



UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 8 Examination in Engineering: November 2014

Module Number: ME8323

Module Name: Production and Operations
Management

[Two Hours]

[Answer all questions, each question carries five marks]

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- Q1. a) Discuss the role of method study in the field of manufacturing Engineering. [1.5 Marks]
- b) Explain steps for conducting a method study [2.0 Marks]
- c) Draw and discuss the usefulness of following with suitable examples. [1.5 Marks]
- I. Multiple activity chart
 - II. String diagram
 - III. Travel chart
- Q2. A project has been defined to contain the activities shown in Table Q2.1, along with their time estimates for completion.
Note: You may use the Normal Distribution shown in Table Q2.2
- a) Calculate the expected time and the variance for each activity. [1.5 Marks]
- b) Draw the critical path diagram. [1.0 Marks]
- c) Show the earliest start, earliest finish times and latest start, latest finish times. [1.5 Marks]
- d) Show the critical path. [0.5 Marks]
- e) What is the probability that the project can be completed in 24 weeks? [0.5 Marks]
- Q3. a) Explain the purpose of applying performance ratings in time study. [1.25 Marks]
- b) Discuss the different types of allowances that are considered in time study. [1.25 Marks]
- c) Table Q3 shows a partially completed time-study worksheet. Determine the standard time for this operation. [2.5 Marks]

Q4. a) "Scope of operations manager is not limited to fulfill the customer orders by managing the transforming process" Comment on the statement.

[1.0 Marks]

b) Identify the two major differences between service and manufacturing organizations. Find an example of a service and manufacturing company and compare them.

[1.5 Marks]

c) One way that organizations compete is through technological innovation. However, there can be downsides for both the organization and the consumer. Explain.

[1.0 Marks]

d) I. Describe the transformation process of a business.
 II. What constitutes the transformation process at an advertising agency, a bank, and a TV manufacturing organization?

[1.5 Marks]

Table Q2.1 Activity data for the project

Activity	Time Estimates (weeks)			Immediate Predecessor(s)
	Optimistic (a)	Most Likely (m)	Pessimistic (b)	
A	1	3	5	-
B	3	4.5	9	-
C	2	3	4	B
D	2	4	6	A,C
E	4	7	16	D
F	1	1.5	5	C
G	2.5	3.5	7.5	F
H	1	2	3	F
I	4	5	6	B
J	1.5	3	4.5	H,E,G
K	1	3	5	I,J

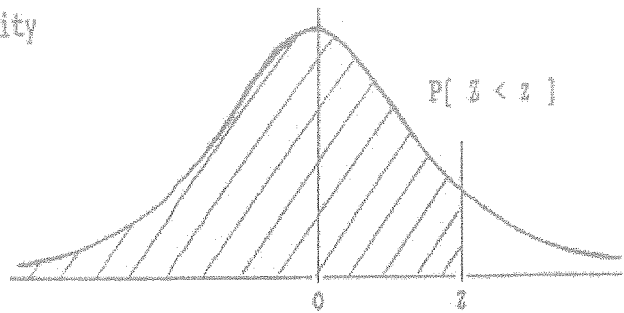
Table Q2.2 Normal Distribution

STANDARD STATISTICAL TABLES

1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z i.e.

$$P[Z < z] = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} \exp(-\frac{1}{2}z^2) dz$$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.0
0.0	0.5000	0.5040	0.5080	0.5120	0.5159	0.5199	0.5239	0.5279	0.5319	0.535
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.575
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.614
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.651
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.687
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.722
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.754
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.785
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.813
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.838
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.862
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8804	0.883
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.901
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.917
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.931
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.944
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.954
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.963
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.970
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.976
2.0	0.9773	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.981
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.985
2.2	0.9861	0.9865	0.9868	0.9871	0.9874	0.9878	0.9881	0.9884	0.9887	0.989
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.991
2.4	0.9918	0.9920	0.9922	0.9924	0.9927	0.9929	0.9931	0.9932	0.9934	0.993
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.995
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.996
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.997
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9980	0.9980	0.998
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.998
z	3.00	3.10	3.20	3.30	3.40	3.50	3.60	3.70	3.80	3.9
P	0.9986	0.9990	0.9993	0.9995	0.9997	0.9998	0.9998	0.9999	0.9999	1.000

Table Q3: Time study worksheet

Elem ent		Cycles									Sum	Avg	Rating	
		1	2	3	4	5	6	7	8	9				
A	Cumulative time	0.09	0.12	0.06	0.11	0.10	0.09	0.13	0.12	0.13				
	Element time													1.05
B	Cumulative time	0.23	0.28	0.21	0.20	0.24	0.22	0.26	0.25	0.25				
	Element time													1.00
C	Cumulative time	0.46	0.49	0.46	0.44	0.47	0.47	0.49	0.46	0.48				
	Element time													0.90
D	Cumulative time	0.61	0.66	0.62	0.59	0.69	0.67	0.67	0.66	0.70				
	Element time													0.85
E	Cumulative time	0.70	0.74	0.72	0.68	0.79	0.80	0.76	0.78	0.81				
	Element time													1.00
F	Cumulative time	1.00	1.02	0.98	0.99	1.07	1.09	1.02	1.06	1.09				
	Element time													1.10
														Sum
	Standard Time:													
	Allowances:													
	Personal 5%													
	Fatigue 5%													
	Delay 5%													