GLASGOW COLLEGE UESTC

Sample paper

Engineering Project Management & Finance (UESTC 3031)

Date: (remember to complete when info available from Ruoli)
Time: (remember to complete when info available from Ruoli)

Attempt all PARTS. Total 100 marks

Use one answer sheet for each of the questions in this exam.
Show all work on the answer sheet.
For Multiple Choice Questions, use the dedicated answer sheet provided.

Make sure that your University of Glasgow and UESTC Student Identification Numbers are on all answer sheets.

An electronic calculator may be used provided that it does not allow text storage or display, or graphical display.

All graphs should be clearly labelled and sufficiently large so that all elements are easy to read.

The numbers in square brackets in the right-hand margin indicate the marks allotted to the part of the question against which the mark is shown. These marks are for guidance only.

Q1 Multiple Choice Question

(1.1) Why do companies use project management? (Find the right combination of statements) [2]

A - To define the project and agree with the customer
B - To estimate project cost and make proposals
C - To allocate the right resource at the right time
D - To assess risk and failure points and make back up plans
E – To track the schedule only once the plan is made

A – 1+2+3+4
B – 1+2+4+5
C – 2+3+4+5
D – 1+3+4+5
E – 1+2+3+5

(1.2) In a Profit and Loss (Income) statement, Earnings before Interest, Tax, Depreciation and Amortization (EBITA) is equal to: [2]

A – Total Sales minus Cost of Sales
B – Gross Profit minus all company operating expenses (salaries and rent etc)
C – Total Expenses minus Net Profit
D – Total Sales minus (Salaries + Rent)
E – Full production costs minus Net Profit

(1.3) Regarding health and safety related to product liability, you as a producer, distributor and seller are responsible for: (find the right combination of responsibilities) [2]

1 – Making sure products being sold to customers are safe
2 – Warning consumers about potential risks
3 – Taking action if a safety problem is found
4 – Making sure the product never breaks down ever
5 – Taking a proactive approach to preventing safety problems

A – 1+2+3+4
B – 1+2+4+5
C – 2+3+4+5
D – 1+3+4+5
E – 1+2+3+5

(1.4) A Sole Trader Company is: [2]

A –a business you run as an individual. You can keep all your business's profits after you've paid tax on them. You're personally responsible for any losses your business makes.

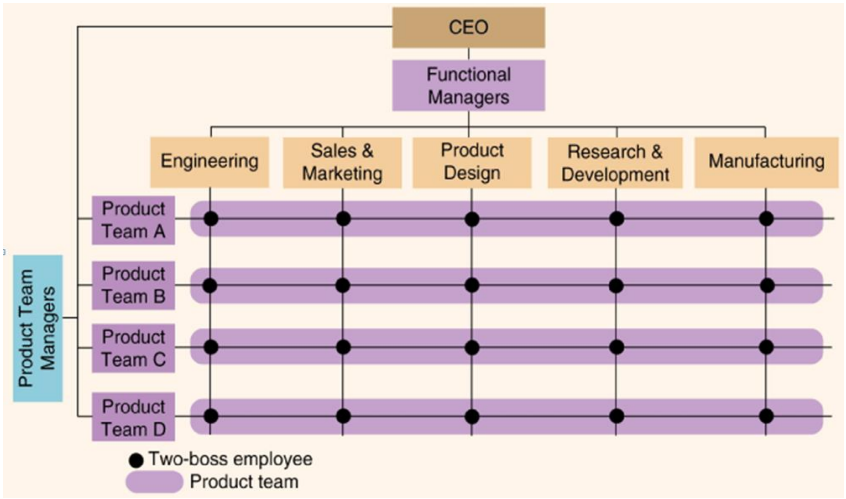
B – A business in which you and your business partner (or partners) personally share responsibility for your business. You can share all your business's profits between the partners. Each partner pays tax on their share of the profits.

C – A company whose shares can be freely traded on the stock market.

D – An organisation you can set up to run your business- it's responsible in its own right for everything it does and its finances are separate from your personal finances. Any profit it makes is owned by the company after it pays Corporation Tax. The company can then share its profits amongst its shareholders.

E – An organisation you can set up to avoid paying tax or having any responsibility as a director.

(1.5) If a company has an organisational structure shown below, it is called: [2]



A – A Team-Based Structure
B – A Matrix Structure
C – A Divisional Structure
D – A Simple Startup Structure
E – A Military Command Structure

(1.6) In a simple Lease–or-Buy calculation, you require a piece of lab equipment for a project. The cost to buy the equipment is 10,000 RMB plus an additional 500RMB per day. You are able to lease the equipment from a local company at a cost of 1500RMB per day. What is the maximum length of time you can lease the equipment before it is cheaper to buy the equipment? [2]

A – 3 days
B – 10 days
C – 16.333 days
D – 12 days
E – 30 days

(1.7) Project management usually happens in 4 stages? According to the definition below:
"This phase consists of those processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary. The key benefit is that project performance is observed and measured regularly to identify variances from the project management plan" [2]

A - Planning
B - Scheduling
C - Controlling
D - Closing
E – Conceptualising

(1.8) If **TC** = Total Cost, **F** = Fixed Costs, **VC** = Variable Cost, **SP** = Selling Price, **R** = Revenue, and **Q** = Quantity of products sold, then the breakeven point of a project is defined as: [2]

A – When **TC = F + (VC).Q**
B – When **R = (SP).Q**
C – When **F – (VC).Q = (SP).Q**
D – When **TC = R**
E – When **(R).Q = SP - VC**

(1.9) Why do companies produce a Profit and Loss (Income) statement? Select the correct combination of reasons from the list below: [2]

1. It is a legal requirement. Tax is paid on profit.
2. It summarises all the year's transactions – as recorded in documents such as invoices.
3. It shows the financial health of the business.
4. It is the only document used by investors when selling the business.
5. It is studied by managers, shareholders, banks, financiers, and other relevant groups of people.

A – 1+2+3+4
B – 1+2+4+5
C – 2+3+4+5
D – 1+3+4+5
E – 1+2+3+5

(1.10) A statement of cash flows within a company contains the following information: [2]

A – A record of all the Cash Inflow transactions such as: Sales of Goods or Services, Sales of Assets, Cash Receipts from investments by owners.
B – A record of Cash outflow transactions such as: Payment of Operating Expenses, Expansion of Operations, repayments on loans, payments to owners as a return on their investment.
C – A combination of A and B.
D – The exact amount of cash held by all employees of the company on a day-to-day basis.
E – Only the amount of cash a company has in the bank at the end of the financial year.

(1.11) To carry out an experiment on a piece of equipment, you have a choice to either lease or buy the test equipment needed. Equipment lease will be $270 / day, purchasing the equipment will be $9000 plus $70 for every day used. What is the maximum number of days the test equipment can be rented before it is cheaper to buy it? [2]

A – 17 days
B – 23 days
C – 33 days
D – 45 days
E – 56 days

(1.12) A factory produces light bulbs that cost 5RMB for materials and 2RMB for labour. The factory has a fixed overhead of 100,000RMB. If the company sells the light bulbs for 11RMB, how many light bulbs must be produced to reach the breakeven point? [2]

A – 9,091 bulbs
B – 14,286 bulbs
C – 25,000 bulbs
D – 33,333 bulbs
E – 50,000 bulbs

Q2 An electronics company is manufacturing a product for use in the computer market. This product uses a wireless module which the company can either buy in from an external supplier at a cost of **$35** or manufacture itself in-house. As the product engineer, you have been asked to calculate which option is best over a 1-year period. The company must manufacture **10,000** modules per year to meet demand. If you decide to purchase externally, you would not be able to save on the fixed overhead costs. The internal costs to produce the wireless modules are as follows:

Table Q2: Cost Breakdown

Costs per Module	**Annual Cost per 10,000 modules ($)**	**Per Unit (Module) costs ($)**
Direct Material	180,000	18
Direct Labour	100,000	10
Variable Overhead	20,000	2
Fixed Overhead (per module)	260,000	26
Total	**$ 560,000**	**$ 56**

a. Using the information above, compare the cost of producing the modules in-house and purchasing from an external supplier. Based on this calculation, which option would be best based on a financial decision? [5]

b. You manager now tells you that the facilities used to make the modules in-house could be used for another product and the fixed overhead costs would be transferred to the other product. Does this change your decision? [5]

c. Using the information in the above table, if your company can sell the modules for $96 each, draw a table showing production costs and sales revenue over volumes of 0 -> 10,000 modules per year. [5]

d. Draw a Breakeven chart showing Total Cost, Variable Cost, Fixed Cost, and Revenue. Show the Breakeven point and calculate its value. [5]

e. Your sales manager tells you he can sell another 2000 modules per year (total 12,000). Assuming the factory has the capacity and Fixed Overhead costs remain the same, how much profit will the company make at this new production figure. [5]

Q3 You have been hired as a project planning consultant by a Company planning the construction of a sports stadium and hotel complex in the Chengdu region. This is a politically very important project, so it should be assumed that 7day working is in operation (i.e. weekends are treated as normal working days). The main activities have been identified as being:

Table Q3: Project Tasks

Activity	Description	Duration	Predecessors
0	Project Start (Milestone)	0	
1	Identify land location	4	0
2	Design Stadium & Training Ground	6	1
3	Design Hotel & Restaurant	8	1
4	Agree plans with client	2	2, 3, 5
5	Purchase Land	3	1
6	Install Electricity Facilities	3	4
7	Rough Landscaping	4	6, 8
8	Build Site Roads	5	4
9	Build Sports Stadium	5	7
10	Build Sports Training Ground	2	7
11	Build Hotel & Restaurant	4	7
12	Project Complete(Milestone)	0	9,10,11

a. Using a network diagram (PERT chart) show the interdependency and durations of tasks. [8]

b. Calculate the overall project duration of the project and determine the critical path. [4]

c. Develop a Gantt chart for this project. [8]

d. Both the PERT Chart (Network Diagram) and the Gantt chart are very useful to a project manager. How should use such tools in managing projects? [5]

Q4 You are a production engineer in a factory producing resistors for the electronics industry. The design specification of this resistor has a nominal value of 59.*90* Ω, an Upper Specification Limit (USL) of -*59.95*Ω, and a Lower Specification Limit (LSL) of *59.86* Ω.

Table Q4: Production line data measurements

Resistor values

59.934	*59.929*	*59.928*	*59.905*	*59.933*	*59.91*	*59.914*	*59.914*	*59.919*	*59.923*
59.901	*59.925*	*59.911*	*59.906*	*59.937*	*59.912*	*59.93*	*59.908*	*59.922*	*59.912*
59.926	*59.921*	*59.919*	*59.921*	*59.917*	*59.923*	*59.897*	*59.926*	*59.932*	*59.936*
59.912	*59.913*	*59.945*	*59.917*	*59.906*	*59.915*	*59.915*	*59.923*	*59.932*	*59.936*
59.915	*59.918*	*59.939*	*59.924*	*59.936*	*59.926*	*59.914*	*59.912*	*59.928*	*59.925*

(a) This information has been recorded by the production operators. Using the worksheet provided, construct a capability chart. [10]

(b) Using the chart you have drawn, in part (a), determine the mean (μ), standard deviation (σ), and process capability factor Cpk of the resistor production line. [4]

(c) Your manager asks if it is possible to tighten the upper and lower limits of production without losing significant product yield. If the new limits are 59.93Ω and 59.88Ω, what percentage of production will be lost? [5]

(d) A customer approaches you asking for resistors supplied to the new tighter tolerances however the cost of the new (tighter) tolerances resistors is more that 5x the cost of your normal resistors. Using a simple example, show how you could improve the tolerance variation using statistical methods. Show the schematic and calculate what the standard deviation of the resistance value would be if it was constructed from 4 resistors from your production facility. [7]

NOTE: you will be GIVEN the Capability chart as part of the answer book in the exam. Please print an A3 sized version if you are attempting this question for practice.