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| **C:\Users\ADMIN\Desktop\j.png** | **JAIPURIA INSTITUE OF MANAGEMENT, INDORE**  Post Graduate Diploma in Management (Batch 2022-24) |
| **Course Title: Operations Research, (Course Code: 40521)**  **End Term Examination, Term - III (May, 2023)** | |
| **Time Duration : 2 Hours Total Marks: 40** | |

***General Instructions*:**

*Use MS Excel Solver to answer Question Nos.1,2,4 & 5. Q3. To be solved in Pen-Paper mode.*

Q1. Bhavnagar Municipal Corporation (BMC) is planning to meet water requirement in the city for year 2024. It has identified three water sources namely; Kalubhar Dam in the west, Ranghola reservoir in the west and Shetrunjay reservoir in the south-west direction of the city. A series of intermediate pumping stations are available with the distances and capacity given in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| From | To | Distance (KM) | Capacity  (Million Liters per day) |
| Kalubhar Dam | Umrala | 18 | 35 |
| Ranghola reservoir | Sanosara | 11.5 | 40 |
| Shetrunjay reservoir | Palitana | 9.5 | 150 |
| Umrala | Sihor | 23.5 | 30 |
| Sanosara | Sihor | 21.5 | 33 |
| Palitana | Sihor | 24 | 50 |
| Palitana | Budhel | 38.5 | 110 |
| Sihor | Bhavnagar | 20 | 120 |
| Budhel | Bhavnagar | 7.5 | 80 |

The daily requirement of water is 150 liters per person per day. The estimated population of Bhavnagar city is 820,000 residents.

Analyze the situation and plan water supply for Bhavnagar municipal corporation. Will these three reservoirs and pumping stations adequate to meet daily requirements? If not, suggest capacity enhancement options. **CLO 3 (8 marks)**

Q2. Branded milk market in Indore city was mainly dominated by state owned brand “Sanchi” for many decades. However, recent entry of “Amul” in Indore market raised ripples as many customers started using “Amul brand”. The market share of other brands of milk in Indore is negligible. Ms. Madhulika Patil, a PGDM graduate form a premium business school recently joined as brand manager of “Amul” in Indore. Her immediate task is to decide a promotion strategy in Indore for the year 2024. She was expected to propose new promotion strategy by June, 2023, so that appointment of a promotion agency, development of creative, finalization of media and promotion plan can be done by December, 2023 and execution can be done from 01 January, 2024. As on today (2023) the market share of these two brands of milk in Indore is Amul 30 % Sanchi 70 %. Till now, both brands were using a single promotion strategy only in a year. Ms. Madhulika collected data for last Nine years which is tabulated below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Promotion Strategy by Amul | Advt. | SP | LES | Advt. | SP | LES | Advt. | SP | LES |
| Promotion Strategy by Sanchi | Advt. | Advt. | Advt. | SP | SP | SP | LES | LES | LES |
| Market share of Amul (%) | 39 | 33 | 35 | 40 | 36 | 32 | 34 | 37 | 38 |

*Note: - Advt. = Advertising, SP = Sale Promotion, LES = Local Event Sponsorship*

Analyze situation and suggest a suitable promotion plan to Ms. Madhulika Patil.

**CLO 3 (8 marks)**

Q3. “Josh Professional University (JPU)” organizes a unique event Clash of Corporates (COC) every year. In this event, a number of sport tournaments are arranged, “Informal Cricket” being one major sports activity in this mega event. The university alumni team always participates in “Informal Cricket” event and the past record indicates that the chances of winning of alumni team are 70 percent.

The university is planning to launch a promotion drive for its alumni to sponsor this COC event. If alumni team wins this informal Cricket event, then a contribution of 4 Million rupees from alumni is expected for renewal of cricket field. If the alumni team loses, then the contribution may reduce to 1.0 Million rupees.

Josh Professional University (JPU)” approached a famous cricket player Mr. Naveen Hirani. He charges Rs. 500,000 for making predictions for the event. In a similar situation in the past, Mr. Hirani’s prediction have been 80 percent correct.

1. If Hirani predicts a win next year, what is posterior probability that the team actually will have a winning season? What is the posterior probability of a losing season for team?
2. If Hirani predicts a loosing for team the next year, what is posterior probability that the team actually will have a winning season? What is the posterior probability of team will lose next year?

Analyze the situation and suggest best course of action for year 2024. **CLO 3 (8 marks)**

Q4. Papa – G and Bharatinia are two famous glucose biscuit brands in Central India. Recently a multinational company Indian Food Company (IFC) also entered in Glucose biscuit market. So competition is fierce in this product category. Ms. Manish recently joined Papa-G as territory manager in central India. His immediate task is to predict future market share for his brand in central India in year 2024, and to predict in the long run. So, he carried out a survey about Glucose biscuit consumption (with a cup of tea) on many road side tea vendor stalls. His survey results for different respondents (Resp. No.) are tabulated below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Resp. No.** | **Current Brand** | **Brand Preference in 2024** |  | **Resp. No.** | **Current Brand** | **Brand Preference in 2024** |
| 1 | Papa-G | Bharatinia |  | 26 | Papa-G | Papa-G |
| 2 | IFC | Papa-G |  | 27 | Papa-G | Papa-G |
| 3 | Bharatinia | Bharatinia |  | 28 | Bharatinia | Papa-G |
| 4 | IFC | Papa-G |  | 29 | Papa-G | IFC |
| 5 | Papa-G | Papa-G |  | 30 | Bharatinia | IFC |
| 6 | Papa-G | IFC |  | 31 | IFC | Papa-G |
| 7 | Papa-G | Papa-G |  | 32 | Papa-G | Papa-G |
| 8 | Papa-G | Papa-G |  | 33 | Bharatinia | Papa-G |
| 9 | Papa-G | IFC |  | 34 | IFC | IFC |
| 10 | Papa-G | Papa-G |  | 35 | Papa-G | Papa-G |
| 11 | Bharatinia | Bharatinia |  | 36 | Bharatinia | Bharatinia |
| 12 | IFC | Papa-G |  | 37 | Papa-G | Papa-G |
| 13 | Bharatinia | Bharatinia |  | 38 | IFC | Papa-G |
| 14 | IFC | IFC |  | 39 | Bharatinia | Bharatinia |
| 15 | Papa-G | IFC |  | 40 | IFC | Papa-G |
| 16 | Papa-G | Papa-G |  | 41 | Papa-G | Bharatinia |
| 17 | Bharatinia | Bharatinia |  | 42 | IFC | IFC |
| 18 | IFC | Papa-G |  | 43 | Bharatinia | Papa-G |
| 19 | Papa-G | IFC |  | 44 | IFC | Bharatinia |
| 20 | IFC | IFC |  | 45 | Bharatinia | IFC |
| 21 | Bharatinia | Papa-G |  | 46 | Papa-G | Papa-G |
| 22 | Papa-G | IFC |  | 47 | Bharatinia | Bharatinia |
| 23 | Papa-G | Papa-G |  | 48 | IFC | IFC |
| 24 | Papa-G | Papa-G |  | 49 | Papa-G | Papa-G |
| 25 | IFC | IFC |  | 50 | Papa-G | Papa-G |

Analyze the situation and suggest further course of action to Mr. Manish. **CLO 3 (8 marks)**

Q5 Rajkot Auto Components Limited manufactures a series of automobile components. The three most common products are Break Assembly, Clutch Assembly and Gear Box assembly. These three assembly products require machining, fabrication and assembly operations.

Each Break assembly requires 2 hours of machining, 3 hours of fabrication and 3 hours of assembly and contributes Rs. 3500 to profit. Each clutch assembly requires 2 hours of machining, 5 hours of fabrication and 1.5 hours of assembly, and contributes Rs. 6000 to profit. Each Gear box requires 5 hours of machining, 6.5 hours of fabrication and 4.5 hours of assembly and contributes Rs. 8500 to profit.

Company has 800 hours per week for machining, 1100 hours per week for fabrication and 1450 hours per week for assembly. The company has entered in a supply agreement for minimum 30 units of break assembly per week to a major automobile company.

Analyze situation and suggest best production plan to Rajkot Auto Components Limited.

**CLO 3 (8 marks)**