Question 1.
(a) In the article, "Vitamins can rejuvenate ... a drug company's profits", *The Sunday Telegraph*, p21, 11 May 2003, Ross Clark said that the pharmaceutical company, GlaxoSmithKline, was charging £206 for a year's supply of its anti-Aids drug, Combivir at that time. But according to Clark

"GlaxoSmithKline along with other companies which manufacture Aids drugs, has been repeatedly bullied to reduce its prices and to surrender its patents on the drugs, allowing third world drug companies to produce cheap, generic versions of the drugs."

(i) Explain why it is that makers of generic versions of drugs are willing and able to charge much less than the original drugs developer for the same drug.

[4 marks]

(ii) How are drug companies protected from generic-drug competition in the early years after drug discovery? How long does such protection last and why do governments agree to provide such protection?

[4 marks]

(b) List and discuss the costs involved in developing, making and selling a new product.

[12 marks]

Question 2.
(a) (i) Write down the equation relating profit, \( P \), to selling price, \( s \), cost per item, \( c_v \), the fixed costs, \( C_F \), and the quantity made and sold, \( Q \).

[1 mark]

(ii) Hence derive an expression for the selling price at breakeven, \( s_o \), as a function of the quantity made and sold, \( Q \).

[2 marks]

(b) You are manager of a firm, BigBadge plc, that manufactures badges carrying a picture of Tower Bridge. The badges are made on three, brand-new machines, each staffed by 2 operators. The machines cost £40,000 apiece, and each is capable of making up to 7,000 badges in a normal working week. The money for the machines has been borrowed from the bank on a repayment-mortgage-type loan, at an interest rate of 7% per annum over 10 years, the expected lifetime of the machines. An operator's wages are £400 for a 40-hour week. You are paid a salary of £32,000 per year, and your secretary is paid £14,000 per year.

Each machine is electrically powered, and rated at 120 kW. Electricity is supplied at 6p per kWh.

Material costs are: steel sheet at £800 per tonne (with 1 tonne enough for 100,000 badges) and inks at £50 per litre, (1 ml per badge).
The machines require maintenance every 440 hours. Maintenance is carried out at weekends when the machines are not working, at a cost of £600 per machine.

A salesman earns commission of £50 for every 5,000 badges sold.

CityBadge pays rent and rates of £500 per week, while heating and lighting cost £240 per month.

(i) Draw up a table of the fixed costs per week. [5 marks]

(ii) Draw up a table of the variable costs. [5 marks]

(iii) Draw a graph of the break-even selling price for the badge over the production and sales range 6,000 to 18,000 badges per week. Mark on your graph the area where a profit will be made. [5 marks]

(iv) What profit will be made if 15,000 badges are sold at 50 pence each? [2 marks]

Question 3.
(a) The Maddock Curve for a project is given by:

\[ \frac{A_{wd}}{B_c} = -\frac{E_r}{B_c} + \frac{E_c}{B_c} \]  \hspace{1cm} (3.1)

(i) Explain each of the symbols in equation (3.1) above. [4 marks]

(ii) Sketch the Maddock Curve for a project that is run perfectly from start to finish. [2 marks]

(b) The costs shown in Figure 3.1 are based on those given at the Holyrood Inquiry, which was set up to examine the construction project for the building for the new Scottish Parliament and which reported in September 2004. Using the data in Figure 3.1, do the following.

(i) Determine \( B_c \) [1 mark]
(ii) Draw up a table under the column headings:

<table>
<thead>
<tr>
<th>Date</th>
<th>$E_c$</th>
<th>$A_{wd}$</th>
<th>$E_r$</th>
</tr>
</thead>
</table>


[4 marks]

(iii) Use your table to plot the Maddock curve for this project.  

[4 marks]

(iv) The latest estimate of the outturn cost was made in February 2004. Use this information to plot the projected course to completion on your Maddock curve, assuming that the project ran perfectly from this date onwards.  

[3 marks]

(v) Comment on how well or otherwise the Holyrood project was managed.  

[2 marks]

Figure 3.1 Cost figures for the Holyrood project: construction of the building to house the new Scottish Parliament
Question 4.
Julian Carruthers's brother Quentin has set up a fashion business, "Carruthers Casual Jeans". Last year he made a profit of £22,727 on a turnover of £272,727. This year he has budgeted for a 10% increase in both sales and costs.

(a)

(i) What profit does this year’s budget imply (to nearest £)?

[2 marks]

(ii) In fact, half-way through this year, his sales are up 50%. This leads him to project an end-of-year profit up 600% on budget. On what reasoning is this based? Is it likely to be right, and if not, why not?

[2 marks]

(iii) In fact each of the three departments is expecting to incur costs significantly above budget:

costs in the Production Department are expected to be up £75,000,
costs in the Marketing & Sales Dept. are expected to be £75,000 up,
while costs in the Distribution Dept. are expected to be £25,000 up
over the year.
What profit do you therefore expect Quentin's company to make this year if it continues with its current operating strategy?

[2 marks]

(b) Sensing that, despite his optimism, there could be problems, Quentin calls for advice from Julian's friend, the management consultant Ron Scroggs. Ron takes Quentin back to the beginning of this year. Each of Quentin's three departments is then asked to estimate the cost of processing 60, 80, 100 and 120 pairs of Carruthers Casual Jeans. The answers are as follows:

- Production Department says its costs for producing either 60 pairs of jeans or 80 pairs per day are essentially the base cost of £400 per day. Producing 100 pairs of jeans per day will cost the base cost plus £100 per day for additional overtime, while producing 120 pairs of jeans per day will cost the base cost plus £100 per day overtime plus £200 per day for a new machine.

- Marketing & Sales Department says that its costs for selling 60 pairs of jeans per day are £350 per day. Selling 80 pairs of jeans per day will require a press advertising campaign, which will cost £50 per day extra. Selling 100 pairs of jeans per day would require a radio advertising campaign as well, and this would cost £100 per day on top of the 80 pairs-a-day cost. Shifting 120 pairs of jeans or more would require television advertisements, which would add a further £200 per day to the costs.

- Distribution Department says that it can deliver up to 100 pairs of jeans per day for the same cost of £150 per day. Selling any more than that would require delivering to additional out-of-turn outlets, so that delivering 120 pairs of jeans per day would require the part-time services of another van and driver, which would cost an additional £100 per day.
In addition, there is an overheads cost of £150 per day, which does not change with throughput.

(i) Draw up a table showing the costs in each of the Departments, the overheads cost and hence the total cost to the firm of making, selling and distributing 60, 80, 100 and 120 pairs of Carruthers Casual Jeans per day.

[7 marks]

(ii) Given that the wholesale selling price of one pair of jeans is £15, what throughput should Quentin aim for, and what profit should he expect per day?

[4 marks]

(iii) How do the figures for the number of pairs of jeans produced, income, costs and profit in your preferred strategy compare with last year's outturn figures on an annual basis? Assume a business year has 250 days.

[3 marks]

Question 5.
(a) What are the three basic ways in which a firm may charge for its services when tendering for an engineering job (the three types of tender)? Explain the circumstances when each may be the appropriate form of tender, and who bears the risk.

[6 marks]

(b) Your firm, CleanUp plc, has been invited to tender for the decommissioning and decontamination of the garage paint-shop, which is going to be converted into offices and live-work units. The paint-shop is a large, integral room of dimensions: length: 20m, width: 15 m, height: 6m. The owner of the paint-shop, Clearspray plc, requires all existing equipment to be stripped out and disposed of: spray guns, jigs and piping together with the old ventilation system and its associated ducts. What will be left will be a bare space.

Chemical contamination may have occurred. If the contamination of the plaster on the walls and ceilings and of the concrete floors is light, it will be possible merely to decontaminate the surfaces by washing and then seal these by painting. If the contamination is heavy, then parts or all of the walls and ceilings will require replastering, and the top 10 cm of the concrete floor will need to be removed and disposed of and then replaced. A large number of toxic chemicals may have been used in the paint-shop over the past 25 years, and Clearspray is unable to give full details. Finally, Clearspray requires the selected contractor to provide a new ventilation system for the building.

CleanUp had experience 2 years ago of decontaminating a paint-shop and providing a new ventilation system. That was for a paint-shop with dimensions L: 25m, W: 10m, H: 4m, and surface contamination of walls, ceiling and floor had been light enough for painting to suffice. The decontamination and waste disposal had cost CleanUp £150,000, the repainting with high-quality paint £15,000 and the new ventilation
system had cost £50,000 to procure and install. CleanUp had achieved a profit of £80,000 on the job.

(i) Estimate the cost of decontaminating Clearspray's paint-shop, disposing of the waste and installing a new ventilation system if the contamination to the walls, floor and ceiling is light. State your assumptions. [11 marks]

(ii) What is the problem with applying the estimate above as the basis for a fixed-price bid? What other strategies might you apply and why? [3 marks]