



CEX7107 - Construction Productivity & Quantitative Techniques

FINAL EXAMINATION - 2008

Time Allowed: Three Hours

Date: 2009 - 03 - 09 (Monday)

Time: 0930 - 1230 hrs

Answer Four (04) questions. Statistical Tables will be provided.

**SECTION A - CONSTRUCTION PRODUCTIVITY**

- Q1.
- i.) Productivity of construction site operations is influenced by several factors, which could be basically categorized as 'technical' and 'social'. With sound reasoning, identify five (05) most significant 'social' factors that could affect the Productivity of a construction site. (08 marks)
  - ii.) Clearly differentiate between Remuneration and Incentives and compare the advantages and disadvantages of following two financial incentive schemes in the context of highway construction workers.
    - i.) Piecework schemes
    - ii.) Geared schemes(08 marks)
  - iii.) A Construction Project Manager chairing a progress review meeting where main as well as sub-contractors of the project are participating, needs to be prepared in a few strategic areas in advance to make the meeting productive. Identify and describe these strategic items. (09 marks)
- Q2.
- i.) State the definition of 'Method Study' as closely as possible according to BS 3138 and describe five (05) main objectives of this method when applied to construction industry. (08 marks)
  - ii.) Describe the salient features of a good Incentive Scheme, which could be applied to, concrete mixing and placing work gangs in the building construction industry. You should bear in mind of the socio-economic background, work attitudes, etc., of the employees in formulating the answer to this question. (08 marks)
  - iii.) Discuss the advantages of using the method known as 'Activity Sampling' in productivity evaluation of construction work in the light of convenience, economy, speed and validity. (09 marks)
- Q3.
- i.) Managing the working time is one of the most difficult tasks faced by Project Managers. As a result productivity of a Project Manager is significantly undermined by situations that can be described as 'Time Robbers'. Briefly describe in the context of Sri Lankan construction industry, ten (10) of the most significant such situations. (08 marks)
  - ii.) A Construction Project Manager, by nature of his duties of coordinating construction contractors has to resort to negotiation several times in the duration of a project. Define the term "negotiation" and prepare a list of guidelines of application for the process to be effective. (08 marks)
  - iii.) Describe and discuss the bearing of following factors related to personnel, on construction productivity;
    - a.) Stress
    - b.) Energy cycle(09 marks)



**SECTION B - QUANTITATIVE TECHNIQUES**

**Q4.** A building construction contractor purchases electronic door locks from one of the two alternative manufacturers *P* and *Q*. Amount of defective locks in the supply by *P* is about 5%, while with *Q* it is about 8%. A lot of 500 locks for a hotel project consist of 60% supplied by *P*. From this lot of 500, a batch of 50 locks for a particular floor is randomly selected.

- i.) Compute the probability of finding a defective lock. (05 marks)
- ii.) Estimate the expected number of defective locks in the batch of 50. (05 marks)
- iii.) What is the probability that all 50 locks for the floor are in good condition? (05 marks)
- iv.) What is the probability of finding at least one defective lock from the batch of 50? (05 marks)
- v.) If the contractor saves Rs. 1600/- from each of the locks in good condition and the lose Rs. 1100/- for each defective, estimate the net savings for the contractor from the 500 locks. (05 marks)

**Q5.**

The life time of CFL bulbs manufactured by a certain company are normally distributed with an average life of 8000 hours and a standard deviation of 800 hours.

- i.) What percentage of CFL bulbs could be expected to have a lifetime of more than 9000 hours? (08 marks)
- ii.) If a batch of 1000 randomly chosen CFL bulbs is inspected, estimate the number of bulbs that will last more than 8800 hours. (08 marks)
- iii.) What life time limits would you expect to contain central 80% of CFL bulbs? (09 marks)

**Q6.**

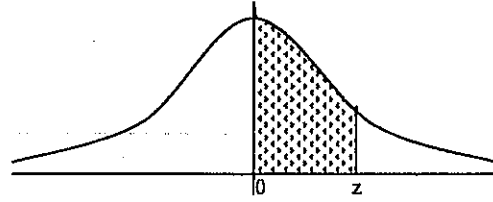
A cement manufacturing company claims that the new blended cement they have developed gives higher compressive strength in concrete as compared to OPC cements available in the market. The 28 day compressive strength (MPa) of 20 concrete cubes made out of the new blended cement according to a given mix proportion are given below, which could be assumed to be normally distributed. From the past experiments, it is known that for the particular mix proportion the 28 day mean compressive strength of cubes with OPC cement is 60 MPa.

59	61	53	64	57	59	62	61	57	57
56	64	64	62	61	63	58	59	59	60

- i. Give an estimate for the mean compressive strength with the new cement. (03 marks)
- ii. Clearly state the null and the alternative hypotheses you would test to examine the validity of the cement manufacturer's claim, stating whether these are one sided or two sided hypotheses. (05 marks)
- iii. Suggest a test statistic that can be used to test the validity of the hypothesis stated in part (ii). (05 marks)
- iv. Test the hypothesis stated in part (ii) using a 5% level of significance and clearly state your conclusions. (07 marks)
- v. Will you still use the statistic stated in part (iv), if the population variance of the compressive strengths of the new cement is known to be 20 MPa? If not, suggest the changes. (05 marks)

# Standard Normal Distribution

Areas under the Standard Normal Curve  
From 0 to z for various values of z



z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0	0.004	0.008	0.012	0.016	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	0.0754
0.2	0.0793	0.0832	0.0871	0.091	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	0.148	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.17	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	0.219	0.2224
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	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	0.2996	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	0.437	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	0.475	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	0.483	0.4834	0.4838	0.4842	0.4846	0.485	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	0.496	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.497	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	0.498	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
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.49995	0.49995	0.49996	0.49996	0.49996	0.49996	0.49996	0.49996	0.49997	0.49997
4.0	0.49997									
4.5	0.49999									
5.0	0.49999									

