BITS PILANI K.K. BIRLA GOA CAMPUS

I SEMESTER 2019-20 MIDTERM EXAM

ECON F213: Mathematical and Statistical Methods in Economics

Total Marks: 30 5/10/2019 Time: 90 minutes

Instructions:

1. **Make an Index of your answers in the Main Answer Book**
2. **Maintain the sequence of questions while writing your answers.**

Part A

1. Consider a competitive market characterized by demand function $Q_D = \alpha - \beta P$, and supply function $Q_S = \gamma + \delta P$, where $\alpha, \beta, \delta > 0$ and $\gamma < 0$. Analyze the impact of the following 2 alternative policies on the endogenous variables in this model.

   a) The government would give subsidy of s per unit to the producers.
   b) The government would give subsidy of s per unit to the consumers.

   You are expected to provide mathematical and graphical analysis. [5]

2. Consider a profit maximizing firm operating in a perfectly competitive market where market price is P*. The Total cost function of the firm is F+C(q) where F is fixed cost and C(q) is variable cost of production. Suppose initially the profit maximizing output of the firm is q*.

   Examine the validity of the following statement using mathematical and graphical analysis: "If the government imposes a lump-sum (fixed) tax of T on the firm, then the firm should optimally reduce its output level below q*." [5]

3. Consider a profit-maximizing firm operating in a perfectly competitive market. Suppose the Total Cost function of the firm is $\frac{1}{10}q^3 - 3q^2 + 50q + 300$, where q denotes output produced. If market price is 20, calculate the optimal output of this profit-maximizing firm. Show all the relevant steps for full credit. [5]

Part B

4. a. Compute the quartiles of the distribution given below. Which graph you would prefer to use for checking those calculated values. Draw the graph manually. [2+1=3]

Height in inches	57.5-60	60-62.5	62.5-65	65-67.5	67.5-70	70-72.5	72.5-75
Number of students	6	26	190	281	412	127	38

b. Why Standard Deviation is more important characteristic than Variance? [1]

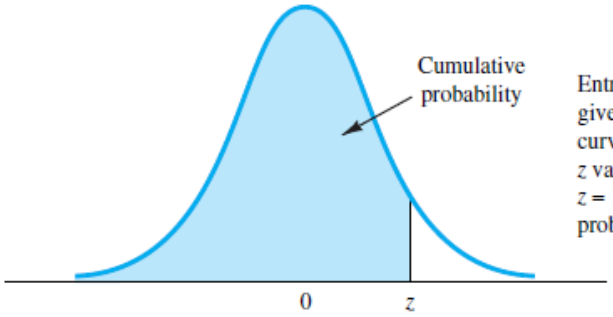
5. Customers are used to evaluate preliminary product design. In the past, 95% of highly successful products received good reviews, 60% of moderately successful products received good reviews, and 10% of poor products received good reviews. In addition, 40% of products have been highly successful, 35% have been moderately successful, and 25% have been poor products.
   a. Calculate the probability that a product attains a good review with the help of a tree diagram. [2]
   b. If a new design attains a good review, what is the probability that it will be a highly successful product? [1]
   c. If a product does not attain a good review, what is the probability that it will be a highly successful product? [1]

6. An installation technician for a specialized communication system is dispatched to a city only when three or more orders have been placed. Suppose orders follow a Poisson distribution with a mean of 0.25 per week for a city with a population of 100,000 and suppose your city contains a population of 800,000. What is the probability that a technician is required after a one-week period? [2]

7. Assume that yesterday the high prices of a commodity followed normal random variable with mean=10 and std. dev= ¼. What is the shortest interval that has probability 0.95 including yesterday's highest price of the commodity? [2.5]

8. Explain the lack of memory property of the exponential distribution. [2.5]

CUMULATIVE PROBABILITIES FOR THE STANDARD NORMAL DISTRIBUTION



Entries in the table give the area under the curve to the left of the z value. For example, for $z = 1.25$, the cumulative probability is .8944.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.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
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990