**JAIPURIA INSTITUTE OF MANAGEMENT, INDORE**

**PGDM**

**THIRD TRIMESTER (Batch 2021-23)**

**END TERM EXAMINATION, MAY-2022**

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| --- | --- | --- | --- |
| Course Name | **Operations Research** | Course Code | **40521** |
| Max. Time | **2 hours** | Max. Marks | **40** |

**INSTRUCTIONS:**

* *All questions are compulsory. Students can use MS Excel Solver.*
* *Please save MS Excel sheets as “Your Name” for submission & evaluation.*
* Any pictures and hand written solutions may be sent as photos along with answer sheet

**Q.1** Khurana family was stuck at home due to COVID-19. Their domestic helpers stopped coming to the home due to pandemic. So, all the three family members Mr. Karan Khurana, Mrs. Navjoot Khurana and their daughter Ms. Simran Khurana had to do all the domestic work. Each member of the family is required to carry out Two tasks. The time taken (in minutes) by each in doing these activities is tabulated below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Online Marketing** | **Cooking** | **Dish Washing** | **Cloths Laundry** | **Sweeping & Dusting** | **Cloths Ironing** |
| Mr. Karan | 15 | 40 | 35 | 25 | 50 | 25 |
| Mrs. Navjoot | 20 | 25 | 30 | 35 | 35 | 25 |
| Ms. Simran | 8 | 35 | 40 | 40 | 55 | 30 |

Apply relevant concepts to the business situation and provide management recommendations to Khurana family. *CLO 2* **(08 Marks)**

**Q2.** Raichur city in Karnataka is facing acute water shortage problem. The mayor wanted to explore all possible options for water supply in the future. Three potential water sources were identified; river Krishna in the north, river Tungabhadra in the south and Lake Merched Kere in the north west side of the city. Each water source has a limited water supply capacity. The project requires multiple pumping stations (P1, P2 …. etc.) in all three directions to bring water. Following table provides the necessary details about flow of water in Million gallons.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **From** | **To** | **Water Flow (Million gallons)** |  | **From** | **To** | **Water Flow (Million gallons)** |
| Krishna | Pumping Station (P1) | 250 |  | Pumping Station (P2) | Pumping Station (P4) | 250 |
| Krishna | Pumping Station (P2) | 100 |  | Pumping Station (P2) | Pumping Station (P5) | 350 |
| Lake Merched Kere | Pumping Station (P1) | 80 |  | Pumping Station (P3) | Pumping Station (P5) | 400 |
| Lake Merched Kere | Pumping Station (P2) | 50 |  | Pumping Station (P4) | Raichur | 400 |
| Tungabhadra | Pumping Station (P3) | 180 |  | Pumping Station (P5) | Raichur | 300 |
| Pumping Station (P1) | Pumping Station (P4) | 300 |  |  |  |  |

Apply relevant concepts to the business situation and provide the Mayor of Raichur about maximum quantity of water which can be provided to Raichur city. *CLO 2* **(08 Marks)**

**Q.3** “Ramakrishna Edible Oils Ltd.” manufactures three type of edible oils namely Sunflower oil, Soybeans oil and Groundnut oil. The crushing processes takes different time for each oil as the seeds have different hardness. The filtering time is same for all three type of oils. However, the packing time differs because the bottles for each type of oil are different. The Crushing, Filtering and Packing time for each MT Sunflower oil are 3.5, 1.0 and 1.25 hours. For each MT of Soybean oil, the timings area 4.5, 1.0 and 1.5 hours. Each MT of Groundnut oil takes 4.0, 1.0 and 1.75 hours.

The company has nine crushing machines, three filtering machines and three packaging machines. All these machines operate 8 hours a day only. Each MT of Sunflower oil generates a net profit of Rs. 35,000, each MT of Soybean oil generates profit of Rs. 46,000 whereas each MT of Groundnut oil generates Rs. 45,000 profit. The company has promised to the distributor of a minimum supply of 5 MT of Sunflower oil and 4 MT of Groundnut oil per day. There is No maximum demand constraint for any of the edible oils.

Analyze the situation and provide meaningful recommendations to the management of Ramakrishna Edible Oils Ltd. *CLO 3*  **(08 Marks)**

**Q.4** “Dainik Surya” and “Shankhnaad” are the only two arch rival newspapers in the central territory state. The marketing director of Dainik Surya was worried about the market share and wanted to formulate his newspaper’s strategy in this competitive environment. He asked his MIS team to gather data for projecting next year market share. Accordingly, the MIS team gathered the following information and presented it to the marketing director of Dainik Surya: -

* Advertising, Sale Promotion and Event sponsorship by both the firms will result in equal market share.
* Dainik Surya with Advertising and Shankhnaad with Sale Promotion will result in 57 % market share for Dainik Surya. At the same time, Dainik Surya with Advertising and Shankhnaad with Event Sponsorship will result in 62 % market share for Dainik Surya.
* Dainik Surya with Sale Promotion and Shankhnaad with advertising will result in 69 % market share for Dainik Surya. Dainik Surya with Sale Promotion and Shankhnaad with Event Sponsorship will result in 52 % market share for Dainik Surya.
* Dainik Surya with Event Sponsorship and Shankhnaad with advertising will result in 78 % market share for Dainik Surya. Dainik Surya with Event Sponsorship and Shankhnaad with Sale Promotion will result in 55 % market share for Dainik Surya.

Analyze the situation and suggest best course of action for Dainik Surya. *CLO 3* **(08 Marks)**

**Q5.** Mr. Rajendra Joshi is an investment consultant with “Malwa Investment Consulting Company Limited”. He is currently exploring options for portfolio management and investment of one of his client Mrs. Shushila Jain for a short time period of One year. Mr. Rajendra Joshi has shortlisted four options, Shares, Government flexible Bonds, Real Estate and Bank Fixed Deposits.

* In case of real estate, In case of shares, there are30 % chances of decline by 15 %, 30 % chances of remaining stable and 40 % chances of a growth of 12 %.
* In case of Government Flexible Bonds, the chances of increase by 6 % are 45 % and chances of increase by 13 % are 55 %.
* there are 25 % chances of growth by 30 %, 30 % chances of growth by 20 % 15 % chances of growth by 5 % and 30 % Chances of a loss by 18 %.
* The Bank Fixed deposits shall be initially be made for six months and shall be renewed after six months. There are 50 % chances of an annual growth of 6 % and 50 % chances of annual growth of 5.5 %.

Analyze the situation and suggest best course of action for Mr. Rajendra Joshi. *CLO 3* **(08 Marks)**