

1. (15%) In a CPM network, the critical path has five activities. Their durations are tabulated next.

Activity	Duration (Days)		
	Optimistic (T_o)	Most Likely (T_m)	Pessimistic (T_p)
A	2	5	9
B	3	4	8
C	4	6	9
D	5	10	20
E	3	5	9

Compute the following:

- The expected value and variance of project duration
- The probability that the project will finish by the end of day 34
- The completion date with at least a 95% confidence level

Hint:

Mean T_e (the expected duration) of the activity: $T_e = (T_o + 4T_m + T_p)/6$

Variance V_T and Standard deviation σ_T of the activity distribution: $V_T = \sigma_T^2 = [(T_p - T_o)/6]^2$

Z Table: Cumulative Probability of the Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7610	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817

見背面

2. (20%) Draw both the AOA (Activity on Arrow) network and the AON (Activity on Node) network for the following project, and use one of them to perform the CPM calculations, mark the critical path, and complete the following table.

Activity	Duration	IPA	Early Start (ES)	Early Finish (EF)	Late Start (LS)	Late Finish (LF)	Total Float (TF)	Free Float (FF)	Interfering Float (IF)
A	6	-							
B	2	-							
C	8	A							
D	5	A, B							
E	3	B							
F	5	C, D							
G	6	D, E							
H	2	F, G							

IPA: Immediate Predecessor(s)

3. (5%) Is a contractor entitled to an extension of time if he/she encounters bad weather during construction? Explain.
4. (10%) Traditionally, the two most widely used formats of construction contracts are the competitively bid contract and the negotiated contract. Describe each format briefly, and state when each format would be most applicable.
5. (20%) 請簡述業主、專案管理 (PCM)、建築師、及營造廠在工程中所扮演的角色與其責任，並簡述傳統制度與統包制度對上述角色任務的影響。
6. (9%) 請舉出三項專業營造業登記之專業工程項目
7. (10%) Please describe Taiwan's construction industry's challenges and opportunities in 2022
8. (11%) What is the definition of IRR (internal rate of return) and NPV (net present value)? How to decide when to use IRR vs. NPV?

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