**Operations Research**

**June 2023 Examination**

**1) A company manufactures two products (A and Band the profit per unit sold is Rs 3 and Rs 5 respectively. Each product must be assembled on a particular machine, each unit of product a takes 12 minutes of assembly time and each unit of product B takes 25 minutes of assembly time. The company estimates that the machine used for assembly has an effective working week of only 30 hours (due to maintenance/breakdown). Technological constraints mean that for every 5 units of product A produced at least 2 units of product B must be produced. Formulate the problem of how much of each product to produce as a linear program and find the points of intersection for maximization. The company has been offered the chance to hire an extra machine, thereby doubling the effective assembly time available. What is the maximum amount you would be prepared to pay (per week) for the hire of this machine and why**? **(10 marks)**

**ANS:**

**Introduction**

The news of the opportunity to rent an additional device sent ripples of pleasure through the company. This became a sport-changer, a chance to double their assembly time and ramp up their production to new heights. The possibility of assembly their customers’ demands faster and extra efficiently than ever earlier than become now inside their grasp. Having an extra machine relieved the workforce, working tirelessly to fulfill deadlines. The long hours and aggravating schedules could soon be a thing of the past. The added capacity would imply they could eventually take a breather and get extra work completed. The company's CEO

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**2) A firm produces three products A, B, and C each of which passes through three different departments fabrication, finishing, and packaging. Each unit of product A requires 3, 4 and 2 hours, B requires 5, 4 and 4 hours and C requires 2, 4 and 5 hours in 3 departments respectively. The maximum capacity available is 60 hours in fabrication department, 72 hours in finishing and 100 hours in packaging department. If unit contribution is Rs. 5 for A, Rs. 10 for B and Rs. 3 for C. Then determine number of units of each product so that total contribution to cost is maximized and also determine if any capacity would remain unutilized using simple method. (10 marks)**

**ANS:**

**Introduction**

A simple method is an effective device for optimization. It is an iterative process that seeks to maximize or decrease an objective function subject to linear constraints. The set of rules is based on the concept of a viable region, the set of all points that satisfy the given conditions. The most appropriate answer is the factor in the possible region that maximizes or minimizes the objective function. But, despite its electricity, there can be instances where a few capacities might need to be utilized even after using the simplex approach to optimize the

**3) a) An investor is considering investing in two securities 'A' and 'B'. The risk and return associated with these securities are different. Security 'A' gives a return of 9% and has a risk factor of 5 on a scale of zero to 10. Security 'B' gives a return of 15% but has a risk factor of 8 on a scale of zero to 10. The total amount to be invested is Rs. 500000/- Total minimum returns on the investment should be 12%. The maximum combined risk should not be more than 6. Formulate as Linear Programming Problem (LPP).** **(5 marks)**

**ANS:**

**Introduction**

One of the foremost benefits of an LLP for safety investment is the constrained liability safety it affords to its companions, which means that every partner's personal belongings are protected from the partnership's liabilities, including any felony or financial penalties that may get up. In addition to liability protection, LLPs offer tax blessings and versatility in

**3) b) There is a small company in the town of Mysore which has recently become engaged in the production of office furniture. The company manufactures tables, desks, and chairs. The production of a table requires 8 kgs of wood and 5 kgs of metal and is sold for Rs 8000; a desk uses 6 kgs of wood and 4 kgs of metal and is sold for Rs 6000; and a chair requires 4 kgs of both metal and wood and is sold for Rs 5000. We would like to determine the revenue-maximizing strategy for this company, given that their resources are limited to 100 kgs of wood and 60 kgs of metal. How will a much bigger company (like IKEA) determine the appropriate amount of money that should be offered for a unit of each type of resource, such that the offer will be acceptable to the smaller company while minimizing the expenditures of the larger company?**

**ANS:**

**Introduction**

When a larger organization like IKEA needs to determine the precise amount of money to provide for a unit of each helpful resource type, it typically takes a strategic approach. The employer will assess the fee and shortage of the resource, in addition to the competitive