**Time allowed: 3hrs**

**Question 1**

A company makes microprocessor, a product for which the demand is extremely seasonal. Our analyst has just obtained demand estimates for all months of the next calendar year: y1; y2; : : : ; d12. As feared, they are very uneven, ranging from 440 to 920. Here's a quick snapshot of the company. We currently have 30 employees each of whom make 20 carpets per month and get a monthly salary of 2000naira. We have no initial surplus of carpets.

How can we handle the fluctuations in demand? There are three ways:

1. Overtime, but this is expensive since overtime pay is 80% more than regular pay. Also, workers can put in at most 30% overtime.

2. Hiring *and* firing, but these cost 320 and 400 naira respectively, per worker.

3. Storing surplus production, but this costs 8 naira per carpet per month. We currently have no stored carpets on hand, and we must end the year without any carpets stored.

Formulate a linear program for the above.

**Question 2**

Keyboard is produced in Kansas and Mexico and consumed in New York and California. Kansas produces 15 cartoons of keyboards and Mexico 8. Meanwhile, New York consumes 10 bags and California 13. The transportation costs per bag are $4 from Mexico to New York, $1 from Mexico to California, $2 from Kansas to New York, and $3 and from Kansas to California.

Write a linear program and determines the amounts of keyboard (in bags) to be transported from each producer to each consumer, so as to minimize the overall transportation cost.

**NB:** PDF submission only