**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** Rajashwar Gowda, the owner of “Gowda Automat” is in a dilemma. His company manufactures three type of auto components from steel bars A, B and C. Each component A requires 30 minutes of Lathe machining, 15 minutes of Polishing and 10 minutes of Buffing. Each unit of B requires 40 minutes of Lathe machining, 25 minutes of Polishing and 15 minutes of Buffing. Each unit of C requires 45 minutes of Lathe machining, 30 minutes of Polishing and 20 minutes of Buffing. Every day, 7.5 hours are available for each of these activity i.e. Lathe machining, Polishing and Buffing. The company has 8 lathe machines, 5 Polishing machines and 4 buffing machines.

Each component A generates a net profit of Rs 150, each unit of B generates a profit of Rs 250 and each unit of C generates profit of Rs. 500. “Gowda Automat” has contracted with Bosch to supply minimum 15 units of each component per day. Apply relevant concepts to the business situation and provide management recommendations for business improvement to Gowda Automat. **(09 Marks)**

**Q.2** Supreme Foodsmanufactures and distributes Tomato Ketchup. The company has three manufacturing facilities at Monga -Punjab, Talegaon – Maharashtra and Hosur – Karnataka with a production capacity of 1500 MT, 2500 MT and 3000 MT respectively. The company supplies bulk tomato ketchup to five bottlers who are located at Mumbai, Kolkata, NCR, Chennai and Nagpur. The demand for these bottlers is 2000 MT, 1200 MT, 1800 MT, 2300 MT and 1700 MT respectively. The bottlers were very happy with Supremes’ Tomato Ketchup pulp but were complaining of shortage in supplies. As the demand was more than supply, Supreme planned to establish a new factory either at Raipur (Chhattisgarh) or Bhubaneshwar (Odisha) for the balance demand of 2000 MT . The per MT transportation costs are given below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | Mumbai | Kolkata | NCR | Chennai | Nagpur |
| Monga | 6000 | 6400 | 1600 | 8000 | 5600 |
| Talegaon | 400 | 6400 | 4800 | 4000 | 2000 |
| Hosur | 4000 | 6000 | 7200 | 1200 | 3600 |
| Raipur | 4000 | 2800 | 4400 | 4400 | 1200 |
| Bhubneshwar | 5600 | 1600 | 5200 | 4800 | 2800 |

Apply relevant concepts to the business situation and provide management recommendations for business improvement to Supreme Foods. **(09 Marks)**

**Q.3** Tide, Surf and Nirma are three competing brands in Indore in economy category washing powder market. Currently, all three brands have equal market share. Mr. Kaushik Gupta, the brand manager of Tide wanted to analyze future market situation. So, he carried out a survey of 450 respondents (150 loyal respondents for each brand).

The result of survey indicate that out of 150 customers of Tide, 120 will continue with the same brand in the next year also, 20 will shift to surf and 10 will shift to Nirma. The response of 150 customers of Surf indicated that 105 will continue with the brand, 25 will shift to Tide and 20 will shift to Nirma. The 150 customers of Nirma brand indicated that 90 will continue with the brand, 30 each will shift to Surf and Tide.

Mr. Kaushik was skeptical about market share in 2023 and in the long run. Analyze the business situation and generate meaningful insights for the management.  **(09 Marks)**

**Q4.**  **Case Study**

In 1979, John Smith founded Smith Electronics in Long Beach, California, to manufacture resistors, capacitors, inductors, and other electronic components. During the Vietnam War, John was a radio operator, and it was during this time that he became proficient at repairing radios and other communications equipment. John viewed his four-year experience with the army with mixed feelings. He hated army life, but that experience gave him the confidence and the initiative to start his own electronics firm. Over the years, John kept the business relatively unchanged. By 1984, total annual sales were in excess of $2 million.

In 1988, John’s son, Ronald, joined the company after finishing high school and two years of courses in electronics at Long Beach Community College. Ronald had always been aggressive in high school athletics, and he became even more aggressive as general sales manager of Smith Electronics. This aggressiveness bothered John, who was more conservative. Ronald would make deals to supply companies with electronic components before he bothered to find out if Smith Electronics had the ability or capacity to produce the components. On several occasions, this behavior caused the company some embarrassing moments when Smith Electronics was unable to produce the electronic components for companies with which Ronald had made deals.

In 1989, Ronald started to go after government contracts for electronic components. By 1994, total annual sales had increased to more than $10 million, and the number of employees exceeded 200. Many of these employees were electronics specialists and graduates of electrical engineering programs from top colleges and universities. But Ronald’s tendency to stretch Smith Electronics to contracts continued as well, and by 2001, Smith Electronics had a reputation with government agencies as a company that could not deliver what it promised. Almost overnight, government contracts stopped, and Smith Electronics was left with an idle workforce and unused manufacturing equipment. This high overhead started to melt away profits, and in 2003, Smith Electronics was faced with the possibility of sustaining a loss for the first time in its history.

In 2005, John decided to look at the possibility of manufacturing electronic components for home use. Although this was a totally new market for Smith Electronics, John was convinced that this was the only way to keep Smith Electronics from dipping into the red. The research team at Smith Electronics was given the task of developing new electronic devices for home use. The first idea from the research team was the Master Control Centre. The heart of the system is the master control box. This unit, which would have a retail price of $250, has two rows of five buttons. Each button controls one light or appliance and can be set as either a switch or a rheostat. When set as a switch, a light finger touch on the bottom either turns a light or appliance on or off. When set as a rheostat, a finger touching the bottom controls the intensity of the light. Leaving your finger on the button makes the light go through a complete cycle, ranging from off to bright and back to off again.

To allow for maximum flexibility, each master control box is powered by two D-sized batteries that can last up to a year, depending on usage. In addition, the research team has developed three versions of the master control box—versions A, B, and C. If a family wants to control more than 10 lights or appliances, another master control box can be purchased. The lightbulb disk, which would have a retail price of $2.50, is controlled by the master control box and is used to control the intensity of any light. A different disk is available for each button position for all three master control boxes. By inserting the lightbulb disk between the lightbulb and the socket, the appropriate button on the master control box can completely control the intensity of the light. If a standard light switch is used, it must be on at all times for the master control box to work.

One disadvantage of using a standard light switch is that only the master control box can be used to control the particular light. To avoid this problem, the research team developed a special light switch adapter that would sell for $15. When this device is installed either the master control box or the light switch adapter can be used to control the light. When used to control appliances other than lights, the master control box must be used in conjunction with one or more outlet adapters. The adapters are plugged in to a standard wall outlet, and the appliance is then plugged in to the adapter. Each outlet adapter has a switch on top that allows the appliance to be controlled from the master control box or the outlet adapter. The price of each outlet adapter would be $25.

The research team estimated that it would cost $500,000 to develop the equipment and procedures needed to manufacture the master control box and accessories. If successful, this venture could increase sales by approximately $2 million. But would the master control boxes be a successful venture? With a 60% chance of success estimated by the research team, John has serious doubts about trying to market the master control boxes even though he liked the basic idea. Because of his reservations, John decided to send requests for proposals (RFPs) for additional marketing research to 30 marketing research companies in southern California.

The first RFP to come back was from a small company called Marketing Associates, Inc. (MAI), which would charge $100,000 for the survey. According to its proposal, MAI has been in business for about three years and has conducted about 100 marketing research projects. MAI’s major strengths appeared to be individual attention to each account, experienced staff, and fast work. John was particularly interested in one part of the proposal, which revealed MAI’s success record with previous accounts.

The only other proposal to be returned was by a branch office of Iverstine and Kinard, one of the largest marketing research firms in the country. The cost for a complete survey would be $300,000. Although the proposal did not contain the same success record as MAI, the proposal from Iverstine and Kinard did contain some interesting information. The chance of getting a favorable survey result, given a successful venture, was 90%. On the other hand, the chance of getting an unfavorable survey result, given an unsuccessful venture, was 80%. Thus, it appeared to John that Iverstine and Kinard would be able to predict the success or failure of the master control boxes with a great amount of certainty. John pondered

the situation. Unfortunately, the two marketing research teams gave different types of information in their proposals.

John concluded that there would be no way that the two proposals could be compared unless he got additional information from Iverstine and Kinard. Furthermore, John wasn’t sure what he would do with the information and whether it would be worth the expense of hiring one of the marketing research firms.

*Success Figures for MAI*

**SURVEY RESULTS**

**OUTCOME**  **FAVORABLE UNFAVORABLE TOTAL**

Successful venture 35 20 55

Unsuccessful venture 15 30 45

Analyze the business situation and generate meaningful insights for the management. **(13 Marks)**