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| **C:\Users\ADMIN\Desktop\j.png** | **JAIPURIA INSTITUE OF MANAGEMENT, INDORE**  Post Graduate Diploma in Management (Batch 2023-25) |
| **Course Title: Operations Research, (Course Code: 40521)**  **End Term Examination, Term - III (April, 2024)** | |
| **Time Duration : 2 Hours Total Marks: 40** | |

*Use MS Excel Solver to answer all the questions. Students can use one book and personal Laptop in the examination hall for reference, but the answers should be attempted on Institute’s Lab desktop and submitted as an Excel file with file name as “student name and enrollment number”.*

**Q1.** “Madhuram Sugar Limited (MSL)” is a multistate sugar manufacturing organization which operates in UP, Maharashtra and Karnataka. The company has three sugar producing facilities at Bijnor (UP), Satara (Maharashtra) and Hubballi (Karnataka). These factories have a production capacity of 500, 400, 600 Million Tons per year. These factories supply sugar products to five major regional markets at Delhi, Kolkata, Chennai, Mumbai and Nagpur. Sugar products from these regional markets are then shipped to the distributors in individual cities of the region. The sugar demand of these regions is 250, 350, 180, 250 and 170 Million tons per year respectively. The excess sugar produced is then exported to Africa via Mumbai port. The transportation costs (Rs. Per Ton) are given in table 1.

**Table 1: Transportation costs**

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| --- | --- | --- | --- |
|  | **Bijnor** | **Satara** | **Hubballi** |
| **Delhi** | 660 | 5616 | 6715 |
| **Kolkata** | 5335 | 6840 | 7180 |
| **Chennai** | 8338 | 3820 | 2758 |
| **Mumbai** | 5746 | 910 | 2502 |
| **Nagpur** | 4277 | 2815 | 3582 |

Analyze situation and develop a distribution plan for Madhuram Sugar Limited. **(8 marks)**

**Q2.** Karnataka Auto Components Limited (KACL) manufactures fuel injection pumps for Diesel cars and trucks. Three models of pump are very common; Direct Injection (GDI), Semi Direct Injection (SDI) and Throttle Body Injection (TBI). These three pumps require machining, honing and assembly operations.

Each GDI pump requires 15 minutes of machining, 20 minutes of honing and 10 minutes of assembly and contributes Rs. 10600 to profit. Each SDI pump requires 18 minutes of machining, 22 minutes of honing and 10 minutes of assembly and contributes Rs. 8500 to profit. Each TBI pump requires 17 minutes of machining, 19 minutes of honing and 13 minutes of assembly and contributes Rs. 7000 to profit.

Company has 700 hours per week for machining, 1200 hours per week for honing and 1650 hours per week for assembly. The company has entered in a supply agreement for minimum 300 units of TBI per week and minimum 200 SDI to a major automobile company. In case of default in supply of minimum quantitate of TBI and SDI per week, a penalty of Rs. one million per week is required to be paid to this customer. There is sufficient demand of all the three products in the market. Analyze situation and suggest best operational plan to Karnataka Auto Components Limited. **(8 marks)**

**Q3.** Mr. Piyush Desai, Managing Director of Gujarat Tea Processors & Packers Ltd. (Wagh-Bakri Tea) is sitting in his corner office puzzled with the information tabled by “Markets 4 U” a market research organization. This market research organization was appointed by him to carryout market research for tea consumption habits of the residents of Gujarat state. The organization studied the brand switching behavior of consumers in the state (in January-February 2024) and collected the following data: -

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| **Previous Purchase (2023)** | **Current Purchase (2024)** | **Number of customers** |
| Wagh Bakri Tea | Wagh Bakri Tea | 270 |
| Brook Bond Red Label | Brook Bond Red Label | 250 |
| Tata Tea | Tata Tea | 190 |
| Wagh Bakri Tea | Brook Bond Red Label | 90 |
| Brook Bond Red Label | Wagh Bakri Tea | 30 |
| Tata Tea | Wagh Bakri Tea | 20 |
| Wagh Bakri Tea | Tata Tea | 40 |
| Brook Bond Red Label | Tata Tea | 80 |
| Tata Tea | Brook Bond Red Label | 30 |

If same buying behavior continues in the future, is this a cause of concern for Mr. Piyush Desai in the near future (next four years) and in the long run? Analyze.  **(8 marks)**

**Q4.** A city in central India has two major Hindi news papers namely, Dainik Bhaskar (DB) and Dainik Jagran (DJ). Both these newspapers are fiercely competing against each other to gain maximum market share in the city. The current market share of DB and DJ is 60 and 40 percent respectively Mr. Shudhanshu Kumar, the brand manager of DB has been working on a combination of promotion mix strategies which will help him to increase in the market share. He shortlisted three options; advertising, channel promotion and event sponsorship.

If both newspapers go for advertising DB will gain 7 % market share. If DB goes for advertising and DJ goes for channel promotion, then DB shall lose 2 % market share. If DB goes for advertising and DJ goes for event sponsorship, then DB shall gain 5 % market share.

If both newspapers go for channel promotion, DB will gain 6 % market share. If DB goes for channel promotion and DJ goes for advertising, then DB shall lose 4 % market share. If DB goes for channel promotion and DJ goes for event sponsorship, then DB shall gain 4 % market share.

If both newspapers go for event sponsorship, DB will gain 7 % market share. If DB goes for event sponsorship and DJ goes for advertising, then DB shall lose 7 % market share. If DB goes for event sponsorship and DJ goes for channel promotion, then DB shall gain 4 % market share.

Develop an appropriate action plan for “Dainik Bhaskar”. What shall be the individual strategies and value of this/these option in term of market share?  **(8 marks)**

**Q5.** South India Logistics Limited (SILL) is planning a Full truck consignment from Mumbai to Chennai. The company has explored following network of roads passing through intermediate cities. A recent information indicated that road from Pune to Solapur is under construction and time taken is very high, i.e. 12 hours instead of normal 5 hours. The diesel consumption is 8 liters per hour and average speed of truck on a good road is 40 kilometers per hour. The cost of diesel is Rs. 105/- per liter.

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| **From** | **To** | **Distance** |
| Mumbai | Pune | 153 |
| Pune | Solapur | 253 |
| Solapur | Kalaburgi | 125 |
| Kalaburgi | Raichur | 155 |
| Raichur | Kurnool | 110 |
| Kurnool | Kadappa | 205 |
| Kadappa | Tirupati | 140 |
| Tirupati | Chennai | 133 |
| Pune | Kolhapur | 234 |
| Kolhapur | Belgavi | 114 |
| Belgavi | Hubballi | 100 |
| Hubballi | Hospet | 154 |
| Hospet | Ballari | 63 |
| Ballari | Anantpur | 102 |
| Anantpur | Vellore | 299 |
| Vellore | Chennai | 157 |
| Anantpur | Kadappa | 167 |
| Mumbai | Goa | 587 |
| Goa | Hubballi | 151 |
| Hubballi | Bengaluru | 413 |
| Bengaluru | Vellore | 212 |

Explore the optimum route for South India Logistics Limited.  **(8 marks)**