	MATHEMATICS: MT-402 Operation Research (111412) Time: 2Hrs. Max. Marks: 60	Ans
1)	The critical path is…….. (A) The longest path (B) The shortest path (C) The path operates from starting to end node (D) All path operates from start to end activities	(A)
2)	Activities A,B and C are the immediate predecessors for activity X if the earliest finish time for the three activities are 8, 12, 6 then the earliest start time for X will be (A) 8 (B) 12 (C) Cannot be determined (D) 6	(B)
3)	While scheduling a project by CPM (A) A project is divided into various activities (B) Required time for each activity is established (C) A sequence of various activities is made according to their importance (D) All of the above	(D)
4)	In CPM project completion time is (A) Maximum time (B) Minimum time (C) Average time (D) All of these	(A)
5)	In network diagram (A) Time flows from right to left (B) Time flows from left to right (C) Time flows from centre to left (D) Time flows from centre to right	(B)

6)	Which is an valid statement for a project having three paths A-B-C with 20 days length, A-D-C with 15 days length and A-E-C with 18 days length (A) A-D-C is the critical path (B) The expected duration of the project is 20 days (C) A-B-C has the max total float (D) The expected duration of the project is 15 days	(B)
7)	Which of the following is not a phase of project management (A) Project planning (B) Project scheduling (C) Project controlling (D) Project being	(D)
8)	The full form of PERT is (A) Program Evaluation and Rate Technology (B) Program Evaluation and Robot Technology (C) Program Evaluation and ReviewTechnique (D) Program Expert and Risk Technology	(C)
9)	………….. are used to represent activity in a network diagram. (A) Circles (B) Squares (C) V-Rectangles (D) Arrows	(D)
10)	The shortest possible time in which an activity can be achieved under ideal circumstances is known as………. (A) Pessimistic time estimate. (B) Optimistic time estimate. (C) Expected time estimate (D) The most likely time estimate.	(B)
11)	PERT analysis is based on (A) Optimistic time (B) Pessimistic time (C) Most likely time (D) All the above	(D)
12)	Expected time estimate (te) can be calculated by (A) $\frac{t_0 + 4t_m + t_p}{6}$ (B) $\frac{t_0 + 4t_p + t_m}{6}$ (C) $\frac{4t_0 + 4t_p + 4t_m}{4}$ (D) $\frac{t_0 + t_m + t_p}{3}$	(A)

13)	Formula for total float is (A) LST-EST (B) LFT-EFT (C) Both A and B (D) None	(C)
14)	Float is useful for (A) Rescheduling activities (B) Rescheduling events (C) Define Critical path (D) None of the above	(A)
15)	In a queuing problem to have feasible results mean service rate has to be higher than mean arrival rate (A) True (B) False (C) Depending on condition (D) Do not know	(A)
16)	If the arrival of customers follows ……….. distribution inter-arrival time will follow exponential distribution . (A) Poisson (B) Exponential (C) Both (D) Depending on condition	(A)
17)	Vehicles at a single attendant petrol pump arriving according to poisson distribution with a mean rate of 10 vehicles per hours. The attendant renders service at an average of 15 vehicles per hour. The average waiting time that a vehicle must wait before it is taken up for service shall be (A) 12 mints (B) 15 mints (C) 8 mints (D) 9 mints	(C)
18)	Average waiting time in the Queue W_q= (A) $\frac{2\lambda}{4(\mu-\lambda)}$ (B) $\frac{\lambda}{\mu(\mu-\lambda)}$ (C) $\frac{\mu}{\lambda(\lambda-4)}$ (D) $\frac{\mu^2}{\lambda(\lambda-\mu)}$	(B)
19)	In M / M / 1: FIFO model of Queuing theory the probability that server is idle is…….. (A) $\frac{\lambda}{\mu}$ (B) $\frac{\mu}{\lambda}$ (C) $1-\frac{\mu}{\lambda}$ (D) $1-\frac{\lambda}{\mu}$	(D)

20)	The long form of EVPI (A) Expected value of perfect information (B) Expected value of probability information (C) Expected variable profit of Interest (D) Elementary variable of probability input	(A)
21)	Hurwit criterion is Decision making criteria (A) Under certainty (B) Under uncertainty (C) Under risle (D) All above	(B)
22)	In Decision Tree Method Decision points are represented by the symbol (A) Square (B) P (C) Circle (D) None of these	(C)
23)	Maxi min criterion means decision maker attempts to (A) Maximise the minimum possible profits (B) Minimize the expected loss. (C) Maximum regrets. (D) Minimum regrets.	(A)
24)	……is a method for learning about a real system by experimenting with a model that represents the system. (A) Decision theory. (B) CPM-PERT. (C) Replacement theory. (D) Simulation.	(D)
25)	"X simulated Y"is true iff … i) X and Y are formal system. ii) Y is taken to be the real system. (A) (i) is true. (B) (ii) is true. (C) Both (i) & (ii) are true. (D)Both (i) & (ii) are are false.	(C)
26)	Which is not Methodology foe simulation process….. (A) Developed the simulation model. (B) Identify he problem. (C) The solution results is maximisation & minimisation of objective function. (D) Specify values of decision variable to be tested.	(C)

27)	The Monte-carlo method of simulation was developed by ….. (A) Neumann and stainslaw Ulam. (B) Monte and carl Ulam. (C) Henry-carlo Neumann. (D) Albert Carlo.	(A)
28)	Consider the following statements… i) Simulation produced optimal results. ii) A good Simulation model may be very expensive often it takes year to develop a usable model. iii) Each application of simulation is ad hoc to great extent. (A) All statements are true. (B) (i) and (ii)true and (iii)is false. (C) Only (iii)is true. (D) (ii) and (iii)are true and (i) is false.	(D)
29)	Customer arrives at a service facility to get the required service .The interval and service times are constant and are 1.8 mints. & 4 mints. Respectively. Simulate the system for 14 mints. Determine average waiting time of customer. (A) 3 mints. (B) 2.5 minutes. (C) 2 minutes (D) 3.7 minutes	(D)
30)	Consider the following statements.. i) In bio-medical system, including fluid balance, distribution of electrolyte in human body and brain activities, simulation used. ii) Simulation is not applicable for designed of weapon system, war strategies. (A) (i) is true. (B) (ii) is true. (C) Both (i) & (ii) are true. (D)Both (i) & (ii) are false.	(A)
31)	……..requires the generation of a sequence of random numbers that is an integral part of the Simulation model. (A) System Simulation (B) Monte – carlo Simulation (C) Neumann – Carlo Simulation. (D)Random Model.	(B)

32)	Consider the following statements i) Simulation is flexible and straight forward technique. ii) It can be used to analyse large and complex real world system that can't be solved by conventional quantitative techniques model. (A) (i) is true. (B) (ii) is true. (C) Both (i) & (ii) are true. (D)Both (i) & (ii) are false.	(C)
33)	The departmental store has a single counter. Consumers arrive at a rate of 20 per hour and average rate of number of customers serviced by cashier is 24. Then under usual assumption the probability that cashier is idle is….. (A) 5/6 (B) 4/5. (C) 1/5 (D) 1/6	(C)
34)	All the parameter linear programming model are assumed to be…. (A) variables (B) constraints (C) functions (D) None	(B)
35)	In M/M/1 : ∞/FIFO model of queuing theory. The probability that the server is busy is… (A) $\frac{\lambda}{\mu}$ (B) $\frac{\mu}{\lambda}$ (C) $1-\frac{\lambda}{\mu}$ (D) $1-\frac{\mu}{\lambda}$	(A)

36) .	If arrival rate = λ = 20 per hour and service time = μ = 24 per hour under usual assumptions expected waiting time of consumer in system is …. (A) 12.5 minutes. (B) 5 minutes (C) 15 minutes. (D) 10 minutes.	(C)
37)	In Decision making under certainly each action will lead to …..outcome. (A)Only One. (B) Only two. (C)infinitly. (D)All above.	(A)
38)	In Decision making under risk decision maker knows the …….. for each possible alternative courses of action. (A)Probability of occurrence of input. (B)Probability of occurrence of outcomes. (C)Action taking. (D) None of these.	(B)
39)	What is the long form of EMV (A)Expected money value. (B)Expected money variable. (C)Elementary model value. (D)Elementary Monetary value.	(D)

40) Marketing staff of a certain industrial organisation has submitted th following payoff table, giving profits in million rupees, concerning certain proposal depending upon the rate of technological advance in the next three years as follows : (B)

Technological advance→ / Decision↓	Much	little	None
Accept	2	5	-1
Reject	3	2	4

What is thebest decision under certainty?

(A) Accept. (B) Reject.

(C) Not confirmed. (D) None.

41) Replacement is essential for (D)

(A) Loss of accuracy. (B) Reduced rate of production.

(C) Frequent breakdowns. (D) All above reasons.

42) Method to be used to evaluate replacement alternatives. (D)

(A) Annual equivalent annuity method. (B) Present value method.

(C) MAPI method. (D) Any one of the above.

43) Different replacement alternatives are (D)

(A) Breakdown replacement. (B) Planned replacement.

(C) Group replacement. (D) All are correct as per situation.

44) The Objective of a scientific inventory control system is to reduced investment in various forms of inventory. The statement is (A)

(A) True. (B) False.

(C) Cannot say (D) None.

45)	The non-linear programming problem solved by using…… (A) Wolfe's Method. (B) Kelly's cutting plane method (C) Lagrange's multiplier technique. (D) all of these	(D)
46)	Economic order quantity (EOQ) results in … (A) Reduced chances of stock outs. (B) Equalization of carrying cost and procurement cost (C) Favourable Procurement price. (D) None of these.	(B)
47)	Buffer stock is the level of stock… (A) Half of the actual stock. (B) At which the ordering process should start. (C) Minimum stock level below which actual stock should not fall. (D) maximum stock in inventory.	(C)
48)	If a decrease in unit price causes the average demand rate to increase, which are of these would not increase? (A) Lead time. (B) ROP. (C) EOQ (D) Annual holding.	(A)
49)	The Cost of Insurance and taxes are including in (A) Set up cost. (B) Cost of Ordering. (C) Cost of shortages. (D) Inventory carrying cost	(D)
50)	The order cost per order of an inventory is Rs. 400 with an annual carrying cost of RS. 10 per unit. The Economic Order Quantity (EOQ) for an annual demand of 2000 unit is (A) 400 (B) 410 (C) 500 (D) 1590.	(A)
51)	Using the basic EOQ model, if the ordering cost doubles. The order quantity will be (A) Double its formal value. (B) About 50% it's formal value. (C) About 71% of its formal value. (D) Unaffected.	(C)

52)	Which of the following is not an inventory? (A) Machines. (B) Row material. (C) Finished products. (D) Consumable tools.	(A)
53)	Which of the following is true for inventory control? (A) Economic order quantity has minimum total cost per order. (B) Inventory carrying costs increasing with quantity per order. (C) Ordering cost decreases with 10 size. (D) All the above.	(D)
54)	Which of the following is a valid objective function for a linear programming problem ? (A) Max. 5xy (B) Min. 4x+3y+(2/3z) (C) Max. $5x^2+6y^2$. (D) Min. $(x_1+x_2)/x_3$.	(B)
55)	let Z be a real valued function of n variables defined by Max. or Min. $Z=f(x_1,x_2,x_3,...,x_n)$ subject to the constraints $g_i(x)\{\le,\ge or =\} b_i$, i=1,2,3…m, $x\ge 0$ where either f(x) or some $g_i(x)$ or both are non-linear . it is general form of (A) Linear programming. (B) Non-linear programming. (C) C-programming. (D) C^{++} -programming	(B)
56)	The necessary condition for a Max.(or Min.) of f(x) are ….. (A) $\frac{\partial L}{\partial x_i}=\frac{\partial f}{\partial x_i}+\sum_{i=1}^{m}\lambda_i\frac{\partial g_i}{\partial x_j}=0$ (B) $\frac{\partial L}{\partial x_j}=\frac{\partial f}{\partial x_i}-\sum_{i=1}^{m}\lambda_i\frac{\partial g_i}{\partial x_j}=0$ (C) $\frac{\partial L}{\partial x_i}=\sum_{i=1}^{m}\lambda_i\frac{\partial g_i}{\partial x_j}=0$ (D) $\frac{\partial L}{\partial x_i}=\frac{\partial f}{\partial x_i}+\sum_{i=1}^{m}\lambda_i g_i=0$	(B)
57)	The Lagrangian function is of the form L(x,λ) = f(x)- $\sum_{i=1}^{m}\lambda_i g_i(x)$ where x stand for (A) Lagrangian function (B) Lagrangian multiplier (C) Decision variable (D) None	(C)
58)	The method of lagrange multipliers is a strategy for finding the … (A) Only maxima of function (B) Only minima of function (C) None (D) local Maxima and Minima of function	(D)

59)	A Non-LPP with non-linear objective function and linear constraints such a non-LPP is called … (A) Quadratic programming problem. (B) Non-Quadratic programming problem. (C) Linear programming problem (D) Non-Linear programming problem	(A)
60)	Which of the following is a valid objective function for a QPP. (A) $\min f(\mathrm{x}) = 3\mathrm{x}_1^2 + x_2^2 + 2x_1x_2 + x_1 + 6x_2 + 2$ (B) $\min f(\mathrm{x}) = 3\mathrm{x}_1^3 + x_2^3 + 2x_1x_2 + x_1^2 . + 6x_2 + 2$ (C) $\max f(\mathrm{x}) = 2\mathrm{x}_1 + 3x_2 + 6x_3 + 2$ (D) All of these	(A)
61)	The procedure used to solve assignment problems wherein one reduces the original assignment costs to a table of opportunity costs is called ………….. (A) Stepping – stone method (B) MODI method (C) Matrix reduction (D) Simplex reduction	(C)
62)	…………. Occurs when the number of occupied squares is less than the number of rows plus (A) degeneracy (B) infeasibility (C) Unboundedness (D) unbalanced	(A)
63)	The solution of transportation problem with ‘ m’ rows(supplies) and ‘n’ columns (destination) is feasible if number of positive allocations are (A) m+n (B) m*n (C) m+n-1 (D) m+n+1	(C)
64)	The operations research technique which helps in minimizing total waiting and service costs is (A) Queuing theory (B) Decision theory (C) Both A and B (D) None of these	(A)
65)	Optimal solution of an assignment problem can be obtained only if (A) Each row and column has only one zero element (B) Each row and column has at least one zero element (C) The data is arrangement in a square matrix (D) Simplex reduction	(A)

66)	When total supply is equal to total demand in transportation problem , the problem is said to be (A) Balanced (B) Unbalanced (C) Degenerate (D) None of these	(A)
67)	The decision making criteria that should be achieve maximum long term payoff is (A) EOL (B) EMV (C) Hurwicz (D) Maximax	(B)
68)	Decision theory concerned with (A) Method of arriving at an optimal decision (B) Selecting optimal decision in sequential manner (C) Analysis of information that is available. (D) All of above.	(D)
69)	All of the following are steps in the decision-making process EXCEPT (A) Defined the problem (B) List alternatives (C) Identify the possible outcomes (D) Compute the posterior probabilities	(D)
70)	…………….. is an activity oriented diagram. (A) CPM (B) PERT (C) Histogram (D) None	(A)
71)	PERT emphasis on………………….. (A) Time (B) Activity (C) A and B (D) None	(A)
72)	……………………is concerned with the problem of replacement of machine, electricity bulbs, men etc. (A) Decision theory (B) Replacement theory (C) Simulation (D) None	(B)
73)	Operation research is application of ………………method to arrive at the optimal solution to the problem. (A) Economical (B) Scientific (C) Both A and B (D) artistic	(B)

74)	O.R. is based upon collected information, knowledge and advanced study of advanced study of various factor impacting a particular operation. The leads to more informed …………………… (A) Management process (B) Decision making (C) Procedure (D) Mathematical model	(B)
75)	OR can evaluate only the effects of ………………………. (A) Financial factors (B) Personal factor (C) Numeric and quantifiable factor. (D) None	(C)
76)	Which of the following is not the phase of OR methodology. (A) Formulating (B) Constructing a model (C) Establishing controls (D) Controlling the environment	(D)
77)	The objective function and constraints are functions of two types of variable …………………….. Variable sand ………………………. Variables. (A) Positive and negative (B) Controllable and uncontrollable (C) Strong and weak (D) None	(B)
78)	What have been constructed from OR problem and methods for solving the model that are available in many cases? (A) Scientific model (B) Algorithm (C) Mathematical models (D) None	(C)
79)	Which of the following is not needed to use the transportation model? (A) The case of shipping one unit from each origin to each destination (B) The destination points and demand per period at each. (C) The origin point and the capacity of supply per period at each. (D) Degeneracy	(D)
80)	……………………… or ……………………………are used to "balance" an assignment or transportation problem, (A) Destination, source (B) Units supplies, unit demand (C) Dummy rows, Dummy columns (D) Artificial cells, Degenerate cells.	(C)

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