CEL 464 **Construction Economics and Contract Management** **MAJOR**
Venue VI 301 **Time : 8:00- 10:00** **27.11.2014**

ANSWER ALL QUESTIONS. ASSUME MISSING DATA IN CASE REQUIRED.

Q 1 A flood control pumping station is being designed. Three possible pumping schemes are proposed and the relevant costs are shown in the following table. What is the most economical range of pumping time in hours/ years for each scheme? Figure shows the frequency of pumping demand. What is the most economical scheme? The cost of capital may be taken as 19%. **(10 marks)**

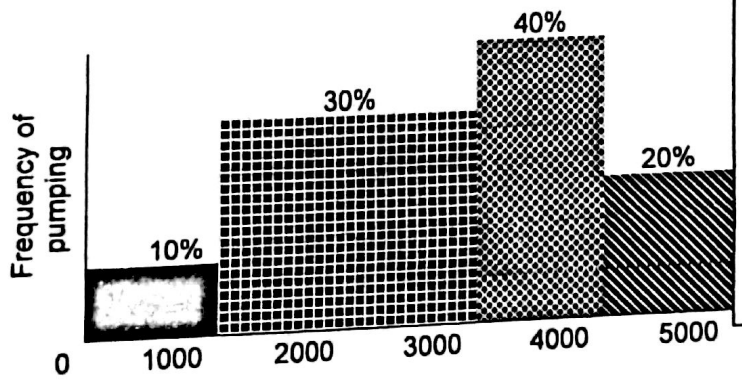
Table: cost of alternative schemes

	A	B	C
Cost of pumps ($)	12000	18000	28000
Life (years)	15	15	20
Maintenance per annum ($)	1000	1500	1500
Cost of pipes ($)	22000	18000	12000
Life (years)	30	30	30
Cost of pumping (cent per hour)	120	90	80

Note:
Capital recovery factor (CRF) for i= 19% and n=15 years = 0.20509

For i=19% and n=20 years CRF = 0.19604

For i=19% and n=30 years CRF =0.19103



Q 2 The records of 30 previous bids in which you and your competitor have participated are given in the following table. The bidding behavior of a typical competitor against you *(his bid/your* cost), as a contractor, can be shown in the following histogram. **(10 marks)**

Sl No.	B/C Ratio (Competitor's bid price ÷ your cost)	No of bids
01	1.04	6
02	1.08	12
03	1.12	3
04	1.16	6
05	1.2	3

(a) Based on the above behavior, what is the markup value that this competitor uses on average? What is the probability of winning this competitor if you use a markup of 14%?

(b) In a new project with a $1,000,000 estimated cost, what is your optimum markup strategy against four typical competitors using Friedman's model? What is the expected profit at optimal markup?

Q 3 Two pumps can be used for pumping a corrosive liquid. A pump with a brass impeller costs Rs 40,000 and is expected to last for three years. A pump with a stainless steel impeller will cost Rs 95,000 and lasts for five years. An overhaul costing Rs 15,000 will be required after 2000 operating hours of brass one while overhaul of Rs 35,000 for stainless steel after 9000 hours. If the operating cost of each pump is Rs 25/hour, how many hours /year must the pump be required to justify the purchase of expensive pump? (Use interest rate of 10% /yr.) **(10 marks)**

(A/P, 10%,3)=0.3951, (A/P,10%,5)=0.2571

Q 4 Write short notes on the following (not more than 2-3 sentences):**(1x 10= 10 marks)**

(a) markup
(b) mobilization advance
(c) escalation
(d) power of attorney
(e) letter of intent
(f) liquidated damage
(g) quantity variation clause in a contract
(h) closure of contract
(i) running bill
(j) cost code

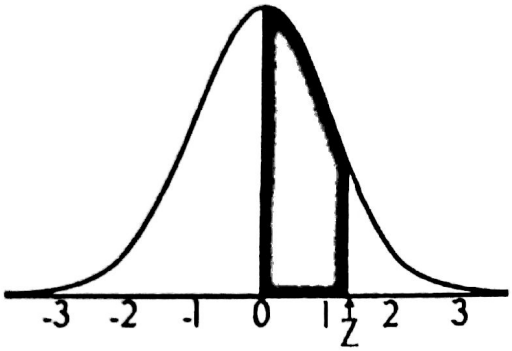
Q 5 The purchase price of a small electricity generating plant is $20000. The operating costs based on the annual average estimated hours of operation are $800 in the first year, when manufacturer's warranties operate, and $1200 in the second year, rising by $300 each year thereafter. The resale value of the plant can be assumed to be as predicted in Table below. The cost of capital is 15%. Calculate the optimum replacement age. **(10 marks)**

Year	Predicted resale values $
1	18000
2	16000
3	15000
4	12000
5	8000
6	5000
7	2000

(A/P, 15%,1)=1.1500, (A/P,15%,2)=0.6151,(A/P,15%,3)=0.4380,(A/P,15%,4)=0.3503, (A/P,15%,5)=0.2983, (A/P,15%,6)=0.2642, (P/F,15%,1)=0.8696, (P/F,15%,2)=0.7561, (P/F,15%,3)=0.6575, (P/F,15%,4)=0.5718, (P/F,15%,5)=0.4972, (P/F,15%,6)=0.4323.

Appendix 5

STANDARD NORMAL DISTRIBUTION



The following table can be used to find the area under the curve from the central line to any Z-value up to 3.
To determine the area under the curve between 0 and 1.35, start at the row for 1.3, and read along until 1.35. The value corresponding to Z = 1.35 is 0.4115.

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990