University of Mumbai

Examination 2020 under cluster ALL (Lead College: VCET)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **ALL_Institute Level Optional Course 1**
Curriculum Scheme: Rev2016
Examination: BE Semester VII
Course Code: ILO 7015 and Course Name: Operations Research
Time: 2 hours Max. Marks: 80

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0701_R16_ALL_VII_ILO7015_QP_Sample

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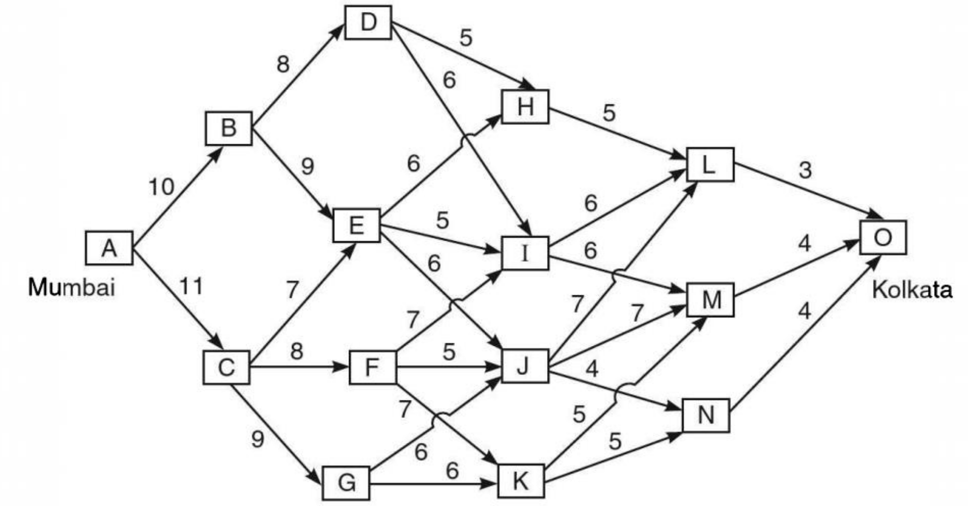
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following is not a characteristic of the Standard form of a Linear programming problem?
Option A:	The objective function is of the maximization type
Option B:	The constraints are inequalities of the type
Option C:	The constraints are equations
Option D:	All decision variables are 0
2.	A feasible solution of a Linear programming problem
Option A:	Need not satisfy all the constraints
Option B:	Must satisfy all the constraints simultaneously and the non- negative restrictions
Option C:	Must be a corner point of the feasible region only
Option D:	Need not satisfy the non -negative restrictions
3.	If the objective of the Primal is to maximize with constraints of the type then …….
Option A:	Objective of the Dual is to minimize with constraints of the type
Option B:	Objective of the Dual is to maximize with constraints of the type
Option C:	Objective of the Dual is to minimize with constraints of the type
Option D:	Objective of the Dual is to maximize with constraints of the type

4.	In dual simplex method the solution is optimal if all
Option A:	$XBi's \geq 0$
Option B:	Δ_j's ≥ 0
Option C:	XB_i's ≤ 0
Option D:	XB_i's $= 0$
5.	The optimal solution to the Linear programming problem Maximize Z= $3x1 + x2$ subject to the constraints $-2x1 + x2 \leq 1$ $x1 \leq 2$ $x1 + x2 \leq 3$ and $x1, x2 \geq 0$
Option A:	(0,1)
Option B:	(2,1)
Option C:	(2,0)
Option D:	(⅔ ,7/3)
6.	In a LPP, the constraint equation ax + by = c is written as-----
Option A:	ax + by < c and ax + by ≤ c
Option B:	ax + by > c and ax + by ≥ c
Option C:	ax + by < c and ax + by > c
Option D:	ax + by ≤ c and ax + by ≥ c
7.	A saddle point of a payoff matrix is the position of such an element in the payoff matrix which is
Option A:	minimum in its row and maximum in its column

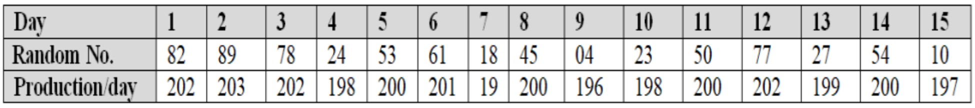
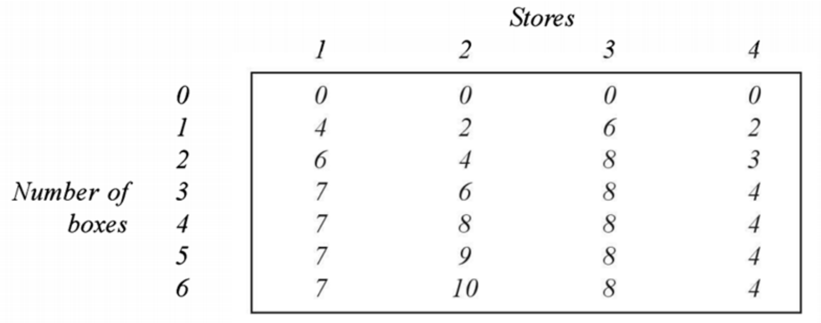
<table>
<tr><td>Option B:</td><td>minimum in its column and maximum in its row</td></tr>
<tr><td>Option C:</td><td>minimum in its row and minimum in its column</td></tr>
<tr><td>Option D:</td><td>maximum in its row and maximum in its column</td></tr>
<tr><td></td><td></td></tr>
<tr><td>8.</td><td>The two person zero sum game given by the matrix
<table>
<tr><td></td><td colspan="2">Player B</td></tr>
<tr><td rowspan="2">Player A</td><td>1</td><td>1</td></tr>
<tr><td>4</td><td>-3</td></tr>
</table>
</td></tr>
<tr><td>Option A:</td><td>Is not fair</td></tr>
<tr><td>Option B:</td><td>Is fair</td></tr>
<tr><td>Option C:</td><td>Is fair and strictly determinable</td></tr>
<tr><td>Option D:</td><td>Is not fair and strictly determinable</td></tr>
<tr><td></td><td></td></tr>
<tr><td>9.</td><td>Competitive Games are classified according to</td></tr>
<tr><td>Option A:</td><td>number of players involved</td></tr>
<tr><td>Option B:</td><td>number of activities</td></tr>
<tr><td>Option C:</td><td>determinable games</td></tr>
<tr><td>Option D:</td><td>number of strategies involved</td></tr>
<tr><td></td><td></td></tr>
<tr><td>10.</td><td>In the two phase method the artificial variable in the objective function is assigned the cost</td></tr>
<tr><td>Option A:</td><td>-1</td></tr>
<tr><td>Option B:</td><td>0</td></tr>
<tr><td>Option C:</td><td>-M</td></tr>
<tr><td>Option D:</td><td>M</td></tr>
<tr><td></td><td></td></tr>
<tr><td>11.</td><td>In the Revised Simplex method the objective function</td></tr>
<tr><td>Option A:</td><td>is also treated as one of the constraints</td></tr>
<tr><td>Option B:</td><td>is neglected while solving</td></tr>
</table>

Option C:	is not considered as a constraint
Option D:	is considered very small in value at the starting table
12.	The statement of Weak Duality Theorem is
Option A:	If the primal is of maximization type every feasible solution to the dual has an objective function value greater than or equal to every feasible solution to the primal.
Option B:	If P = D have feasible solutions such that W = Z , then these are optimal to Primal and Dual.
Option C:	If P and D have feasible solution then both have optimal solutions with $Z^*=W^*$
Option D:	If X^* and W^* are optimal solutions to P and D, then XV + WU = 0 (at optimum) w
13.	On an average, 6 customers reach a telephone booth every hour to make calls. Determine the probability that exactly 4 customers will reach in 30 minute period, assuming that arrivals follow Poisson distribution.
Option A:	0.5
Option B:	0.168
Option C:	0.182
Option D:	0.159
14.	In an Queuing Model, the times between two successive requests arriving, is called---
Option A:	Inter-arrival time
Option B:	Arrival time
Option C:	Poisson Distribution
Option D:	Average Residual service time
15.	The patients coming to a Doctor has a mean arrival rate (l) of 8/hr and the machine has a service rate (m) of 10/hr. What is the probability that there are zero persons in the queuing system?
Option A:	0.8
Option B:	0.25

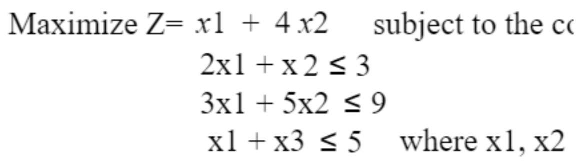
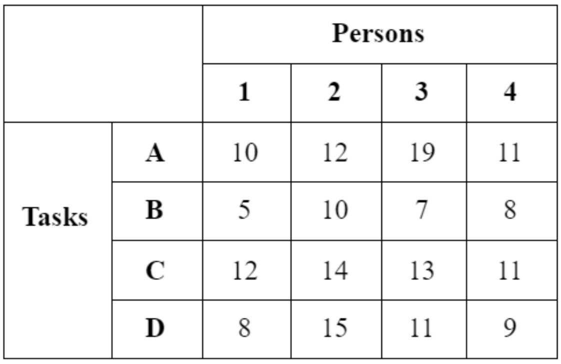
Option C:	0.2
Option D:	1
16.	Which one is **NOT** the feature of the Dynamic programming problem?
Option A:	Dynamic programming splits the original large problem into smaller sub-problems
Option B:	It involves multistage decision making
Option C:	A wrong decision taken at one stage does not prevent from taking of optimum decisions for the remaining stages
Option D:	It is essential to know about the previous decisions and how the state arise
17.	Following graph represents an instance of a travelling salesman problem.  Identify the number of stages and states for the problem to be solved using dynamic programming.
Option A:	6 stages, 13 states
Option B:	5 stages, 15 states
Option C:	6 stages, 14 states
Option D:	5 stages, 14 states
18.	A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts production, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for a year is Rs. 2 and the set up cost of a production run is Rs. 1800. How frequently should production runs be made?
Option A:	10.44 days
Option B:	11.44 days

Option C:	12 days
Option D:	11 days
19.	Re-order level of an item is always
Option A:	Less than its minimum stock
Option B:	Less than its maximum stock
Option C:	More than its maximum stock
Option D:	More than its minimum stock
20.	The EOQ for the following data Annual usage = 1000 pieces Expending cost = Rs. 4 per order Cost per piece = Rs. 250 Inventory holding cost= 20% of Average inventory Ordering cost = Rs. 6 per order Material holding cost= Re.1 per piece
Option A:	22
Option B:	23
Option C:	20
Option D:	24

<table>
<tr><td>Q2
(20 Marks)</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Solve the game whose payoff matrix is given by
<table>
<tr><td></td><td colspan="3">Player B</td></tr>
<tr><td rowspan="3">Player A</td><td>-3</td><td>-1</td><td>6</td></tr>
<tr><td>2</td><td>0</td><td>2</td></tr>
<tr><td>5</td><td>-2</td><td>-4</td></tr>
</table>
</td></tr>
<tr><td>B</td><td>Write the dual of the following LPP:
Maximize z = 2 $x_1 - x_2 + 4 x_3$</td></tr>
</table>

<table>
<tr><td></td><td>Subject to $x_1 + 2x_2 - x_3 \leq 5$
$2x_1 - x_2 + x_3 \leq 6$
$x_1 + x_2 + 3x_3 \leq 10$
$4x_1 + x_3 \leq 12$
$x_1, x_2, x_3 \geq 0$</td></tr>
<tr><td>C</td><td>A company manufactures around 200 bikes.Depending upon the availability of raw material and other conditions, the daily production has been varying from 196 to 204 bikes . The finished bikes are transported in a specially designed three- storeyed lorry that can accommodate only 200 bikes , whose probability distribution and random numbers are given in the following table:

<table>
<tr><th>Day</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th></tr>
<tr><td>Random No.</td><td>82</td><td>89</td><td>78</td><td>24</td><td>53</td><td>61</td><td>18</td><td>45</td><td>04</td><td>23</td><td>50</td><td>77</td><td>27</td><td>54</td><td>10</td></tr>
<tr><td>Production/day</td><td>202</td><td>203</td><td>202</td><td>198</td><td>200</td><td>201</td><td>19</td><td>200</td><td>196</td><td>198</td><td>200</td><td>202</td><td>199</td><td>200</td><td>197</td></tr>
</table>
Answer the following questions
1) Simulate the process to find out what will be the average number of bikes waiting in the factory
2) What will be the average number of empty space in the lorry?</td></tr>
<tr><td>D</td><td>The owner of a chain of 4 grocery stores has purchased six crates of fresh strawberries. The following table gives the estimated profits of each store when it is allocated various number of boxes.

<table>
<tr><th></th><th></th><th colspan="4"><i>Stores</i></th></tr>
<tr><th></th><th></th><th><i>1</i></th><th><i>2</i></th><th><i>3</i></th><th><i>4</i></th></tr>
<tr><td><i>Number of boxes</i></td><td><i>0</i></td><td><i>0</i></td><td><i>0</i></td><td><i>0</i></td><td><i>0</i></td></tr>
<tr><td></td><td><i>1</i></td><td><i>4</i></td><td><i>2</i></td><td><i>6</i></td><td><i>2</i></td></tr>
<tr><td></td><td><i>2</i></td><td><i>6</i></td><td><i>4</i></td><td><i>8</i></td><td><i>3</i></td></tr>
<tr><td></td><td><i>3</i></td><td><i>7</i></td><td><i>6</i></td><td><i>8</i></td><td><i>4</i></td></tr>
<tr><td></td><td><i>4</i></td><td><i>7</i></td><td><i>8</i></td><td><i>8</i></td><td><i>4</i></td></tr>
<tr><td></td><td><i>5</i></td><td><i>7</i></td><td><i>9</i></td><td><i>8</i></td><td><i>4</i></td></tr>
<tr><td></td><td><i>6</i></td><td><i>7</i></td><td><i>10</i></td><td><i>8</i></td><td><i>4</i></td></tr>
</table>
The owner does not wish to split crates between stores, but is willing to make zero allocation. Find the allocations of six crates so as to maximize the profits using dynamic programming.</td></tr>
<tr><td>E</td><td>A grocery store employs one cashier at its counter. Nine 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, find
1)Average number of customers in the queue
2) Average time a customer waits before being served</td></tr>
<tr><td>F</td><td>A Stocklist has to supply 12000 units of a product per year to his customer. The demand is fixed and the shortage cost is assumed to be infinite. The</td></tr>
</table>

	inventory holding cost is Rs. 0.20 per unit per month and the ordering cost per order is Rs. 350. Determine 1) The optimum lot size q_0 2) Optimum scheduling period t_0 3) Minimum total variable yearly cost

<table>
<tr><td>Q3.
(20 Marks)</td><td>Solve any Two Questions out of Three 10 marks each
<i>Please delete the instruction shown in front of every sub question</i></td></tr>
<tr><td>A</td><td>Solve the following LPP by Simplex Method.

Maximize $Z= x1 + 4x2$ subject to the cc
$2x1 + x2 \leq 3$
$3x1 + 5x2 \leq 9$
$x1 + x3 \leq 5$ where x1, x2</td></tr>
<tr><td>B</td><td>Solve the following assignment problem

<table>
<tr><th></th><th></th><th colspan="4">Persons</th></tr>
<tr><th></th><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>Tasks</td><td>A</td><td>10</td><td>12</td><td>19</td><td>11</td></tr>
<tr><td></td><td>B</td><td>5</td><td>10</td><td>7</td><td>8</td></tr>
<tr><td></td><td>C</td><td>12</td><td>14</td><td>13</td><td>11</td></tr>
<tr><td></td><td>D</td><td>8</td><td>15</td><td>11</td><td>9</td></tr>
</table></td></tr>
<tr><td>C</td><td>Solve the Transportation problem and test for optimality
<table>
<tr><th></th><th>D1</th><th>D2</th><th>D3</th><th>D4</th><th>Available</th></tr>
<tr><td>O1</td><td>1</td><td>2</td><td>1</td><td>4</td><td>30</td></tr>
<tr><td>O2</td><td>3</td><td>3</td><td>2</td><td>1</td><td>50</td></tr>
<tr><td>O3</td><td>4</td><td>2</td><td>5</td><td>9</td><td>20</td></tr>
<tr><td>Required</td><td>20</td><td>40</td><td>30</td><td>10</td><td>100 total</td></tr>
</table></td></tr>
</table>