2x-3y \geq -18$**
37. By the using two method to solve a linear programming problem, in phase I, a new objective function is formed by the assigning on the left hand side, Zero to every original variable (including slack and surplus variable) and _____ to each of the artificial variable:
- M
 - **$-M$**
 - $+1$
 - -1
38. Under the individual replacement policy an item is replaced on its:
- Success
 - **Failure**
 - Maximum utilization
 - Minimum utilization
39. In scatter diagram if both variables X and Y tend to move in the same direction the correlation is called.
- **▶ Negative**
 - **▶ No Correlation**
 - **▶ Curvilinear**
 - **▶ Positive**

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40. In EXCEL use the function to calculate correlation.

- ► COREL
- ► **CORREL**
- ► CORRELE
- ► CORRELATION

41. Slope of the line passing through the points A (2, 3) and B (3, 4) is:

- ► Zero
- ► **One**
- ► Two
- ► Three

42. The equation for the intercept of the regression line is $Y = a + bX$ where b is:

- ► Intercept
- ► **Slope**
- ► Equation
- ► Dependant variable

43. The correlation coefficient between x and y shows:

- ► Whether y depends on x
- ► whether x because y
- ► **whether there is any relation between x and y**
- ► whether there is a linear relation between x and y

44. In a linear regression of y on x, $y = a + bx$:

- ► the variance of x is constant for all values of y
- ► a fitted straight line goes through (0, 0)
- ► Both variables have the same variance
- ► **x is the explanatory variable**

45. Equation for the line having slope 5 and intercept 3 is:

- ► $y = 5 + 3X$
- ► $y - 3 = 5(X - 2)$
- ► $Y = X$
- ► **$Y = 3 + 5x$**

46. As the relationship deteriorates from a perfect correlation, what happens to the points on a scatter diagram?

- ► **They become more scattered.**
- ► The slope changes.
- ► The y-intercept changes.
- ► Both (ii) and (iii), above.

47. The measure of how well the regression line fits the data is the:

- ► coefficient of determination
- ► slope of the regression line
- ► mean square error
- ► **standard error of the regression coefficient**

48. How many arrangements can be made of the letter MOVING

- ► 900

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- ▶ 120
- ▶ 600
- ▶ **720**

49. The method of moving averages is used for what purposes?

- ▶ It is used to plot a series.
- ▶ It is used to exponentiate a series.
- ▶ **It is used to smooth a series.**
- ▶ It is used in regression analysis.

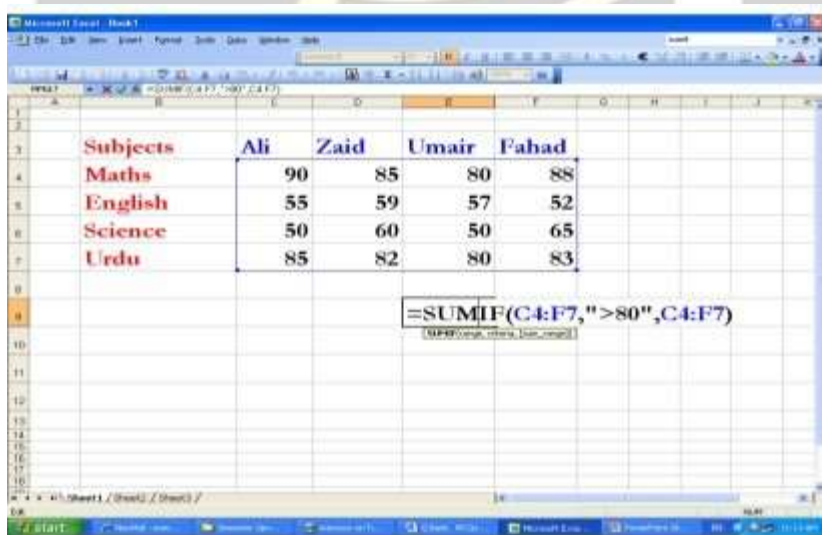
50. In a set of 10 observations the mean is 20 and the median is 15. There are 2 values that are 6, and all other values are different. What is the mode?

- ▶ 15
- ▶ 20
- ▶ **6**
- ▶ 16

51. If sign of r is negative then it indicates

- ▶ **Direct relationship between X & Y**
- ▶ Indirect relationship between X & Y
- ▶ X & Y equal
- ▶ X & Y are square

43. The answer of the SUMIF function in the above diagram is:



The screenshot shows a Microsoft Excel spreadsheet with the following data:

Subjects	Ali	Zaid	Umair	Pahad
Maths	90	85	80	88
English	55	59	57	52
Science	50	60	50	65
Urdu	85	82	80	83

Below the table, a formula bar shows the formula: `=SUMIF(C4:F7,">80",C4:F7)`

- ▶ 763
- ▶ 663
- ▶ 613
- ▶ **513**

44. In a class of 30 students, there are 17 girls and 13 boys. Five are A students, and three of these students are girls. If a student is chosen at random, what is the probability of choosing a girl or an A

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student?

- ▶ **19/30**
- ▶ 11/15
- ▶ 17/36
- ▶ None of these

45. If an event has an even chance of happening it has a probability of 2

- ▶ True
- ▶ **False**

46. Men tend to marry women who are slightly younger than themselves.

Suppose that every man married a woman who was exactly .5 of a year younger than themselves. Which of the following is CORRECT?

- ▶ The correlation is $-.5$.
- ▶ The correlation is $.5$.
- ▶ **The correlation is 1.**
- ▶ The correlation is -1 .
- ▶ The correlation is 0

47. Three year moving averages is

- ▶ **Arithmetic mean of 3 numbers continuously.**
- ▶ Sum of 3 numbers continuously.
- ▶ Average of 3 fixed numbers.
- ▶ Sum of 3 fixed numbers.

48. The price at which the product should be sold to the consumer is called the ___ price.

- ▶ Retailer's
- ▶ **List**
- ▶ Manufacture's
- ▶ Raw material

49. If A and B are any two matrices of order $m \times n$ and $p \times q$ respectively and $m > n$ and $p < q$. What should be the condition on m, n, p, q for the product AB to hold?

- ▶ $n > p$
- ▶ $m \leq q$
- ▶ $q = p$
- ▶ **$n = p$**

50. According to taxation rules; the amount of allowances is treated tax free if it is up to of the basic salary.

- ▶ **Half of**
- ▶ One third

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- ▶ 40%
- ▶ One fourth

51. The minimum number of points required to calculate the intercept of a straight line is/are

- ▶ one
- ▶ **two**
- ▶ three
- ▶ one or three

52. The price of a fountain pen was Rs.15 which grew to Rs. 19.50. Find the percent change.

- ▶ 3%
- ▶ 0.3%
- ▶ **30%**
- ▶ 0.03%

53. Ali has improved his typing speed from 40w/m to 60w/m. The percentage improvement is

- **Answer is 33.33%**

54. This example returns the depreciation for an asset that costs Rs. 10,000, with a salvage value of \$6,000. The useful life of the asset is 4 years. The depreciation is being calculated for the first year, and there are 12 months in the first year.

- **DB (10000, 6000, 4, 1, 12)**
- DB (10000, 6000, 4, 12, 1)
- DB (6000, 10000, 4, 12, 1)
- DB (10000, 6000, 4, 1, 1)

54. This example returns the depreciation for an asset that costs Rs. 10,000, with a salvage value of \$8,000. The useful life of the asset is 5 years. The depreciation is being calculated for the third year, and there are 10 months in the first year.

- DB (10000, 5, 8000, 3, 10)
- DB (10000, 8000, 5, 10, 3)
- **DB (10000, 8000, 5, 3, 10)**
- DB (10000, 8000, 10, 3, 5)

55. To add two cells (A1 and A2) together you use the following formula

- **A1+A2**
- ADD(A1+A2)
- Together(A1:A2)
- A1 plus A2

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56. If ratio of boys and girls in a class is 7: 5, which of the following can't be the total number of the students in the class?

- 36
- **50**
- 60
- 120

57. Assume you will work for the next 20 years and at the end of each year you will deposit \$20,000 into a savings account. At the end of that 20 year period you will start withdrawing your retirement living

expenses from that account at the beginning of every year. This financial plan involves a ____ problem

while you are working and a ____ problem while you are in retirement.

- A present value of dollar, future value of dollar.
- A future value of an annuity due, a present value of an annuity due.
- **A future value of an ordinary due, a present value of an ordinary due.**
- A future value of an ordinary due, a present value of an annuity due.

58. which of the following is linear equation:

- **$2x-3y=-6$**
- $X+x+x$
- $520X^2y^2$
- Y^2-3+0

59. For graphing univariate data we use

- pie charts, Bar charts .
- Pareto diagrams.
- Side by side chart
- **Both (1) & (2)**

60. If an operation A can be performed in m ways and B in n ways, then the two operations can be performed together in ----- ways.

- $M+n$
- $M-n$
- **$M*n$**
- n/m

61. C^{100}_0

- ▶ 100
- ▶ 0
- **▶ 1**

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- ▶ None of these

62. The result of BINOMDIST is #NUM!. Why?

	A	B	C	D	E
1	Data	Description			
2		-2 Number of successes in Trials.			
3		5 Number of independent trials.			
4		0.5 Probability of success on each trial.			
5	=BINOMDIST(A2,A3,A4,TRUE)	Probability of exactly -2 of 10			
6	#NUM!	trials being successful.			
7					
8					

- ▶ One parameter is missing.
- ▶ Third parameter is FALSE
- ▶ **The number of successes in trials is negative.**
- ▶ Probability of success on each trial is not suitable.

63. For a Poisson random variable, the probability that X is some value x is given by the following formula:

$$P(X = x) = \frac{\mu^x e^{-\mu}}{x!}, \quad x = 0, 1, \dots$$

$$POISSON = \frac{e^{-\lambda} \lambda^x}{x!},$$

64. In the formula, 'e' is a constant whose value is

- ▶ **2.71828**
- ▶ 3.14157
- ▶ 22 / 7
- ▶ 9.325

65. Time series data is analyzed by the moving average.

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- ▶ **True**
- ▶ False

67. Is every Linear Programming has solution?

- false
- **may are not may**

68. _____employs a different modeling and solution logic than linear programming

- (a). Transportation Model
- (b). Inventory Control Model
- **(c). Dynamic Programming**
- (d). None of the above

69. To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce

- (a). Parallel Activity
- **(b). Dummy Activity**
- (c). Sequential Activity
- (d). None of the above

70. EST and EFT of activities are calculated in

- **(a). Forward pass**
- (b). Backward pass
- (c) right pass

71. Critical path is obtained by connecting the jobs having

- (a). Activities having same EST and LST
- (b). Activities having same EFT and LFT
- (c). Activities having zero slack
- **(d). All of the above**

72. The Variance VT of expected time is calculated as

(a). $V_i = \left(\frac{t_m - t_o}{6}\right)^2$

(b). $V_i = \left(\frac{t_o - t_p}{6}\right)^2$

(c). $V_i = \left(\frac{t_p - t_m}{6}\right)^2$

(d). None of the above

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73. In LP problems Additivity means that

- (a). The effect of two different programs of production is the same as that of a joint program
- (b). **The doubling (or tripling) the product will exactly double (or triple) the profit and the required resource**
- (c). Both (a)& (b)
- (d). None of the above

74. Two of the first steps of OR process encompass the actual use of OR techniques. These steps are

- **(a). Model Construction and Model Solution**
- (b). Observation and Implementation
- (c). Definition of the problem and Model Solution
- (d). Model Solution and Implementation of results

75. Let FS = Free Slack, TS = Total Slack, INDS = Independent Slack, then which relation is true

- (a). $TS \leq FS$
- (b). $INDS \leq FS$
- (c). $FS \leq TS$
- **(d). Both (b) & (c)**

76. Best possible time estimate that a given activity would take under normal conditions which often

exist, is called :

- **(a). Most Likely time estimate**
- (b). Pessimistic time estimate
- (c). Smallest time estimate
- (d). None of the above

77. Standard Deviation S.D is

- **(a). One sixth of the difference between pessimistic time estimates and optimistic time estimates**
- (b). One sixth of the difference between pessimistic time estimates and most likely time estimates
- (c). One sixth of the difference between optimistic time estimates and most likely time estimates
- (d). One sixth of the difference between most likely time estimates and optimistic time estimates

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78. The amount of an activity can be delayed without affecting the early start time of any other job, is called :

Which one is best describe Sectoral planning

- ? **Inventory Planning in agriculture**
- ? Improving the layout of a workshop in a company
- ? Simulation Modeling of the Economy of the country
- ? None of these.

79. EST and EFT of activities are calculated in :

- **Forward pass**
- Backward pass
- Path does not effected

80. _____ may be less than most likely time estimate

- **Pessimistic time estimate**
- Smallest time estimate
- Optimistic Time estimate

81. The dummy activities consume

- **No time, no resources**
- No time but some resources
- Some resources in minimum time
- None of these

82. If an activity consumes no time and no resources then this activity is called _____.

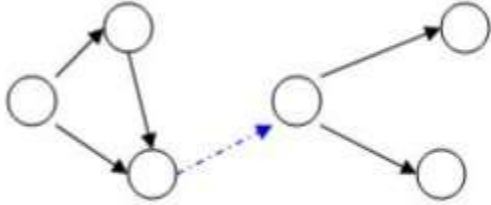
- **dummy activity**
- sequential activity
- critical activity
- cyclic activity

83. ost period ----- (No of ordered items)

- Holding cost
- Set up cost
- Stock out cost
- **Item cost**

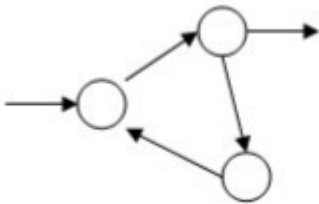
84. The following network is an example of

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- ▶ Redundancy
- ▶ Cycling
- ▶ Looping
- ▶ **Merging**

85. The following network is an example of



- ▶ **Redundancy**
- ▶ Dangling
- ▶ Cycling
- ▶ Dummy

86. Which one is best describe Micro Economic Planning?

- ▶ Distribution of fertilizer
- ▶ **Improving the layout of a workshop in a company**
- ▶ Investment planning of the country
- ▶ PERT

87. If $t_0 = 6$, $t_m = 12$ and $t_p = 18$, then $V_t =$ ____

- ▶ 12
- ▶ 2
- ▶ **4**
- ▶ 144

88. Which inventory model also known as a saw tooth model?

- ▶ **Purchasing Model with no shortages**
- ▶ Purchasing Model with shortages
- ▶ Manufacturing Model with no shortages

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- ▶ Manufacturing Model with shortages

89. For backward pass computations

- ▶ Earliest start time Latest start time
- ▶ Earliest start time Latest start time
- ▶ Earliest start time Latest start time = 0
- ▶ Earliest start time Latest start time

90. For an activity if optimistic time, most likely time estimate and pessimistic time estimate are 3, 6 and 15 respectively then expected time is

- ▶ 4
- ▶ 3
- ▶ 7
- ▶ 20

91. In a quadratic programming problem unlike linear programming problem

- ▶ Only objective function is quadratic
- ▶ Both objective function and constraints are quadratic
- ▶ Only constraints are quadratic
- ▶ At least one of objective function or constraint must be quadratic

92. Solution region of the constraint $x \geq 0$ is

- ▶ Half plane to the right of straight line $x = 0$
- ▶ Half plane to the right of y-axis
- ▶ Half plane to the region where abscissas are non-negative
- ▶ All are equivalent

93. The objective function and constraints are functions of two types of variables, _____ variables and _____ variables.

- ▶ Positive and negative
- ▶ Controllable and uncontrollable

94. The objective function for a minimization problem is given by $z = 2x_1 - 5x_2 + 3x_3$. The hyperplane for the objective function cuts a bounded feasible region in the space $(x_1, x_2, \text{ and } x_3)$. Find the direction vector d , where a finite optimal solution can be reached.

- $d(2, -5, 3)$
- None of Given
- $D(-2, 5, -3)$
- $D(2, 5, 3)$

95. What have been constructed from OR problems and methods for solving the models that are available in many cases?

- ▶ Scientific Models
- ▶ None of Given

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- Algorithms
- **Mathematical Models**

96. A dummy activity is a simulated activity of sorts, one that is of ___ duration and is created for the sole purpose of demonstrating a specific relationship and path of action on the arrow diagramming method.

- **▶ Zero**
- ▶ Minimum
- ▶ Maximum
- ▶ Average

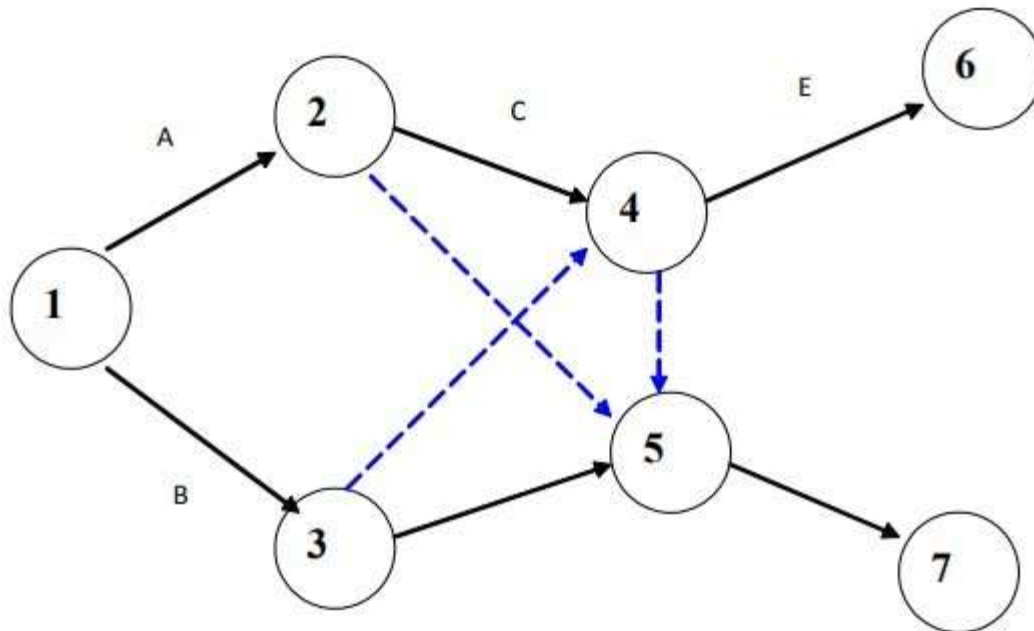
97. Activity definition refers to the process of parsing a project into a number of individual tasks which must be completed _____ the deliverables can be considered completed. Activity definitions rely on a number of specific input processes.

- **▶ before**
- ▶ both before and after
- ▶ after

98. A forward pass is used to determine and calculate the _____ dates, through utilization of a previously specified start date.

- **▶ early start and early finish**
- ▶ late start and early finish
- ▶ early start and late finish
- ▶ late start and late finish

96. Is this Network legal?



- **▶ Yes.**
- **▶ No.**

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97. Total cost per period = Item cost + Order cost + Holding cost + _____.

- ▶ Shortage cost
- ▶ Optimum Shortage (S^*)
- ▶ Economic Order Quantity. (Q^*)
- ▶ Maximum Inventory. (I_{max} .)

98.

$K \sqrt{I}$

Where K is called service factor.

$$\sqrt{I} \quad \text{▶ } 2$$

$$\sqrt{\frac{2I}{3}} \quad \text{▶}$$

$$\sqrt{\frac{2I}{3}} \quad \text{▶}$$

$$\sqrt{\frac{3I}{2}} \quad \text{▶}$$

99. When money value changes with time at 20%, the discount factor for the 2nd year is

- 1
- **B. 0.833**
- C. 0
- D. 0.6955

100. Which of the following replacement policies is considered to be dynamic in nature?

- Time is a continuous variable and the money value does not change with time
- When money value does not change with time and time is a discrete variable
- **When money value changes with time**
- When money value remains constant for some time and then goes on changing with time

101. When the probability of failure reduces gradually, the failure mode is said to be

- Regressive
- **Retrgressive**
- Progressive
- Recursive

102. _____ is concerned with the determination of the most economic replacement policy.

- Probabilistic programming

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- Linear programming
- Search theory
- **Replacement theory**

103. Which cost of the following is irrelevant to replacement analysis?

- Purchase cost of the machine
- Operating cost of the machine
- Maintenance cost of the machine
- **Machine hour rate of the machine**

104. Group replacement policy is most suitable for

- Trucks
- Infant machines
- **Street light bulbs**
- New cars

105. Replacement of an item will become necessary when

- **an old item becomes too expensive to operate or maintain**
- when your operator desires to work on a new machine
- when your opponent changes his machine in his unit
- when the company has surplus funds to spend

106. The following is not discussed in group replacement policy

- Failure Probability
- Cost of individual replacement
- Loss due to failure
- **Present worth factor series**

107. It is assumed that maintenance cost mostly depends on

- calendar age
- manufacturing date
- **running age**
- user's age

108. Replacement decision is very much common in this stage

- Infant stage
- Old age
- Youth
- **In all the above**

109. The replacement policy that is imposed on an item irrespective of its failure is

- **Group replacement**

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- Individual replacement
- Repair spare replacement
- Successive replacement

105. The Variance V_t of expected time is calculated as

• $V_t = (t_m - t_0 / 6)^2$

• **$V_t = (t_0 - t_p / 6)^2$**

• $V_t = (t_p - t_m / 6)^2$

- None of the Above

106. Two of the first steps of OR process encompass the actual use of OR techniques.

These steps are

- **(a). Model Construction and Model Solution**
- (b). Observation and Implementation
- (c). Definition of the problem and Model Solution
- (d). Model Solution and Implementation of results

107. Let FS = Free Slack, TS = Total Slack, INDS = Independent Slack, then which relation is true

- (a). $TS \leq FS$
- (b). $INDS \leq FS$
- (c). $FS \leq TS$
- **(d). Both (b) & (c)**

108. When money value changes with time at 10 %, then PWF for the first year is

○ **1**

- B. 0.909
- C. 0.852
- D. 0.9

109. Contractual maintenance or agreement maintenance with the manufacturer issuitable for equipment, which is

- **In its infant state**
- When a machine is an old one
- Scrapped
- None of these

110. Which of the following maintenance policy is not used in the old age stage of amachine?

- Operate up to failure and do corrective maintenance
- Reconditioning
- Replacement

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➤ **Scheduled preventive maintenance**

111. The following replacement model is said to be a probabilistic model

- When money value does not change with time and time is a continuous variable
- When money value changes with time
- When money value does not change with time and time is a discrete variable
- **Preventive maintenance policy**

112. A machine is replaced with an average running cost

- Is not equal to the current running cost
- till the current period is greater than that of next period
- **of the current period is less than that of next period**

113. Decreasing failure rate is usually observed in _____ stage of the machine

- **infant**
- youth
- old age
- any time in its life

114. The type of failure that usually occurs in old age of the machine is

- Random failure
- Early failure
- Chance failure
- **Wear - out failure**

115. The production manager will not recommend group replacement policy in case of

- When large number of identical items is to be replaced
- Low cost items are to be replaced, where record keeping is a problem
- For items that fail completely
- **Repairable items**

116. In replacement analysis the maintenance cost is a function of

- **time**
- resale value
- initial investment
- none of these

117. Which of the following is the correct assumption for replacement policy when money value does not change with time?

- No Capital cost
- No scrap value
- **Constant scrap value**
- Zero maintenance cost

118. Which one of the following does not match the group?

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- Present Worth Factor (PWF)
- Discounted rate (DR)
- Depreciation value (DV)
- **Mortality Tables (MT)**

119. Group replacement policy applies to

- Irreparable items
- Repairable items
- Items that fail partially
- **Items that fail completely & suddenly**

120. If a machine becomes old, then the failure rate expected will be

- Constant
- **Increasing**
- decreasing
- we cannot say

121. Replacement is said to be necessary if

- Failure rate is increasing
- Failure cost is increasing
- Failure probability is increasing
- **Any of these**

122. In this stage, the machine operates at highest efficiency and its production rate will be high

- Infant stage
- **Youth stage**
- Old age
- None of these

123. In retrogressive failures, the failure probability _____ with time

- increases
- remains constant
- **decreases**
- none of these

124. Search and cutting methods are used to solve following types of problems

- Transportation
- Assignment
 - **B. Integer Programming**
 - C. Queuing problems

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125. To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce

- Parallel Activity
- **Dummy Activity**
- Sequential Activity
- None of these

126. The variable is chosen by examining the cost coefficients in the objective function.

- **Entering**
- Leaving

127. In retrogressive failures, the failure probability _____ with time

- Increases
- Remains
- Constant
- **Decreases**

128. Decreasing failure rate is usually observed in _____ stage of the machine

- **Infant**
- Youth

129. When money value changes with time at 10 %, then PWF for first year is

- 1
- **0.909**
- 0.989
- D. 0.852

130. The rent for the stores where materials are stored falls under

- **Inventory carrying cost**
- Ordering cost

131. O.R. Society of India is founded in the year

- 1965
- 1970
- 1960
- **1959**

132. The rule which determines the decision at each stage is known as

- State
- Stage
- **Policy**
- Decision

133. In dynamic programming problems, the main problem is divided into sub problems. Each sub problem is known as

- Part
- None of given

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- **Stage**
- State

134. A competitive situation is known as

- Competition
- Marketing
- **Game**
- None of the above

135. In case, there is no saddle point in a game then the game is

- Deterministic game
- Fair game
- **Mixed strategy game**
- Multi player game

136. When Minimax and Maximum criteria matches, then

- Fair game is exists
- Unfair game is exists
- Mixed strategy exists
- **Saddle point exists**

137. If the value of the game is zero, then the game is known as

- Fair strategy
- Pure strategy
- **Pure game**
- Mixed strategy

138. The objective of network analysis is to _____.

- **minimize total project duration**
- minimize total project cost
- minimize production delays, interruption and conflicts
- maximize total project duration

139. Service mechanism in a queuing system is characterized by _____.

- customers behavior
- **servers behavior**
- customers in the system
- server in the system

140. The difference between total float and head event slack is _____.

- **free float**
- independent float
- interference float
- linear float

141. For any primal problem and its dual _____.

- optimal value of objective function is same
- dual will have an optimal solution iff primal does too

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- **primal will have an optimal solution iff dual does too**
- both primal and dual cannot be infeasible

142. If any value in XB column of final simplex table is negative, then the solution is _____.

- Infeasible
- Infeasible
- **Bounded**
- no solution

143. Operations Research approach is _____.

- **multi-disciplinary**
- scientific
- intuitive
- collect essential data

144. If there is no non-negative replacement ratio in solving a Linear Programming Problem, then the solution is _____.

- Feasible
- Bounded
- **Unbounded**
- Infinite

145. The calling population is considered to be infinite when _____.

- all customers arrive at once
- **capacity of the system is infinite**
- service rate is faster than arrival rate
- arrivals are independent of each other

146. In marking assignments, which of the following should be preferred?

- Only row having single zero
- Only column having single zero
- **Only row/column having single zero**
- Column having more than one zero

147. A petrol pump has one pump; Vehicles arrive at the petrol pump according to poisson input process at average of 12 per hour. The service time follows exponential distribution with a mean of 4 minutes. The pumps are expected to be idle for _____.

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- 4/5
- 5/3
- 6/5

148. If the order quantity (size of order) is increased, _____

- holding costs decrease and ordering costs increase
- **holding costs increase and ordering costs decrease**
- the total costs increase and then decrease
- storage cost as well as stock-out cost increase

149. A mixed strategy game can be solved by _____.

- Simplex method
- Hungarian method
- **Graphical method**
- Degeneracy

150. The activity cost corresponding to the crash time is called the _____.

- critical time
- normal time
- cost slope
- **crash cost**

151. A set of feasible solution to a Linear Programming Problem is _____

- **convex**
- polygon
- triangle
- bold

152. If the primal problem has n constraints and m variables then the number of constraints in the dual problem is _____.

- **mn**
- $m+n$

153. The non-basic variables are called _____.

- **shadow cost**
- opportunity cost
- slack variable
- surplus variable

154. Key element is also known as _____.

- slack
- surplus

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➤ artificial

➤ **pivot**

155. To resolve degeneracy at the initial solution, a very small quantity is allocated in _____ cell

➤ occupied

➤ **unoccupied**

156. An assignment problem is a particular case of _____.

➤ **transportation Problem**

➤ assignment Problem

➤ travelling salesman problem

➤ replacement Problem

157. Using _____ method, we can never have an unbounded solution

➤ Simplex

➤ **Dual simplex**

158. A queuing system is said to be a _____ when its operating characteristic are independent upon time

➤ pure birth model

➤ pure death model

➤ transient state

➤ **steady state**

159. The difference between total and free float is _____.

➤ total

➤ free

➤ independent

➤ **interference**

160. The number of time estimates involved in Program Evaluation Review Technique problem is _____.

➤ 1

➤ 2

➤ **3**

➤ 4

161. The assignment problem is always a _____ matrix.

➤ circle

➤ **square**

➤ rectangle

➤ triangle

162. The slack variables indicate _____.

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- excess resource available.
- shortage of resource
- nil resource
- **idle resource**

163. While solving a linear programming problem infeasibility may be removed by

- _____.
- adding another constraint
 - adding another variable
 - **removing a constraint**
 - removing a variable

164. During iteration while moving from one solution to the next, degeneracy may occur when _____.

- the closed path indicates a diagonal move
- **Two or more occupied cells on the closed path with minus sign are tied for lowest circled value.**

165. Maximization assignment problem is transformed into a minimization problem by _____.

- adding each entry in a column from the maximum value in that column
- subtracting each entry in a column from the maximum value in that column
- **subtracting each entry in the table from the maximum value in that table**
- adding each entry in the table from the maximum value in that table

166. Priority queue discipline may be classified as _____.

- pre-emptive or non-pre-emptive
- limited
- **unlimited**
- finite

167. Replace an item when _____.

- **average cost upto date is equal to the current maintenance cost**
- average cost upto date is greater than the current maintenance cost
- Average cost upto date is less than the current maintenance cost.
- next year running cost is more than average cost of nth year

168. In time cost trade off function analysis _____.

- **cost decreases linearly as time increases**
- cost increases linearly as time decreases
- cost at normal time is zero
- cost increases linearly as time increases

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169. The minimum number of lines covering all zeros in a reduced cost matrix of order n can be _____.

- **at the most n**
- at the least n
- $n-1$
- $n+1$

170. For a 2.5% increase in order quantity (under fundamental EOQ problem) the total relevant cost would _____.

- **Increase by 2.5%.**
- Decrease by 2.5%.

171. In the basic EOQ model, if the lead time increases from 2 to 4 days, the EOQ will _____.

- double increase
- **remain constant**
- but not double
- decrease by a factor of two

172. In the network, one activity may connect any _____ nodes

- 1
- **2**
- 3
- 4

173. Graphical method is also known as _____.

- Simplex Method
- Dual Simplex Method
- Big-M Method
- **Search-Approach Method**

174. Linear Programming Problem is a technique of finding the _____.

- **optimal value**
- approximate value
- initial value
- infeasible value

175. The irreducible minimum duration of the project is called _____.

- critical time
- normal time
- cost slope
- **crash duration**

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176. The cost of a slack variable is _____.

- 0
- 1
- 2
- -1

177. The server utilization factor is also known as _____

- exponential distribution
- **traffic intensity**

178. A Linear Programming Problem have _____ optimal solution

- 1
- 2
- Less than 1
- **more than 1**

179. The models in which only arrivals are counted and no departure takes place are called _____.

- **pure birth model**
- pure death mode

180. _____ of a queuing system is the state where the probability of the number of customers in the system depends upon time

- pure birth model
- pure death model
- transient state
- **steady state**

181. The initial event which has all outgoing arrows with no incoming arrow is numbered _____.

- 0
- 1
- -1
- 2

182. In a network diagram an event is denoted by the symbol _____.

- arrow
- straight line
- curve
- **circle**

183. _____ is used for non-repetitive jobs

- Queue
- Replacement

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- CPM
- PERT

184. An _____ represent the start or completion of some activity and as such it consumes no time

- activity
- event
- slack
- path

185. The region common to all the constraints including the non-negativity restrictions is called the _____.

- solution space
- unique solution
- optimum solution
- infeasible solution

186. _____ Operation research approach is typically based on the use of _____.

- Physical model.
- Mathematical model.
- Iconic model.
- Descriptive model.

187. For a salesman who has to visit n cities, following are the ways of his tour plan _____.

- $n!$
- $(n+a)!$
- $(n-a)!$
- N

188. _____ The time between the placement of an order and its delivery is called as _____.

- buffer time
- lead time
- Economic Order Quantity
- capital time

189. _____ All the basis for a transportation problem is _____.

- square
- rectangle

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- diagonal
- **triangle**

190. The linear function to be maximized or minimized is called _____ function.

- injective
- surjective
- bijective
- **optimal**

191. The coefficient of an artificial variable in the objective function of penalty method is always assumed to be _____.

- 0
- 1
- M
- **-M**

192. The process that performs the services to the customer is known as _____.

- queue
- **service channel**
- customers
- server

193. A queuing system is said to be a _____ when its operating characteristic are dependent upon time

- pure birth model
- pure death model
- **transient state**
- steady state

194. Slack is also known as _____.

- **Float**
- event
- activity
- path

195. What type of distribution does a time follow in program evaluation review technique model?

- Poisson
- Exponential
- **Normal**

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- Chi Square

196. A activity in a network diagram is said to be _____ if the delay in its start will further delay the project completion time.

- **Critical**
- critical path
- crash
- non critical

197. In the optimal simplex table, $Z_j - C_j = 0$ value indicates _____.

- **alternative solution**
- bounded solution
- infeasible solution
- unbounded solution

198. In an assignment problem involving 5 workers and 5 jobs, total number of assignments possible are _____.

- **5**
- 10
- 15
- 20

199. Average number of trains spent in the yard is denoted by _____.

- $E(n)$
- $E(m)$
- **$E(v)$**
- $E(w)$

200. The dual of the dual is _____.

- dual-primal
- primal-dual
- dual
- **primal**

201. All equality constraints can be replaced equivalently by _____ inequalities

- 1
- **2**
- 3
- 4

202. If the primal has an unbound objective function value then the dual has

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- solution
- basic solution
- basic feasible solution
- **no feasible solution**

203. An activity is represented by a/an _____.

- **arrow**
- straight line
- curve
- arc

204. The penalty for not taking correct decision is known as _____.

- fine
- loss
- cost
- **opportunity cost**

205. Every basic feasible solution of a general assignment problem having a square pay-off matrix of order n should have assignments equal to _____.

- **$2n-1$**
- n
- $n+1$
- $n-2$

206. A game is said to be fair if _____.

- **lower and upper values are zero**
- only lower value to be zero
- only upper value to be zero
- lower and upper values are not equal to zero

207. When $D=18000$, holding cost=Rs.1.20, set-up cost=Rs.400, $EOQ =$

- **3465**
- 3750
- 3500
- 4000

208. Given arrival rate = 15/hr, service rate = 20/hr, the value of traffic intensity is

- _____.
- **$3/4$**

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- 4/3
- 3/5
- 4/5

216. A solution can be extracted from a model either by

- Conducting experiments on it
- Mathematical analysis
- **Both A and B**
- Diversified Technique

217. Which of the following would be the objective of the yield per minute in a chemical process which depends upon the temperature 'x' and pressure 'y'?

- **Maximization**
- Minimization
- Inflection
- Average

218. Which of the following would be the objective of the cost per unit of producing certain cameras?

- Maximization
- **Minimization**
- Inflection
- Average

219. Which of the following would be the objective of the revenue in a production of cell phones?

- Inflection
- Average
- **Maximization**
- Minimization

220. Which of the following would be the objective of the efficiency of a certain air conditioning system depending upon temperature 'x', pressure 'y', moisture 'w' and cross-sectional area of outlet 'u'?

- Minimization
- Inflection
- Average
- **Maximization**

221. Which of the following would be the objective of the daily loss of heat in a heating system?

- Maximization
- **Minimization**

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- Inflection
- Average

222. Which of the following is an intermediate step to model a linear programming problem?

- **Identify the objective function**
- Identify the non-negative restrictions and constraints
- Identify the unknown decision variables
- None of these

223. Which of the following is first step to model a linear programming problem?

- **Identifying the objective function**
- Identifying the non-negative constraints
- Identifying the unknown decision variables
- Identifying all the restrictions

224. The word 'Linear' in Linear programming problem describes -----between two or more variables.

- That a Correlation exists
- A recurrence relation
- **A direct proportionate relation**
- An inverse proportionate relation

225.2 Which of the following is the meaning of 'Linear'?

- **Relationship between the variables is a straight line**
- Relationship between the variables is a curvilinear
- Relationship between the variables is discrete line
- Relationship between the variables is finite or infinite

226. The objective function and----- together form a Linear Programming problem.

- **A set of constraints**
- Unrestricted variables
- Feasible region
- Optimal solution

227. Which of the following correspond to the practical limitations of available resources while modeling a real life situation into a linear program?

- Objective function
- **Constraints**
- Decision variables
- Linear function

228. Which of the following category of items in ABC analysis has the maximum Holding Cost?

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- **A category**
- B category
- C category
- All categories'' items have equal Holding Costs

229. In North West Corner method, the first step after choosing the appropriate cell in 1st row, we allocate----- so that the capacity of first row or first column is exhausted.

- As Least as possible
- **As much as possible**
- Any arbitrary quantity
- Non-negative quantity

