Section A

Professional, Industrial and Management Studies (PIMS)

(Answer both questions from this section)

Question 1

Three quantities form the basis for cost performance measurement using Earned Value Management. They are Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP), and Actual Cost of Work Performed (ACWP).

a. Explain what is meant by BCWS, BCWP and ACWP? (10 marks)

b. Define the additional terms used on the following earned value analysis graph and explain what is happening to the project? (10 marks)

c. Define the ‘cost performance index (CPI)’ and ‘schedule performance index (SPI)’.

A project is defined with a budget of £200,000, with a planned duration of 10 months, to produce 50 units. Its current status is: ‘spend to date’ of £120,000, ‘elapse time’ 5 months, and has ‘produced’ 20 complete units. What are the BCWS, BCWP, ACWP, CPI and SPI? (10 marks)
Question 2

The table below provides data covering a random sample of 50 corrective maintenance repair actions on a typical system. Each of the times represents the completion of one corrective maintenance cycle.

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a. Describe what is meant by a maintenance cycle. (4 marks)
b. Prepare a frequency histogram that represents this data? (4 marks)
c. What probability distribution does this histogram represent? (2 marks)
d. What percentage of the total repair actions falls within the range 46 to 78 minutes? (6 marks)
e. Determine the percentage of total population repair times that lie between 40 and 50 minutes. (Tables for Cumulative Normal Probabilities are provided). (5 marks)
f. Determine the upper confidence limit (in minutes) for a confidence level of 95%. (Tables for Cumulative Normal Probabilities are provided). (5 marks)
g. When considering probability distributions in general, the time dependency between probability of repair and the time allocated for repair usually produces one of three common probability distribution functions – normal, exponential and log-normal. How does each relate to maintenance? Draw a log-normal graph showing the mode, geometric mean, mean, and designated percentile. (4 marks)
Section B

Professional, Industrial and Management Studies (PIMS)

(Answer one question from this section)

Question 3

This question relates to the Transatlantic Tunnel (TAT) project. Using systems analysis, develop a high-level architecture for a system through the identification and the application of the system’s ‘technical performance measures’ (TPMs). Answer the questions in the following order to build up the design:

a. Define the problem space for the tunnel project – ie, why is this project being considered?  
   (5 marks)

b. What assumptions are made for the analysis?  
   (5 marks)

c. Specify the Technical Performance Measures (TPMs) that could be used for this railway system?  
   (5 marks)

d. Describe how you would estimate the fixed costs for railway operations?  
   (6 marks)

e. Describe how you would estimate the utilisation of the railway for both passenger and freight traffic?  
   (7 marks)

f. How would you estimate using breakeven analysis the number of trains/day needed to establish a viable business?  
   (6 marks)

g. Describe a high-level systems architecture to support the business?  
   (6 marks)
Question 4

Management of risk will be key to the investment decision and the ultimate success of the Tunnel under the Atlantic project. From a systems analysis perspective provide a response to each of the following questions regarding risk. You should limit your response to each part to no more that 200 words.

a. What will be the major risks considered during the investment decision process?  

(6 marks)

b. What will be the major risks considered during the design process?  

(7 marks)

c. What will be the major risks that could impact the construction of the railway system?  

(7 marks)

d. What are the major risks to safety?  

(7 marks)

e. What will be the major risks that need to be managed during operations?  

(6 marks)

f. Chose one of the major risk areas from your responses to parts ‘a’ to ‘e’ of this question and discuss possible mitigating measures that could be adopted by management?  

(7 marks)

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