

Answer all questions.

QUESTION 1

Refer to the “Jeyes Wipes” Case Study handed out to you prior to the exam and answer the following question:

You are the Jeyes Wipes Divisional Managing Director and you have heard that Stephen Mottram is disenchanted with the new organisation of the group and that he and Gary Swanson are thinking about the possibility of a Management Buyout. You have reported this to the new Group Chief Executive who has asked you to analyse the factors which are motivating or de-motivating Stephen.

A. You are required to analyse Stephen’s motivation in terms three of Herzberg’s Hygiene Factors and three of his Motivators are shown below.

1. Hygiene factors - Give a mark next to each heading indicating your assessment of the level of his dissatisfaction out of 10 (i.e. 1 indicates mild dissatisfaction and 10 indicates a very high level of dissatisfaction). You must explain your assessment.

1.1 Quality of Supervision

1.2 Company Policies

1.3 Relations with Others

2. Motivators - Give a mark out of 10, next to each heading indicating your assessment of the level of his satisfaction. (i.e. 1 indicates mild satisfaction and 10 indicates a very high level of satisfaction). You must explain your assessment.

2.1 Recognition

2.2 Work itself

2.3 Responsibility

(15)

B. You should summarise in no more than 100 words your overall assessment of Stephen Mottram's motivation and whether you feel that he is likely to attempt a management buyout. (5)

TOTAL: 20 Marks

QUESTION 2

2.1 You have been employed by a parastatal organisation (in a fictional country) which is in charge of road building, road infrastructure development and road maintenance. Your organisation has been tasked with a massive infrastructure upgrade programme to take place over the next seven years.

QUESTION 2 CONTINUES OVERLEAF/....

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- a. In no more than two lines, describe two important transformations that are required. (2)
- b. Perform a CATWOE analysis of the problem.

Answer this question as follows:

C: <Definition of C>: party/parties who are part of C
Etc...

(9)

- c. Following on from which, propose a suitable mechanism for cost recovery of this US \$ 2 billion project.
Brevity in your answer is expected. (2)

2.2 Consider the following scenario:

Martin and you joined a small engineering firm at the start of 2013. Martin was tasked with designing a bracket for the MD's bookcase and you were tasked with designing a perpetual motion machine. After six months, Martin's bracket has been installed and it is holding up well. You have, by contrast, not developed a single concept worthy of developing as a prototype. In your half year performance assessment, your boss reprimands you and tells you "carry on and if you're stuck, go look on the internet". Martin is congratulated and handed a new task of designing a new drive system for an old lathe. After a further six months, you have yet again failed in delivering a working machine, even though you've built a few prototypes from cardboard. Martin is promoted and put in charge of two other junior engineers, his team is tasked with the design of a small machine. You continue with your project, though your boss indicates that he is reorganising his budget, and cutting your research budget by 30%, which will be reallocated to Martin. At your next performance assessment, your boss is very disappointed to not have a perpetual motion machine, and he indicates to you that the company could "make millions if you finally got your act together" he cuts your budget further which he allocates to Martin's team which now consists of six engineers. Over time, you continue work on your perpetual motion machine and remain in the same position you started with. You have not been promoted and your pay has not been increased. Martin now heads up a division, has forty people working under him and drives a Porsche.

- a. Name the archetype which is causing you frustrations at your company (2)
- b. Making the assumption that Martin and you are equally competent, what went wrong? (3)
- c. Assuming that only your proactivity will fix this situation, what can you do? (2)

TOTAL: 20 Marks

QUESTION 3

3.1 ANSWER **2 OUT OF 3** QUESTIONS (each question is worth 10 marks):

- a. "We can't solve problems by using the same kind of thinking we used when we created them." [Albert Einstein]. Discuss this statement in the context of the increasing complexity of our modern engineering world.
- b. Systems Engineering Management is accomplished by integrating three major activities. What are these activities? Explain in detail.
- c. Explain the need for risk management in Systems Engineering and briefly outline the risk management process.

3.2 ANSWER **1 OUT OF 2** QUESTIONS (each question is worth 10 marks):

- a. Explain the concept of a WBS (including its key characteristics/requirements) and why it is important.
- b. As technological uncertainty increases, the type of project implemented changes. Explain this statement.

TOTAL: 30 Marks

QUESTION 4

You are managing a project to design, develop, and produce a prototype of a small computer. In the current rapidly changing globalised environment, it is crucial that the product hits the market in less than a year. The project team has thus been tasked with producing a prototype in 8 months time or 35 weeks. The project team decides that the following activities are the major components of the project:

The design of the computer (Task A) must be completed before the prototype construction (Task B) and equipment evaluation (Task C) can begin. Once the prototype has been built, it can be tested (Task D). Once tasks C and D have been finished, the equipment report (Task E) and the methods report (Task F) can be written. Once these 2 reports have been done, the final report can be compiled (Task G).

- a. Develop a table showing the project activities and the precedence relationships.
- b. Review the expected times and variances (present these in a table) for all activities in the project, given the information in the table below:

QUESTION 4 CONTINUES OVERLEAF/....

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Activity	Optimistic Time	Most Likely Time	Pessimistic Time
A	10	22	28
B	4	4	10
C	4	6	14
D	1	2	3
E	1	5	9
F	7	8	9
G	2	2	2

- Draw (by hand) a complete network diagram for the project.
- Determine the critical path. Show early start and early finish **OR** late start and late finish **AND** slack. What is the **estimated** project length (in weeks)?
- What is the variance and standard deviation for the overall project?
- What is the probability that the project will be completed in 35 weeks?
- What is the project due date (number of weeks) that will give the project a 99% chance of being completed on-time?
- Suppose that the team has been told it must complete the project 2 weeks ahead of the critical path time. Given the information in the table below, determine which activity(ies) should be crashed and what additional cost this will add to be the project. Show all calculations and explain your answers.

Activity	Crash Time (weeks)	Normal Cost (Rands)	Crash Cost (Rands)
A	18	80 000	84 500
B	3	30 000	34 000
C	6	26 000	27 000
D	1	48 000	49 000
E	3	56 000	58 000
F	7	30 000	30 500
G	1	22000	20750

TOTAL: 30 Marks

-----END OF EXAM-----

EQUATIONS

$$Z = \frac{X - \mu}{\sigma}$$

$$t = (a + 4m + b)/6$$

$$v = [(b - a)/6]^2$$

APPENDIX I NORMAL CURVE AREAS

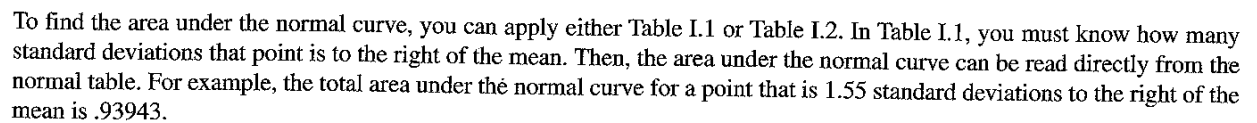


TABLE I.1										
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97784	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997