| Mansoura University Final Exam Time: 3 Hours	Faculty of Engineering Advanced Project Management Sep 23, 2013	Structural Engineering Dept. Graduate Studies Master's Program

Question 1: (30 marks)

a) Consider the activity of construction of a concrete wall which is divided into 20 similar sections. A team of carpenters will take 6 days for erecting formworks and another 2 days for stripping them for a section of the wall. Mixing and placing concrete will take 1 day for each section. It is necessary to wait 1 day between concreting a section and stripping its formworks.

Calculate the duration (in working days) of this activity taking into consideration the following requirements:
- Minimum number of sets of formworks should be used (a set of formwork may be used up to 7 times).
- Each time a concrete mixer is hired for this activity it should be used for three following days.

b) The construction plan for a single house in a 21-house project is as follows. All durations are in weeks. The deadline to complete all 21 houses is 36 weeks. Determine the proper crews to use. Before start of construction, you found out that you have to use one less crew in task B and two less in task F. Also, you get instructions to utilize double the crews in task E for the last 10 houses only. Draw the LOB chart that reflects the project with these changes. What will be the project duration?
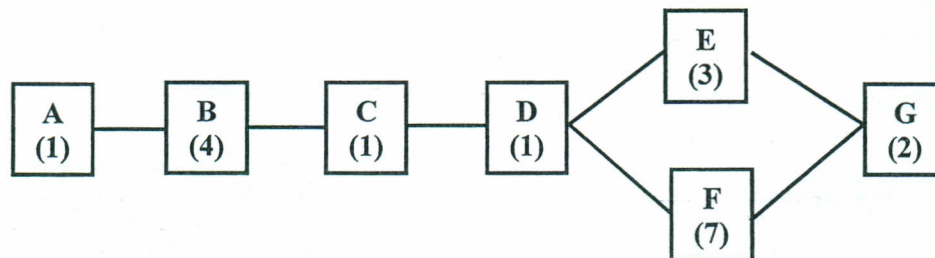
Question 2: (15 marks)

a) The bid data for 12 projects on which contractor C competed with competitor X is collected and presented in the shown histogram, draw the probability of beating competitor X vs. markup?
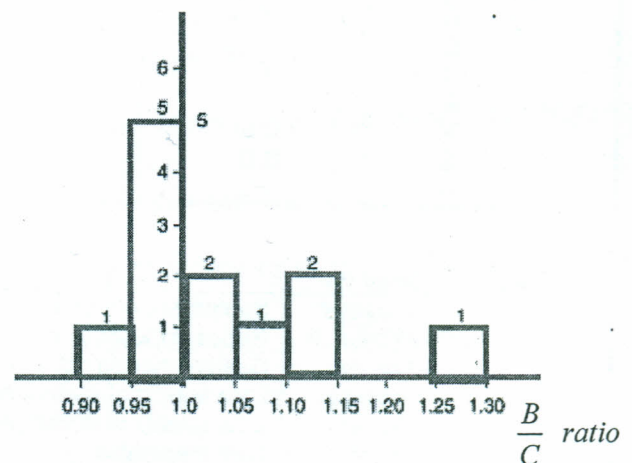
b) Assume that a typical competitor has a B/C ratio with $\sigma = 0.07$. Also, assume that the markups associated with a 23% probability of beating seven typical competitors is 6.5% using Friedman's model. Calculate the average markup used by this competitor in any bid?

Question 3: (15 marks)

a) A small project is shown, having the following properties:

Path 1: (A-B-F-G), Length 40 days,
           Standard Deviation 2 days

Path 2: (A-C-D-F-G), L=39 days, SD = 2.5 days

Path 3: (A-C-E-G), L = 38 days, SD = 3.0 days
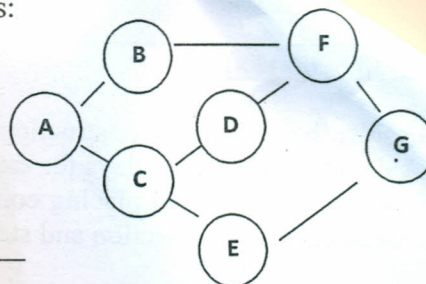
Answer related questions (Show all Calculations):

1. What is the mean total project duration: _____
2. What is the probability to finish in 39 days or less: _____
3. What is the probability to finish in 41 days or less: _____
4. What is the probability to finish in 46 days or less: _____
5. What is the additional days to add to reach 90% confidence level: _____

b) Figure 3 (page 4) shows a plan of the present site layout for the construction of Mansoura New Water Treatment Plant. Tabulate your criticisms for the present site layout and what are the corrections that could be made to enhance this layout?

Question 4: (30 marks)

Consider the following small contract along with resources usage for each activity in addition to the recorded work changes and delays.

a) Draw the as-built schedule and determine how each party is responsible for the contract delayed completion.

Activity	Predecessor	Duration (Days)	Resource Rate	
			Resource I (Max=6)	Resource II (Max=4)
A	---	8	2	1
B	A	12	1	2
C	---	5	3	0
D	C	10	2	2
E	---	7	2	3
F	C,E	15	4	2
G	B,D	8	3	0
H	F	2	1	2

No.	Delay By	Reason	Effective Dates	Affected Activity
1	Contractor	Equipment not on site	1-2	E
2	Owner	Redesign work in activity D	6-12	D
3	Owner	Design change (20% extra work)	--	F
4	Contractor	Late supply of materials	9-13	B
5	Owner	Late supply of drawings	10-12	F
6	Owner	Late inspection	25	B
7	Contractor	Equipment breakdown	25-26	F

b) Assume that resource "II" is a multi-skilled resource and one unit of "II" can substitute one unit of resource "I". It is required to schedule the project, using the earliest late start (ELS) rule so that the resources usage at any time period does not exceed the resource limits.

...ed Value plot for a project is show to the right (Figure 1) with the ACWP
... the three curves.
...e question marks by the appropriate answers:

BCWS

To-Date

Figure 1

BCWS

?
?

Cost Overrun
Schedule Advantage

Time

ACWP
BCWP

?

?

Time

CPI
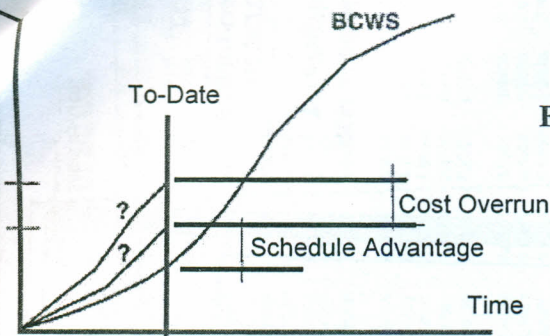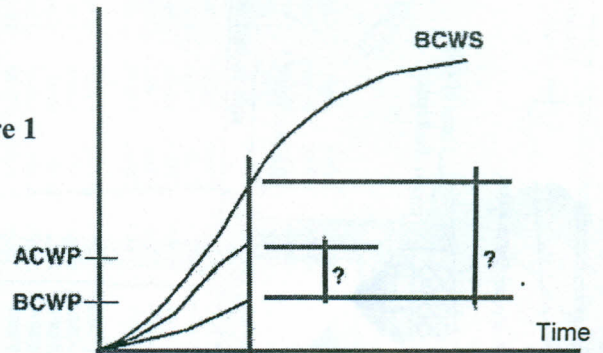
ii) Allocate the following project performance statuses on the **CPI-SPI** graph
  1. Cost overrun and schedule advantage
  2. On Cost and schedule delay
  3. On cost and according to the schedule
  4. Cost saving and schedule delay
  5. Allocate the progress status of the previous question of Figure 1.

Figure 2

1

SPI
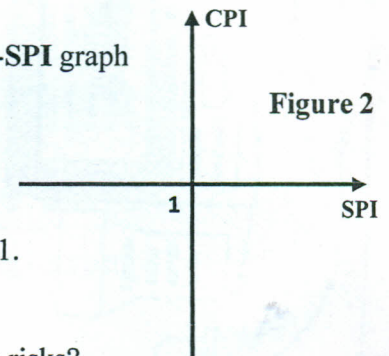
b) Choose the correct answer(s):
  i) Which of these is a valid response to negative risks and not positive risks?
        1. Exploit   2. Mitigate   3. Enhance   4.Share

ii) Which of the following is true about risks?
        1. The risk register documents all the identified risks in detail
        2. Risk impact should be considered, but probability of occurrence is not important
        3. Risks always have negative impact and not positive
        4. Risk Response Plan is another name for Risk Management Plan.

iii) During which stage of risk planning are risks prioritized based on their relative probability and impact?
        1. Perform Qualitative risk analysis   2. Identify Risks
        3. Perform Quantitative risk analysis   4. Plan Risk Responses

iv) If a project has a 60% chance of a LE 100,000 profit and a 40% chance of a LE 100,000 loss,
    the expected monetary value of the project is?
        1. LE **20,000** profit   2. LE **40,000** loss   3. LE **100,000** profit   4. LE **60,000** loss

v) Which of these statements about Risk in a project is correct?
        1. Risks are always negative in nature and are threats that need to be managed well
        2. A risk is always induced external to the project.
        3. Risk responses reflect an organization's perceived balance between risk taking and risk avoidance
        4. Risks need not be planned for in all projects

Figure 3: Site Layout

Labels on the figure:

- Entrance
- Batch plant office
- Water Reservoir Batch Plant
- Stand by Gen.
- Fuel tank
- Guard house # 2
- Truck mixer parking
- Cement storage
- TEMPORARY GRAVEL ROAD
- RAW WATER PUMP STATION
- Aggregate storage Area (1200 m²)
- Guard house # 1
- SERVICE ENTRANCE
- Warehouse (800 m²)
- Lay down area (1500 m²) for Rebar/Concrete forms
- Laydown area (1100 m²) for material storage
- OPERATIONS BUILDING
- CHLORINE BUILDING
- Indoor material storage
- Subcontractor's office
- First aid
- Lab
- Supervisor office
- Canteen
- PROCESS BASINS
- CLEAR WATER RESERVOIRS
- PARKING
- Contractor's office
- ROCK ALUM FACILITY
- Consultant office
- DECANT BASIN #1
- SLUDGE BASIN #1
- DECANT BASIN #2
- SLUDGE BASIN #2
- Workshop
- Yard area for metal work
- Stand by Gen.
- NEW MANSOURA WATER TREATMENT PLANT
- MOBILIZATION PRELIMINARY LAYOUT
- PLAN

With our Best Wishes   Examiners Committee: Prof. Emad Elbeltagi & Dr. Mahmoud Dawood

Standard Normal Cumulative Probability Table

Cumulative probabilities for NEGATIVE z-values are shown in the following table:

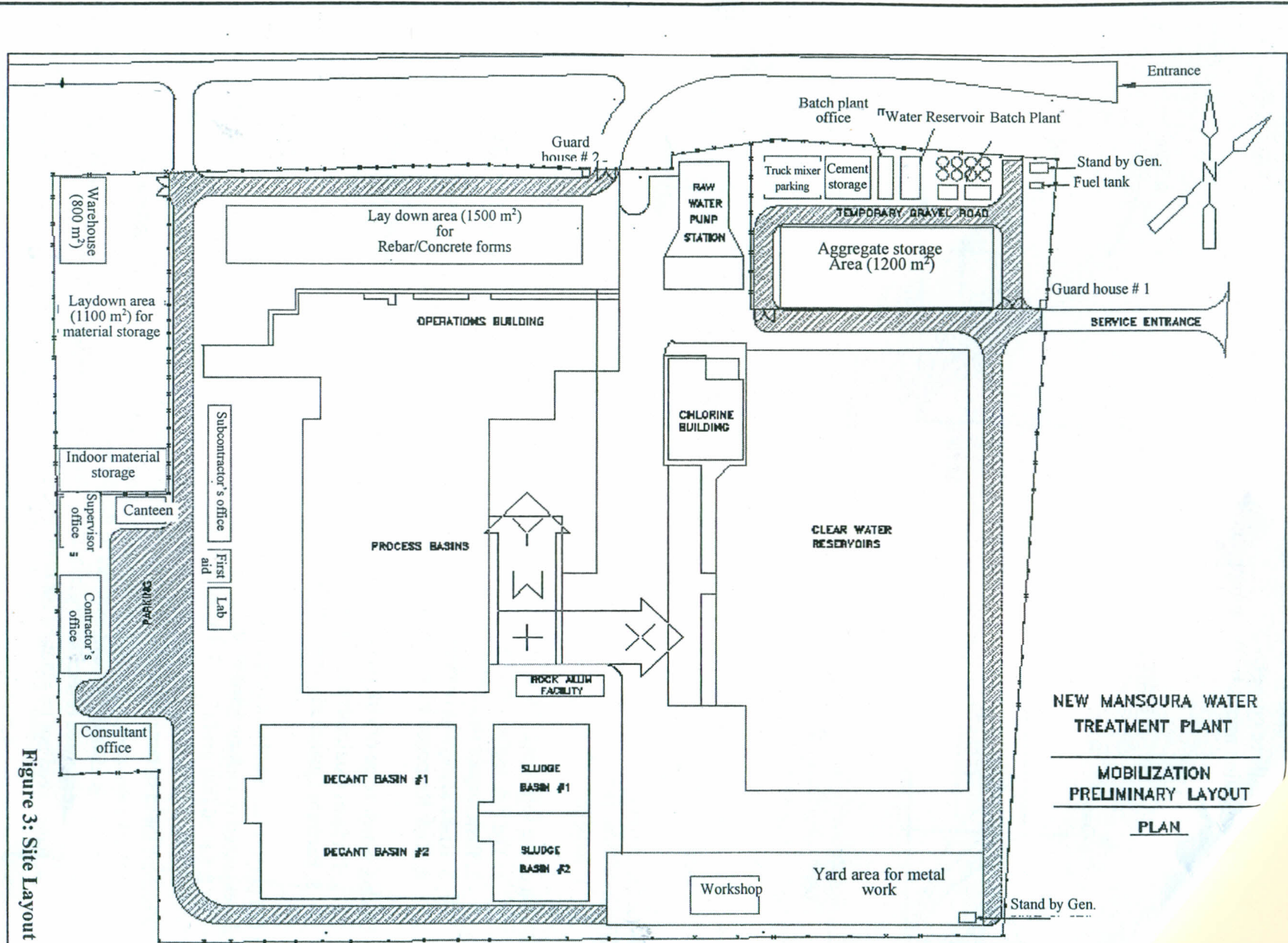| z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Standard Normal Cumulative Probability Table

Cumulative probabilities for POSITIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279		
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675		
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6	
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.64	
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.684	
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.78
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	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998