MARCH 2016

PROJECT MANAGEMENT

**Instructions to candidates:**
a)    Time allowed: Three hours (plus an extra ten minutes' reading time at the start – do not write anything during this time)
b)    Answer FIVE questions with TWO from Section A and THREE from Section B
c)    All questions carry equal marks. Marks for each question are shown in [ ]
d)    Non-programmable calculators are permitted in this examination

**SECTION A**

1.    a)    Identify and describe the main criteria for project selection models.                    [12]
      b)    List FOUR numeric and also FOUR non-numeric types of project selection models.          [8]

2.    a)    Define the terms **monitoring** and **controlling**, in the context of project management.    [10]
      b)    Discuss the THREE types of control that can be exercised on projects.                  [10]

3.    Discuss what are commonly considered to be the THREE broad objectives of any project.          [20]

4.    How can probability and risk management assist the project manager?                    [20]

5.  The following information is extracted from a project to develop a new town centre hotel and shopping complex:

| Activity | Duration (weeks) | Predecessors | Resources |
|---|---|---|---|
| A | 4 | - | 1 Real Estate Consultant<br>1 Survey Team<br>2 Access Permits<br>1 Legal Advisor<br>4 Legal Assistants |
| B | 3 | - | £72,000 |
| C | 6 | - | 2 Architects<br>1 Financial Analyst<br>1 Drill Rig/Crew<br>8 Soil Tests<br>3 Civil Engineers |
| D | 3 | B | £39,000 |
| E | 3 | A,D | £53,000 |
| F | 2 | B | £45,000 |
| G | 3 | E | 1 Architect<br>4 CAD/CAM Engineers<br>3 Interior Decorators<br>2 Landscape Designers<br>2 Modelling Kits |

Resource Costs:

| | | | |
|---|---|---|---|
| **Real Estate Consultant:** | £70/hour | **Survey Team:** | £1,000/day |
| **Financial Analyst:** | £65/hour | **Drill Rig/Crew:** | £750/day |
| **Access permit:** | £250 | **Legal Advisor:** | £100/hour |
| **Legal Assistant:** | £30/hour | **Soil Tests:** | £150 each |
| **Civil Engineer:** | £75/hour | **Architect:** | £85/hour |
| **CAD/CAM Engineer:** | £50/hour | **Interior Decorator:** | £55/hour |
| **Landscape Designer:** | £70/hour | **Modelling Kit:** | £3,250 |

The project is working a standard 8-hour day, 5 days a week. Day rates apply on working days only.

Calculate:
a)  i   the budget for activities A, C and G                                               [10]
    ii  the baseline budget for the project                                              [2]
b)  The Project Manager discovers a scheduling conflict and decides to complete Activity G in 2 weeks instead of the scheduled 3 weeks. This will entail working 60-hour weeks for each of the two weeks. Personnel are currently paid a premium of 30% for overtime hours, defined as hours worked in excess of 40 in a given week. Recalculate the budget for Activity G in light of this information. What is the effect of this action on the overall budget?                       [8]

6. The following table shows the activities and their corresponding durations (weeks) for a project involving the retraining of staff on a new Management Services System:

**Activity Duration (weeks)**

| Activity | Optimistic (O) | Most likely (L) | Pessimistic (P) |
|----------|----------------|-----------------|-----------------|
| A | 15 | 17 | 19 |
| B | 20 | 21 | 22 |
| C | 12 | 12 | 12 |
| D | 15 | 17 | 20 |
| E | 4 | 6 | 10 |
| F | 5 | 6 | 7 |
| G | 7 | 8 | 10 |
| H | 7 | 9 | 10 |
| I | 10 | 12 | 14 |
| J | 9 | 11 | 15 |

a) Calculate the expected duration for critical path activities A-C-F-J, and the expected project duration. [5]

b) Calculate the project standard deviation. [8]

c) The Project Manager requires the project to be completed within 46 weeks. Comment on the likelihood of the project meeting this deadline. [7]

7. The following information has been extracted from a project to develop a component for the ignition system of a new model of all electric car:

| Activity | Duration (weeks) | Predecessors | Cost (£000) |
|----------|------------------|--------------|-------------|
| A | 10 | --- | 100 |
| B | 4 | A | 75 |
| C | 6 | B | 180 |
| D | 3 | B | 250 |
| E | 2 | C | 100 |
| F | 7 | C,D | 100 |
| G | 5 | E,F | 200 |
| H | 3 | F | 50 |

a) Calculate the scheduled completion time and identify the critical path for this project. [7]

b) Assuming that each activity starts as early as possible, construct a Gantt for this project. [8]

c) From the chart obtained in part (b), draw a graph showing the cumulative costs over the lifetime of the project. [5]

8. The following network diagram and additional information relate to a project to install a new smart lighting system to an apartment building:

| Activity | Normal Time (Days) | Normal Cost (£000) | Crash Time (Days) | Crash Cost (£000) |
|---|---|---|---|---|
| A | 5 | 6 | 4 | 9 |
| B | 7 | 3 | - | - |
| C | 10 | 9 | 7 | 12 |
| D | 4 | 7 | - | - |
| E | 6 | 8 | 5 | 10 |
| F | 5 | 3 | 4 | 6 |
| G | 4 | 3 | 3 | 6 |
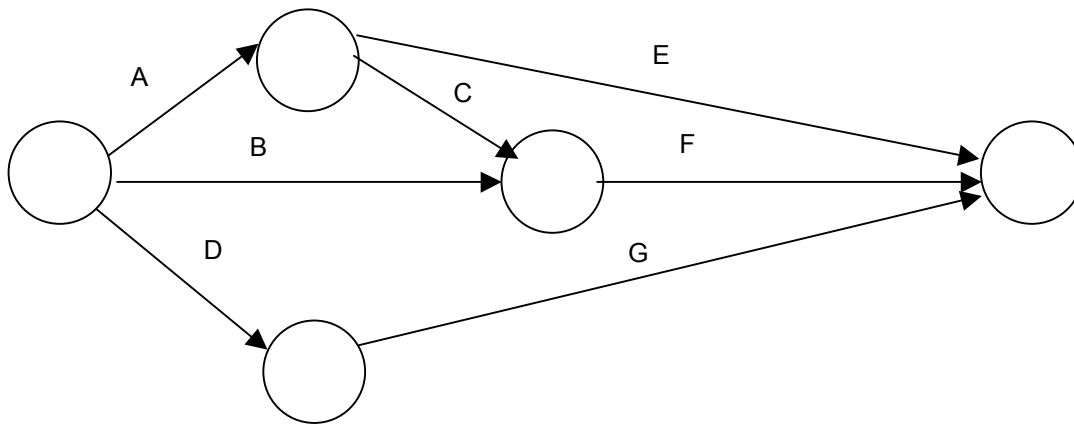


Find:
a) The critical path, the normal project duration and the normal project cost.                                    [4]
b) The crash cost per day for EACH activity.                                                                       [3]
c) Determine the optimal crashing policy that should be adopted to meet a deadline of 16 days at minimum cost.                                                                                                [10]
d) How would the project be affected if it is subsequently discovered that activity A cannot be crashed?                                                                                                           [3]