Name:

Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, July2020

Course: Operation Research and Optimization **Semester: VI**th
Program: B.Tech (CSE-BAO) **Time 02 hrs.**
Course Code: CSBA 3004 **Max. Marks: 60**

Instructions: All questions are of 1 marks each.
There is no negative marling for any question.

Q1 The scientific method in operation research consist of three phase

a) Judgement, research and action
b) Human, Quantitative and Quality of study
c) Scientific, Quantitative and Quality of decision
d) Scientific, Quality of study and research

Q2 In order to visualize the scope of OR, it is applicable at

a) Industry
b) Defence
c) Individual
d) Industry, Defence and Agriculture sectors etc.

Q3 The OR approaches can be successfully applied to which of the following problems:

a) LPP and IPP only
b) LPP, IPP and Queuing theory
c) LPP, IPP, Queuing Theory and Decision theory etc.
d) None of them

Q4 Analyse the following statements (St1 and St2) and predict the correct limitation of operation research:

St1-Mathematical models are applicable to only specific categories of problems.

St-2OR tries to find optimal solution taking all the factors of the problem into account.

a) St1 and St2 both are true
b) St1 and St2 both are false
c) Only St1 is true.
d) Only St2 is true.

Q5 The purpose of using Linear programming is to applying mathematical technique that helps managers in:

(Complete the purpose of above statement by using single or both the statements which are mentioned below.)

St1: Finding different solutions to only single constraint in a problem.

St2: Decision making and planning for the optimal allocation of limited resources.

a) Only St1 is used.
b) Only St2 is used.
c) Both are required.
d) None of them.

Q6 One can use Linear programming problem (LPP) for optimization purpose if following statement are satisfied:

a) There must be a well defined objective function:
b) There must be alternative course of action.
c) Decision variable must be inter-related.
d) All of them

Q7 A milk firm has two plants with a routine milk production of 6 million litres and 9 million litres respectively. Each day the firm must fulfil the requirement of its 3 distribution centres which have milk requirement of 7, 5 and 3 million litres. The cost of shipping 1 million litres of milk from each plant to each distribution centre is given in hundreds of rupees below. Formulate the L.P. model that tried to reduce the transportation cost.

Distribution Centres (1, 2,3)

Plants Type(I, II)

Plant I supply t

Plant I to Distribution centres (1, 2 and 3) shipping cost are 2, 3 , 11.

Plant II to Distribution centres (1, 2 and 3) shipping cost is 1, 9, 6.

Plant I supply 6 and Plant II supply 9.

From the given option predict the required objective function for the above problem statement.

a) Minimum = 100 – 4x1 – 11x2
b) Minimum = 10 – 3x1 – 9x2
c) Minimum = 5x1 – 10x2
d) Minimum = 4x1 – 11x2

Q8 A paper mill produces paper for books as well as for magazine. Each kg of paper for books requires 2 kg of material A and 3kg of material B. For magazine the proportion is 2kg of A and 2kg of B for each kg of paper. The mill needs 15,000 kg paper for books and 6,000 kg for magazines. Materials A and B are availables as 3 and 5 lakhs kg respectively. Requirement for books is twice than that of magazines. Selling price per book is Rs 14/kg and for magazine it is Rs 10/kg. Cost of material A is 2/kg and that for material B is 2.50/kg. It is required to find the product manufacturing plan and the optimum total profit. Predict the required objective function for the given LP problem model.

a) Max Z = Rs (2.50 x1 + x2)
b) Max Z = Rs (3 x1 + 2 x2)
c) Max Z = Rs (2 x1 + 2 x2)
d) Min Z = Rs (14 x1 + 10 x2)

Q9 Find the maximum value of:

Z = 2x1 + 3x2;

Subject to:

x1 + x2 <= 30;

x2>=3;

x2<=12;

x1-x2>=0;

0<=x1<=20;

a) Z = 72
b) Z= 70
c) Z = 71
d) Z = 69

Q10 Find the minimum value of

Z = 5x1 – 2x2;

Subject to

2x1 + 3x2 >=1;

x1,x2>=0;

a) Z= -2/3
b) Z=-1/3
c) Z=-1/2
d) Z= -2/5

Q11 Solve the following problem and predict the solution:

Max Z = -x1 + 2x2;

Subject to

x1-x2<=-1;

-0.5x1+x2<=2;

x1,x2>=0;

a) Unbounded solution
b) No feasible solution
c) Unique optimal solution

d) Multiple optimal solution

Q12 While solving the LP problem it must be put in particular form i.e. Canonical which has following characteristics:

a) Objective function is of max type
b) All constraints are of = type
c) All decision variable are negative
d) All of them

Q13 The main characteristics of the standard form of LP problem is

a) All variable are non-negative
b) The right hand side of each constraint is negative
c) All constraints must be expressed as with = type equation
d) All of them

Q14 While converting the inequality constraints into equality constraints in LP problem, _______________ variable is added or subtracted from left-hand side of each constraints.

a) Non-negative
b) Negative
c) Fractional
d) None of them

Q15 While iterating towards the optimal solution, the simplex method tries to move the current basic ________ to an improved basic feasible solution.

a) Feasible solution
b) Infeasible solution
c) Multiple solution
d) Unbounded solution

Q16 Max Z = 3x1 – x2;

Subject to

2x1 + x2<=2;

x1 + 3x2 >=3;

x<=4;

x1,x2>=0;

While building the ist table, the key column is selected using cj-Zj with following value:

a) 3+M
b) -1+3M
c) -M
d) None of them

Q17 While solving two phase LP problem, an artificial objective function is created through:

a) **Sum of all artificial variable**
b) Subtraction of all artificial variable
c) Division of all artificial variable
d) None of them

Q18 The objective function for the initial table of two phase method used

a) **Original given problem objective function**
b) Artificial variable objective function.
c) No objective function.
d) All of them.

Q19 The major difference between two phase and Big M method is

a) Basic approach to both the method is same.
b) Number of iterations are equal
c) Big M method solve the problem in one pass whereas two phase method solve it in two stages two linear problem
d) **All of them**

Q20 If there exist a tie between slack/surplus variable and decision variable, then one needs to select:

a) **Decision variable**
b) Surplus variable
c) Slack variable
d) All of them

Q21 Suppose in case of unrestricted variable where

x1 =y1-y2;

y1>=0;

y2>=0;

Here the value of x1 will be _________ which is dependent upon whether y1 is larger, equal to or smaller than y2.

a) Positive
b) Zero
c) Negative
d) **Can be positive or zero or negative**

Q22 While using linear programming methods, the benefits one can obtain are:

a) To help in improvement of quality of decision.
b) To help in providing better tools for adjustment to meet changing conditions.
c) Highlighting of bottleneck in any process.
d) **All of them**

Q23 In LPP, the optimal solution for each problem is unique due to

a) **the objective function line which passed only through the extreme point located at the intersection of the two constraint lines (half planes).**
b) the objective function has the same optimal value at more than one extreme point.
c) the objective function has no limit on the constraints.
d) the objective function has conflicting and inconsistent constraints.

Q24 Consider the following LP problem:

Max Z = 5x1 + 4x2

Subject to

x1 – x2 <= 1;

x1 + 2x2 >= 3;

x1, x2>=0;

So after solving it the problem therefore has:

a) **Unbounded solution**
b) Infeasible solution
c) Multiple optimal solution
d) Unique optimal solution

Q25 Penalties are assigned in min or max problem that help in providing solutions to LP problem with (=) or (>=) constraints. So how penalty (M) is designated in max and min problem:

a) **-M for max and +M for min**
b) -M for both max and min
c) +M for both max and min
d) +M for max and -M for min

Q26 In case of two phase problem, the purpose of adding artificial variable is to obtain an initial basic feasible solution. If the given LP problem is to be solved, then the value of artificial variable become:

a) **0**
b) -1
c) 1
d) None of these

Q27 From ist table generated from a given standard form of LP problem (of max type) in dual simplex method, the resulted cj- zj computed from it is either negative or zero and X_B is negative the

a) **The solution is optimal but infeasible.**
b) The solution is not optimal but infeasible.
c) The solution is unbounded.
d) The solution is not optimal as well as not infeasible.

Q28 In case of goal programming, three priorities are given (P1, P2, and P3) where P1 is on highest priority. So in this case while generation of ist simplex table has following characteristics:

a) Each priorities has common cj – zj;
b) The highest priority is at the bottom of all other priority and is evaluated at the end.
c) To select the incoming variable in it the highest priority is ist taken into observation with different minimum ratio rule.
d) To select the incoming variable in it the highest priority is ist taken into observation through different cj –zj.

Q29 For a given Binomial Distribution, if 'n' indicates the number of trials and 'p' indicates the probability of success, then the mean value (μ) is given by ___________

a) np
b) n
c) p
d) np(1-p)

Q30 For a given Poisson Distribution, if mean(m) is equal to 1, then the P(1) is denoted by?

a) 1/e
b) e
c) e/2
d) Indeterminate

Q31 Analyse the given two-person game, and determine the saddle point if it exists:

	Y_1	Y_2
X_1	4	6
X_2	5	-3

a) X_2Y_2
b) X_1Y_2
c) X_1Y_1
d) There is no saddle point.

Q32 __________________ method is used for verification of optimality of the current solution while solving a transportation problem?

a) Vogel's approximation method
b) Modi method
c) Stepping-stone method
d) All of the above

Q33 An assignment problem is a type of transportation problem because it contains following property:

a) It contains equal no of rows and columns
b) The x_{ij} contains either 0 or 1 value.
c) All rim conditions contains one
d) All of the above.

Q34 The issue of degeneracy in case of transportation problem always states that:

a) It requires addition of dummy rows/columns.
b) This problem has no feasible solution.
c) It contains multiple feasible solutions
d) Both a and b only.

Q35 From the following statements related to the northwest corner method is considered as incorrect?

a) One must check that all supply and demand constraints are met.
b) In this case, one must exhaust the supply for each row before moving down to its next row.
c) In this case, one must exhaust the demand requirements for each column before moving to its next column.
d) While moving to a new row or column, one must select the cell with a lowest cost.

Q36 The stepping-stone method

a) Is an alternative method that can be used in place of northwest corner rule.
b) Tried to keep track of closed paths with formation of triangular shape.
c) It helps in evaluation of shipping goods through transportation routes which are not currently in lies the solution
d) Helps in identification of the relevant costs for a given transportation problem

Q37 A Hungarian method is basically used to check

a) Solve a transportation problem
b) Solve a travelling salesman problem
c) LP problem
d) Both a and b

Q38 From the following statements, the only statement true about EOQ model is:

a) The ordering cost were to double, then the EOQ model rise.
b) The annual demand were to double, then the EOQ model increase.
c) The carrying cost were to increase, then the EOQ model fall.
d) All are true.

Q39 The time between two successive requests arrive at a server is called:

a) Arrival time
b) Inter arrival time
c) Possion Distribution
d) Average service time

Q40 Suppose in an I/0 system with a single disk gets an average of 50 I/0 requests/second and its average time for a disk being serviced an I/O request is given by 10ms, so calculate the utilization of the a given I/O system:

a) 0.5
b) 0.2
c) 0.75
d) 1.5

Q41 The inter-arrival time and service time in queuing system is calculated using:

a) Poisson distribution
b) Exponential distribution
c) Normal Distribution
d) Both a and b

Q42 Suppose you have maximization problem which is not in its standard form. Predict the kind of change one needs to perform to make the LPP into a standard form maximization problem?

Max(P) = 2x+9y

Subject to 3x+5y<=3

9x+5y>=8;

w.r.t. x>=0,y>=0;

a) Change 9x+5y >= 8 to 9x+5y <= 8
b) Change max P into min P.
c) Convert 3x+5y<>= 3 to 3x+5y >= 3
d) None of the above

Q43 While finding minimum number of lines crossing all zeros in assignment problem. It must follows sub-steps from:

a) Mark the rows that don't have assignments.
b) Mark the column that are already marked and that have zero in marked rows.
c) Mark the rows that have assignments in marked columns.
d) All of them

Q44 In case of unbalanced assignment problem

a) One need to maintain a non-square matrix
b) Cost with value 0 is assigned to the corresponding cell of the matrix in order to maintain a square matrix.
c) Only Row with cost value 0 is assigned to the corresponding cell of the matrix
d) Only column with cost value 0 is assigned to the corresponding cell of the matrix

Q45 Suppose if the given assignment problem is of type max then one need to transform it to min before processing it using following statement (St1/St2):

S1 Subtract all the element of the matrix with largest element.

St2 Multiply matrix element by -1.

a) St1 is required
b) St2 is required
c) St1 and St2 both are required
d) St1 or st2 anyone can be used

Q46 Sometime their exist restriction (technical, space or legal) on assignment problem that don't allow the assignment of a particular facility, then one can solve it by assigning ________ cost to the corresponding cell.

a) Zero

b) Unit
c) Infinite
d) Low

Q47 The information regarding jobs to be scheduled through one machine is given below:

Jobs: A B C D E F G

Processing time (days): A-4, B-12, C-2, D-11, E-10, F-3, G-6

Due Date (days): A-20, B-30, C-15, D-16, E-18, F-5, G-9

Calculate the mean flow time for SPT schedule.

a) 20 days
b) 21 days
c) 28 days
d) 20 days

Q48 The information regarding jobs to be scheduled through one machine is given below:

Jobs: A B C D E F G

Processing time (days): A-4, B-12, C-2, D-11, E-10, F-3, G-6

Due Date (days): A-20, B-30, C-15, D-16, E-18, F-5, G-9

Calculate the mean flow time for FCFS schedule.

a) 28 days
b) 27 days
c) 21 days
d) 24 days

Q49 The information regarding jobs to be scheduled through one machine is given below:

Jobs: A B C D E F G

Processing time (days): A-4, B-12, C-2, D-11, E-10, F-3, G-6

Due Date (days): A-20, B-30, C-15, D-16, E-18, F-5, G-9

Calculate the mean flow time for EDD schedule.

a) 23 days
b) 24 days
c) 21 days
d) 20 days

Q50 The characteristics of two-person zero-sum game are:

a) Only two players are involved and each player has infinite number of strategies to use.

b) Two or more players are involved and each player has infinite number of strategies to use.
c) Only two players are involved and each player has finite number of strategies to use.
d) Two or less players are involved and each player has finite number of strategies to use.

Q51 Suppose in a Game G with the following payoff:

Player A1 has value corresponding to Player B1 is 2

Player A1 has value corresponding to Player B2 is 6

Player A2 has value corresponding to Player B1 is -2

Player A2 has value corresponding to Player B2 is lemda.

Calculate the value of min and max.

a) 2,2
b) 2,-2
c) -2,2
d) -2,-2

Q52 Suppose in a Game G with the following payoff:

Player A1 has value corresponding to Player B1 is 2

Player A1 has value corresponding to Player B2 is 6

Player A2 has value corresponding to Player B1 is -2

Player A2 has value corresponding to Player B2 is lemda.

Calculate the value of G.

a) 2
b) -2
c) 6
d) null

Q53 Solve the following game:

Player A1 has value corresponding to Players B1 and B2 is 30, 2.

Player A2 has value corresponding to Players B1 and B2 is 4, 14.

Player A3 has value corresponding to Players B1 and B2 is 6, 9.

Predict whether this game has saddle point or not.

a) No saddle point exist
b) Saddle point exist
c) Saddle point exist with 10 value.

d) Saddle point exist with 4 value.

Q54 Solve the following game (with Player A-A1, A2, A3 and Player B-B1, B2, B3):

Player A1 has value corresponding to Players B1 and B2 is 30, 2.

Player A2 has value corresponding to Players B1 and B2 is 4, 14.

Player A3 has value corresponding to Players B1 and B2 is 6, 9.

Predict the value of optimal strategy for player A.

a) 5/19, 14/19, 0
b) 5/18, 14/19, 0
c) 5/18, 12/19, 0
d) 5/19, 12/19, 0

Q55 Solve the following game (with Player A-A1, A2, A3 and Player B-B1, B2, B3):

Player A1 has value corresponding to Players B1 and B2 is 30, 2.

Player A2 has value corresponding to Players B1 and B2 is 4, 14.

Player A3 has value corresponding to Players B1 and B2 is 6, 9.

Predict the value of optimal strategy for player B.

a) 6/19,13/19
b) 6/18,13/19
c) 6/19,13/18
d) 6/18,13/18

Q56 Solve the following game:

Player A1 has value corresponding to Players B1 and B2 is 30, 2.

Player A2 has value corresponding to Players B1 and B2 is 4, 14.

Player A3 has value corresponding to Players B1 and B2 is 6, 9.

Predict the value of game.

a) 206/19
b) 206/18
c) 205/19
d) 205/18

Q57 Analysis of a queuing system involves a study of its different operating characteristics which includes:

a) Queue length
b) System length
c) Waiting Time

d) **All of them**

Q58 A self-service store employs one cashier at its counter. 9 customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time, then find average number of customers in system.

a) 9
b) 8
c) 7
d) 10

Q59 A self-service store employs one cashier at its counter. 9 customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time, then find average time a customer waits before being served.

a) 5 min
b) 4 min
c) 6 min
d) 7 min

Q60 Every LPP is associated with another LPP is called

a) Primal
b) Dual
c) None of them
d) Simple