**Operations Research**

**December 2021 Examination**

**Question 1. A company manufactures two products (A and B) and 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 taking 12 minutes of assembly time and each unit of product B 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 five units of product A produced at least two 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)**

##

## Introduction

An organization produces products such as product A and B. The earnings won by selling merchandise A and B in keeping with the unit are Rs 3 and Rs 5, respectively. There may be a gadget that assembles the parts of the goods. For the meeting of a single team of Product A, it takes 12 minutes. And for product B, it takes 25 minutes. Consistent with the estimation, the machine works for 30 hours every week successfully (considering the maintenance and breakdown). Some technical regulations call for the time taken to produce five devices of Its Half solved only

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# Question 2. A firm produces three products A, B, and C each of which passes through three different departments fabrication, finishing, packaging. Each unit of product A requires 3, 4 and 2 hours respectively, B requires 5, 4 and 4 hours respectively and C requires 2, 4 and 5 hours respectively in 3 departments respectively. Every day 60 hours are available in fabrication department, 72 hours in finishing and 100 hours in packaging department. If unit contribution of unit A is Rs. 5, 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 simplex method. (10 Marks)

##

## Introduction

There are three products an employer manufactures; products A, B, and C. In order to manufacture the A, B, and C products, they go through unique processes. There are three steps of fabrication, finishing, and packaging. Product A takes three hours, 4 hours, and a pair of hours for fabrication, finishing, and packaging. Further, Product B takes 5 hours, 4 hours, and 4 hours for the three production steps. And Product C takes 2 hours for fabrication, 4 hours for finishing,

# Question 3a. An investor is considering investing in two securities 'A' and 'B'. The risk and return associated with these securities is 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 return of 15% but has risk factor of 8. Total amount to be invested is Rs. 500000/- Total minimum returns on the investment should be 12%. Maximum combined risk should not be more than 6. Formulate as LPP. (5 Marks)

# Ans 3A.

## Introduction

There has been a decision made to invest a certain amount of money into various securities, 'A' and 'B'. With respect to risk and interest, the securities' risk component and interest rate are both consistent with cents. The investor's notion of investing a sum of Rs. 5, 00,000/- inside the

**Question 3b. There is a small company in 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 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. (5 Marks)**

# Ans 3B.

## Introduction

Small businesses sell office furniture. One of these companies is quite successful. Furniture like tables, chairs, and desks are one of the things that they promote to their customers. There are specific portions of wooden and metal objects that are used to lead them to their destination. It is important to note that the tables, chairs and desks are not included in the fee. Rates will vary