Reg. No.: | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

PG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2024.

(For those admitted in June 2023 and later)

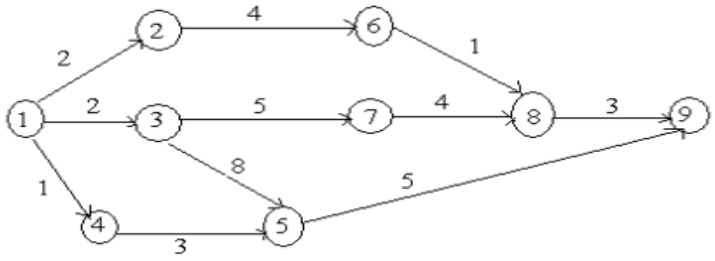
PROGRAMME AND BRANCH: M.COM.,

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
I	PART - III	CORE ELECTIVE - 1	P23CO1E1A	OPERATIONS RESEARCH

Date : 12.11.2024 /AN **Time : 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	If two constraints do not intersect in the positive quadrant of the graph, then. a) the problem is infeasible b) the solution is unbounded c) one of the constraints is redundant d) the problem has alternate solution
CO1	K2	2.	In an Linear programming problem, the restrictions or limitations under which the objective function is to be optimised are called _____. a) Constraints b) Objective function c) Decision variables d) None of the above
CO2	K1	3.	The main objective of transportation problem is to _____. a) maximize the cost b) minimize the cost c) minimize the time d) maximize the time
CO2	K2	4.	The cells which get allocation will be called _____. a) basic cells b) non-basic cells c) assigned cells d) unassigned cell
CO3	K1	5.	The time required for printing of four books A, B, C and D is 5, 8, 10 and 7 hours. While its data entry requires 7, 4, 3 and 6 hours respectively, the sequence time that minimizes total elapsed time is ____. a) ACBD b) ABCD, c) ADCB d) CBDA.
CO3	K2	6.	A two-person zero-sum game means that the _____. (a) the sum of losses to one player is equal to the sum of gains to other (b) the sum of losses to one player is not equal to the sum of gains to other (c) no any player gains or losses (d) none of these
CO4	K1	7.	The replacement policy that is imposed on an item irrespective of its failure is _____. a) Group replacement b) Individual replacement c) Repair spare replacement d) Successive replacement
CO4	K2	8.	Network models have advantage in terms of project. a) planning b) scheduling c) controlling d) all of these
CO5	K1	9.	Which of the following criterion is not used for decision-making under uncertainty? a) maximin b) maximax c) minimax d) minimize expected loss
CO5	K2	10.	Which of the following characteristics apply to the queuing system a) customer population b) arrival process c) both (a) & (b) d) neither (a) nor (b)

<table>
<tr><th>Course Outcome</th><th>Bloom's K-level</th><th>Q. No.</th><th><u>SECTION – B</u> (5 X 5 = 25 Marks)
Answer <u>ALL</u> Questions choosing either (a) or (b)</th></tr>
<tr><td>CO1</td><td>K2</td><td>11a.</td><td>Describe the techniques in operations research.
(OR)</td></tr>
<tr><td>CO1</td><td>K2</td><td>11b.</td><td>A company produces two types of TVs, one is black and white, while the other is colour. The company has the resources to make at most 200 sets a week. Creating black and white set costs Rs. 2700 and Rs. 3600 to create a coloured set. The business should spend no more than Rs. 648000 a week producing TV sets. If it benefits from Rs. 525 per set of black and white and Rs. 675 per set of colours, How many sets of black/white and coloured sets should it produce in order to get maximum profit? Formulate this using graphical method in LPP.</td></tr>
<tr><td>CO2</td><td>K2</td><td>12a.</td><td>Consider the following transportation problem.
<table>
<tr><th></th><th>D_1</th><th>D_2</th><th>D_3</th><th>D_4</th><th>Availability</th></tr>
<tr><td>O_1</td><td>5</td><td>8</td><td>3</td><td>6</td><td>30</td></tr>
<tr><td>O_2</td><td>4</td><td>5</td><td>7</td><td>4</td><td>50</td></tr>
<tr><td>O_3</td><td>6</td><td>2</td><td>4</td><td>6</td><td>20</td></tr>
<tr><td>Requirement</td><td>30</td><td>40</td><td>20</td><td>10</td><td></td></tr>
</table>
Determine initial basic feasible solution by VAM
(OR)</td></tr>
<tr><td>CO2</td><td>K2</td><td>12b.</td><td>Find Solution using Row minima method
<table>
<tr><td></td><td>D1</td><td>D2</td><td>D3</td><td>Supply</td></tr>
<tr><td>S1</td><td>4</td><td>8</td><td>8</td><td>76</td></tr>
<tr><td>S2</td><td>16</td><td>24</td><td>16</td><td>82</td></tr>
<tr><td>S3</td><td>8</td><td>16</td><td>24</td><td>77</td></tr>
<tr><td>Demand</td><td>72</td><td>102</td><td>41</td><td></td></tr>
</table></td></tr>
<tr><td>CO3</td><td>K3</td><td>13a.</td><td>A book binder has one printing press, one binding machine and manuscripts of 7 different books. The times required for performing printing and binding operations for different books are shown below.
<table>
<tr><td>Book</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Printing time (hours)</td><td>20</td><td>90</td><td>80</td><td>20</td><td>120</td><td>15</td><td>65</td></tr>
<tr><td>Binding time (hours)</td><td>25</td><td>60</td><td>75</td><td>30</td><td>90</td><td>35</td><td>50</td></tr>
</table>
Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all the books.
(OR)</td></tr>
<tr><td>CO3</td><td>K3</td><td>13b.</td><td>Find the solution of game using 2Xn Games method for the following pay-off matrix
<table>
<tr><td></td><td></td><td>Player B</td><td></td></tr>
<tr><td></td><td></td><td>B1</td><td>B2</td></tr>
<tr><td></td><td>A1</td><td>-3</td><td>4</td></tr>
<tr><td>Player A</td><td>A2</td><td>-1</td><td>1</td></tr>
<tr><td></td><td>A3</td><td>7</td><td>-2</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>CO4</td><td>K3</td><td>14a.</td><td>A firm is considering the replacement of a machine, whose cost price is Rs 12,200 and its scrap value is Rs 200. From experience the running (maintenance and operating) costs are found to be as follows:
<table>
<tr><td>Year</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>Running Cost</td><td>200</td><td>500</td><td>800</td><td>1,200</td><td>1,800</td><td>2,500</td><td>3,200</td><td>4,000</td></tr>
</table>
When should the machine be replaced?
(OR)</td></tr>
<tr><td>CO4</td><td>K3</td><td>14b.</td><td>Find the critical path and calculate the slack time for the following network
 
</td></tr>
<tr><td>CO5</td><td>K4</td><td>15a.</td><td>Classify the steps involved in decision tree analysis.
(OR)</td></tr>
<tr><td>CO5</td><td>K4</td><td>15b.</td><td>Simplify Queuing theory and also discuss its assumptions and limitations.</td></tr>
</table>

<table>
<tr><th>Course Outcome</th><th>Bloom's K-level</th><th>Q. No</th><th><u>SECTION – C</u> (5 X 8 = 40 Marks)
Answer <u>ALL</u> Questions choosing either (a) or (b)</th></tr>
<tr><td>CO1</td><td>K4</td><td>16a.</td><td>Examine the features of operations research.
(OR)</td></tr>
<tr><td>CO1</td><td>K4</td><td>16b.</td><td>Solve by using Big-M method the following linear programming problem.
Maximize Z= -2x-y
Subject to 3x+y=3
and x,y ≥ 0
4x+3y≥ 6 x+2y≤ 4</td></tr>
<tr><td>CO2</td><td>K5</td><td>17a.</td><td>Find Solution using Voggel's Approximation method, also find optimal solution using modi method,
<table>
<tr><td></td><td>D1</td><td>D2</td><td>D3</td><td>D4</td><td>Supply</td></tr>
<tr><td>S1</td><td>19</td><td>30</td><td>50</td><td>10</td><td>7</td></tr>
<tr><td>S2</td><td>70</td><td>30</td><td>40</td><td>60</td><td>9</td></tr>
<tr><td>S3</td><td>40</td><td>8</td><td>70</td><td>20</td><td>18</td></tr>
<tr><td>Demand</td><td>5</td><td>8</td><td>7</td><td>14</td><td></td></tr>
</table>
(OR)</td></tr>
<tr><td>CO2</td><td>K5</td><td>17b.</td><td>Find Solution of Assignment problem using Hungarian method
<table>
<tr><td>Work \ Job</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>A</td><td>10</td><td>5</td><td>13</td><td>15</td><td>16</td></tr>
<tr><td>B</td><td>3</td><td>9</td><td>18</td><td>13</td><td>6</td></tr>
<tr><td>C</td><td>10</td><td>7</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>D</td><td>7</td><td>11</td><td>9</td><td>7</td><td>12</td></tr>
<tr><td>E</td><td>7</td><td>9</td><td>10</td><td>4</td><td>12</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>CO3</td><td>K5</td><td>18a.</td><td>Find the sequence that minimizes the total time required in performing the following job on three machines in the order ABC. Processing times (in hours) are given in the following table.
<table>
<tr><td>Job</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>Machine A</td><td>8</td><td>10</td><td>6</td><td>7</td><td>11</td></tr>
<tr><td>Machine B</td><td>5</td><td>6</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Machine C</td><td>4</td><td>9</td><td>8</td><td>6</td><td>5</td></tr>
</table>
(OR)</td></tr>
<tr><td>CO3</td><td>K5</td><td>18b.</td><td>Find the solution of game using graphical method for the following pay-off matrix
<table>
<tr><td></td><td></td><td>Player B</td><td></td></tr>
<tr><td></td><td></td><td>B1</td><td>B2</td></tr>
<tr><td>Player A</td><td>A1</td><td>1</td><td>-3</td></tr>
<tr><td></td><td>A2</td><td>3</td><td>5</td></tr>
<tr><td></td><td>A3</td><td>-1</td><td>6</td></tr>
<tr><td></td><td>A4</td><td>4</td><td>1</td></tr>
<tr><td></td><td>A5</td><td>2</td><td>2</td></tr>
<tr><td></td><td>A6</td><td>-5</td><td>0</td></tr>
</table></td></tr>
<tr><td>CO4</td><td>K5</td><td>19a.</td><td>A computer contains 10,000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs 1 only. If all the resistors are replaced at the same time, the cost per resistor would be reduced to 35 paise. The percentage of surviving resistors say S(t) at the end of month t and the probability of failure P(t) during the month t are as follows:
<table>
<tr><td>t</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>P(t)</td><td>0</td><td>0.03</td><td>0.07</td><td>0.20</td><td>0.40</td><td>0.15</td><td>0.15</td></tr>
</table>
What is the optimal replacement plan?
(OR)</td></tr>
<tr><td>CO4</td><td>K5</td><td>19b.</td><td>A small maintenance project consists of the following jobs whose precedence relationship is given below.
<table>
<tr><th>Job</th><th>Duration(days)</th></tr>
<tr><td>1-2</td><td>15</td></tr>
<tr><td>1-3</td><td>15</td></tr>
<tr><td>2-3</td><td>3</td></tr>
<tr><td>2-5</td><td>5</td></tr>
<tr><td>3-4</td><td>8</td></tr>
<tr><td>3-6</td><td>12</td></tr>
<tr><td>4-5</td><td>1</td></tr>
<tr><td>4-6</td><td>14</td></tr>
<tr><td>5-6</td><td>3</td></tr>
<tr><td>6-7</td><td>14</td></tr>
</table>
a) Draw an arrow diagram representing the project.
b) Find the total float for each activity.
c) Find the critical path and the total project duration.</td></tr>
<tr><td>CO5</td><td>K6</td><td>20a.</td><td>A large steel manufacturing company has three options with regard to production: (i) produce commercially, (ii) build pilot plant, (iii) stop producing steel.
The management has estimated that their pilot plant, if built, has 80% chances of high yield and 20% chance of low yield. If pilot plant does show a high yield, management assigns a probability of 0.75 that the commercial plant will also have a high yield. If pilot plant shows a low yield, there is only a 0.1 chance that the commercial plant will show a high yield. Finally, management's best assessment of the yield on a commercial-size plant without building a pilot plant first has a 0.6 chance of high yield. A pilot plant will cost Rs 3,00,000/-. The profits earned under high and low yield conditions are Rs 1,20,00,000/- and-Rs 12,00,000/- respectively.
Find the optimum decision of the company.</td></tr>
<tr><td>CO5</td><td>K6</td><td>20b.</td><td>(OR)
Find the infinity Queuing Model, where Arrival Rate λ=6 per 1 hr, Service Rate μ=7 per 1 hr.</td></tr>
</table>