Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	CONSTRUCTION PLANNING AND SCHEDULING
COURSE CODE	:	BFP 40103
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	DECEMBER 2014/ JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Discuss TWO **(2)** importances of Work Breakdown Structure (WBS) in construction planning.

(5 marks)

(b) In a Critical Path Method (CPM) network, the critical path has six activities. Their durations are tabulated in Table **Q1**.

Table **Q1**: Optimistic Duration (T_o), Most Likely Duration (T_m) and Pessimistic Duration (T_p) for Critical Activities.

	Duration (Days)		
Activity	Optimistic (T_o)	Most Likely (T_m)	Pessimistic (T_p)
B	2	3	5
D	4	8	13
F	5	6	8
K	3	3	3
N	7	10	15
S	3	5	8

Referring to Table **Q1(a)** for Cumulative Probability of the Standard Normal Distribution value, compute the following:

(i) The probability that the project will finish by the end of day 36.
(ii) The probability that the project will finish by the end of day 39.
(iii) The probability that the project will finish before day 38.
(iv) The probability that the project will finish on the 35th day.
(v) The probability that the project will finish at least 3 days early
(vi) The probability that the project will finish no more than 4 days late.
(vii) The completion date with at least a 90% confidence level.

(20 marks)

Q2 (a) In project management, the term 'resources' was used to indicate three main categories: labor (human), materials and equipment. Explain the two categories of labor and provide examples for each category to support your answer.

(5 marks)

(b) Table **Q2** show the labor data for one project in Penang. Based on the data provided, manually level your resources with a maximum eight laborers per day. Improve the daily resources use in the project by starting from low, increase the resources use gradually till it peaks around the middle and gradually decrease towards the end of the project. Use Precedence Diagram Method (PDM) to show your network.

Table **Q2**: Labor data for Project in Penang.

Activity	Duration (days)	Predecessor	Laborers/day
A	6	-	2
B	2	-	3
C	9	-	3
D	4	A,B	3
E	7	B	4
F	5	D	2
G	10	D,E	3
H	8	C,F,G	1
I	3	C,G	2
J	2	H,I	3

(20 marks)

Q3 (a) Contractor's main expenses normally involves 'direct cost' and 'indirect cost'. Explain the meaning of 'direct cost' and 'indirect cost' for construction. Provide example of each type of cost in your answer.

(5 marks)

(b) Using data provided in Table **Q3**, perform the crashing program by doing the following:

(i) Generate the network diagram for the project using Arrow Diagram Method (ADM).

(ii) Calculate the least cost and crash durations for critical activities.

(iii) Calculate the total cost associated with each duration. Indirect (overhead) cost is RM200 per day.

(iv) Based on your analysis, conclude on your Least-Cost-Duration (LCD) for the project.

Table **Q3**: Normal Cost and Crash Cost Data

Activity	Predecessor	Duration (days)		Cost (RM)	
		Normal	Crash	Normal	Crash
A	-	1	1	800	800
B	A	7	4	1000	1600
C	A	6	4	300	500
D	A	3	2	400	800
E	B	3	1	100	200
F	B,C	7	5	500	800
G	D	8	4	1200	1400
H	E	7	6	350	600
I	F	5	3	700	850
J	F,G	3	2	500	1000
K	H,I,J	5	4	450	800

(20 marks)

Q4 (a) Define the meaning of project planning and scheduling.

(5 marks)

(b) Provide an earned-value analysis to evaluate the progress of the sewer and water lines project shown in Figure **Q4 (a)** and **Q4 (b)**. The original budget is $147,500 and the project is schedule to be completed in 94 working days. A status report after 10 working days into the project includes the following information:

Activity 10, 100% complete as schedule, actual cost = $1,500
Activity 20, 100% complete as schedule, actual cost = $2,200
Activity 30, 100% complete as schedule, actual cost = $4,000

(i) Determine the Budgeted Cost Work Performed (BCWP), Actual Cost Work Perform (ACWP), Budgeted Cost Work Schedule (BCWS) and Budget at Completion (BAC) for the project.
(ii) Evaluate the Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI) and Schedule Performance Index (SPI) for the project and report on the project status after 10 working days.
(iii) Evaluate the project status at the end of the contract by performing schedule forecasting to evaluate the ETC and EAC.

(20 marks)

-END OF QUESTIONS-

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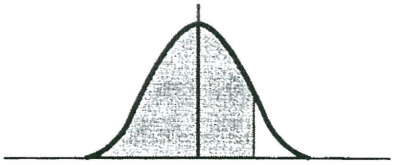
Table Q1 (a): Cumulative Probability of the Standard Normal Distribution

CUMULATIVE PROBABILITIES OF THE NORMAL DISTRIBUTION (AREAS UNDER THE STANDARDIZED NORMALIZED CURVE FROM $-\infty$ TO z)



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	0.5319	0.5359
0.1	0.5389	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
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

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****
** INPUT DETAILS **
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PROJECT: SEWER & WATER LINE

ACTIVITY LIST:

NUMBER	CODE	DESCRIPTION	DURATION	COST	ASSIGNED START
10	5000	MOVE ON SITE	3	1400.	
20	1100	SURVEY SEWER LINES	4	2700.	
30	1200	EXCAVATE FOR MANHOLES	3	3500.	
40	1200	INSTALL MANHOLE FORMWORK	5	6000.	
50	1200	PLACE CONCRETE MANHOLES	5	4700.	
60	1300	TRENCH SEWER LINE	10	12600.	
70	1200	STRIP MANHOLE FORMWORK	2	2100.	
80	1400	LAY SEWER PIPE	15	11250.	
90	1200	INSPECT MANHOLES	1	800.	
100	1300	REMOVE TRENCHING EQUIPMENT	2	1400.	
110	1500	BACKFILL SEWER TRENCH	6	3600.	
120	5000	SEWER LINE COMPLETE	0	0.	
130	2110	SURVEY WATER LINE A	6	4000.	
140	2120	SURVEY WATER LINE B	5	3400.	
150	3000	UNDERGROUND ELECTRICAL	5	2500.	
160	4000	DRILL WATER WELL	12	7000.	
170	2310	TRENCH WATER LINE A	9	8800.	
180	2410	LAY PIPE FOR WATER LINE A	7	16800.	
190	2320	TRENCH WATER LINE B	16	15600.	
200	2510	BACKFILL WATER LINE A	2	900.	
210	2420	LAY PIPE FOR WATER LINE B	14	33600.	
220	2520	BACKFILL WATER LINE B	3	2850.	
230	3000	INSTALL WATER METERS	1	600.	
240	4000	SET WATER PUMP	2	1400.	
250	5000	PROJECT COMPLETE	0	0.	

SEQUENCE OF ACTIVITIES:

FROM	TO
10	20
20	30
30	40
40	50
40	60
50	70
60	80
70	90
80	90
80	110
80	100
90	120
100	120
110	120
120	130
120	160
120	150
120	140
130	170
140	190
150	230
160	240
170	180
170	190
180	200
180	210
190	210
200	220
210	220
220	250
230	250
240	250

Project Start Date: April 1, 2002
Five-Day Work Week
No Assigned Holidays

FIGURE Q4 (a): Computer Input Data File for Sewer and Water Lines Project

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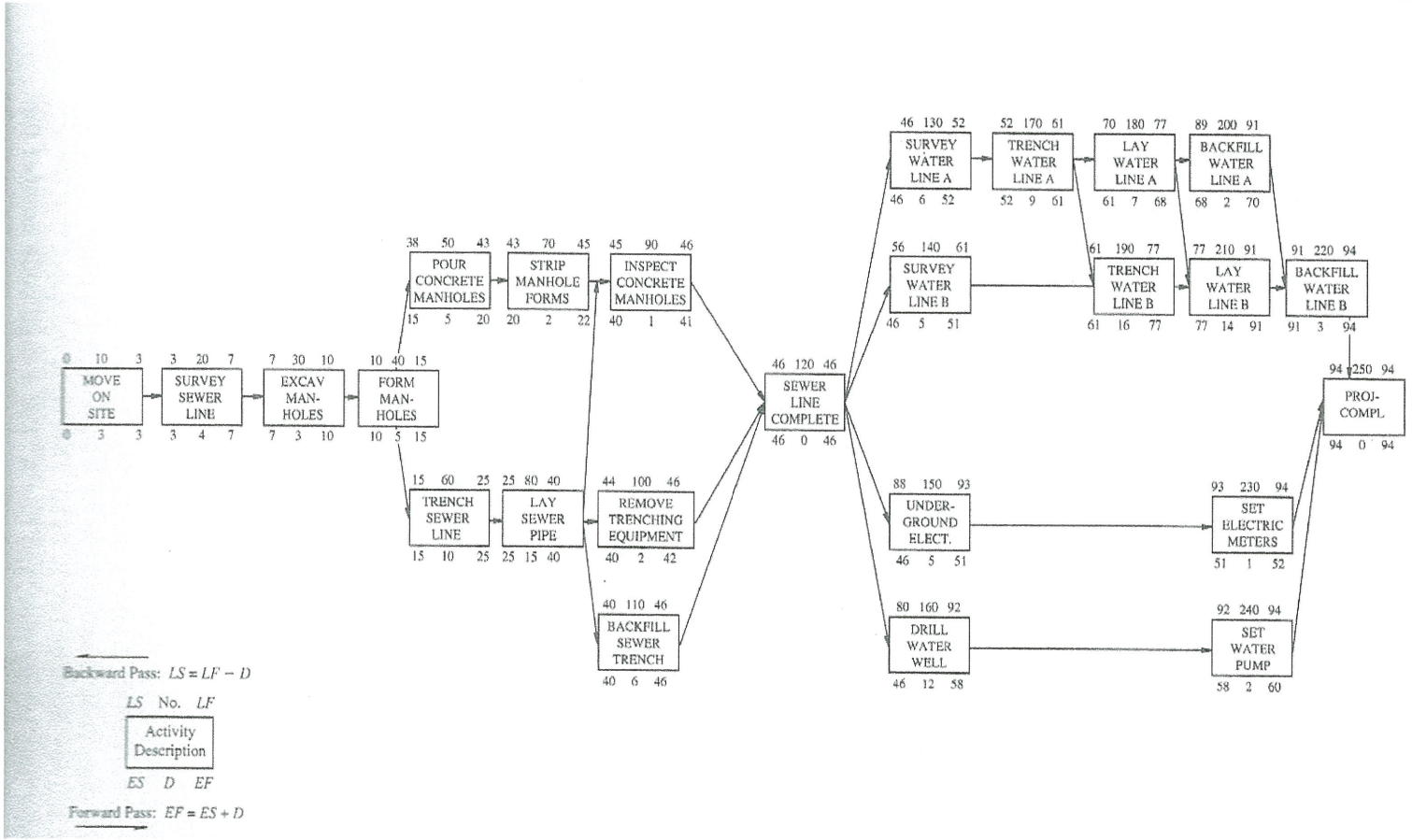

FIGURE Q4 (b): CPM Diagram for Construction Phase of Sewer and Water Lines Project.