Worksheet Three: Aggregate Planning

Please attempt the questions before the session and be prepared to share your solutions.

Question One

Yog-to-go is a small business that produces high protein yogurts. Their demand fluctuates seasonally due to varying customer preferences. The company needs to create a 6-month aggregate production plan to meet demand while minimising costs. The company currently employs 18 workers, and each worker produces 15 yogurts per day. The hiring cost per worker is £350 and the firing cost is £725 per worker. The inventory holding cost per unit per month is £0.75. The regular production cost is £3.75 per unit. The monthly demand and the number of production days per month are presented in the table below.

Month	Demand	Production Days
January	5,000	21
February	7,500	20
March	6,600	24
April	7,900	23
May	7,750	21
June	8,150	19

Calculate the following for Yog-to-go and show your calculations steps:

a) Convert the forecasted demands to demands in terms of aggregate units and clearly state the aggregate units used

b) Using the minimum constant workforce strategy, calculate the total number of workers to be hired and/or be fired over the 6-month period

c) Calculate the total cost of the plan found in part b).

Question Two

A furniture company produces three products: sofa, recliner and footstools. The forecasts over the next 5 months are shown in the table below. Production is as follows: sofas require 5 labour hours, recliners require 4 hours and footstools require 2 hours. There are 20, 18, 23, 15 and 23 working days in the months January through to May respectively.

Month	Sofa	Recliner	Footstools
Jan	10	100	130
Feb	60	90	110
March	75	55	170
April	35	75	135
May	10	50	150

The company currently employs 50 workers that each work 8 hours per day. Workers are paid £1750 per month. Hiring costs are £600 and firing costs are £1750. The inventory holding cost is £2 per aggregate unit of production per month.

a) Convert the product forecasts into an aggregate forecast, clearly explain how you defined an aggregate unit of production.

b) How many workers should be working each month to most closely match the aggregate forecasts from part a)? Compute the total cost of the plan.

c) Assuming that stockouts are not allowed, determine a minimum constant workforce plan using the aggregate forecasts from part (a). Calculate also the cost of the plan and compare with plan (b).

Question Three

ThreadKind produces a clothing line using responsibly sourced wool and cotton. At present, the company produces an Organic Wool Cardigan and a Cotton Everyday Tee from responsibly sourced fibres. The predicted demand for these two items over a six-month planning horizon is as follows:

Month	Number of Working Days	Organic Wool Cardigan	Cotton Everyday Tshirt
1	25	1400	700
2	20	1200	600
3	21	400	200
4	24	500	250
5	18	600	300
6	20	800	400

On average, cardigans require one hour to produce, and tshirts require three hours to produce. All workers are skilled in production of both garments. ThreadKind currently have 20 full-time permanent employees. Permanent employees earn £19 per hour and work 8 hours per day (regular time). They can also do overtime, up to 3 hours per day and during this overtime earn £25 per hour. Recruiting extra full-time permanent workers costs £4250 per worker.

It costs ThreadKind £1.50 to hold one aggregate unit of production in inventory for one month. At the start of month one, ThreadKind holds 300 Cardigans and 150 Tshirts in inventory. There are no ending inventory requirements.

a) Using the individual product forecasts, calculate the corresponding forecasts for aggregate units of production and clearly explain how you defined the aggregation scheme.

b) Ignoring the overtime option for the permanent staff, what would be the size of the permanent workforce required (i.e., the minimum constant workforce plan) to satisfy the demand for the coming six months using regular time only? Calculate the monthly production and inventory levels and all the relevant costs for this plan. Visualise your plan in an appropriate diagram.