

Time allowed: 2 hr 30 min

Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means**. In case of rough work, please use answer sheet.

Section A: Short answer questions (Five marks each. Attempt three; total marks 15)

- A1. Considering the 'transformation process' view of the operations function, name and give examples of any four different kinds of transformation processes.
- A2. Are you in favour of simplification and standardization in product design? Give reasons for your answer.
- A3. Give five differences between a process layout and a product layout.
- A4. List any three characteristics of services and briefly write about the implications these have for designing of services.
- A5. A) What do you mean by process capability ratio? How does it differ from process capability index?
B) The Meghna Company manufactures parts for an aircraft company using three computerized numerical controlled (CNC) turning centers. The company wants to decide which machines are capable of producing a specific part with design specifications of $0.0970 \text{ cm} \pm 0.015 \text{ cm}$.

The machines have the following process parameters:

Sr. No.	Machine Process mean (cm)	Standard deviation (cm)
1.	0.0995	0.004
2.	0.1002	0.009
3.	0.0950	0.005

Determine which machines (if any) are capable of producing the part.

Section B: 10 marks each. Attempt any 2; total marks 20

- B1. Today Drip Coffee Ltd. Produces commercial coffee machines that are sold all over the world. The Company's production has operated at near capacity for a year now. The company thinks that the sales growth will continue and wants to develop long range forecast to help plan facility requirements for the next three years. The sales records for the past ten years have been compiled as follows:

Year	Annual Sales	Year	Annual sales
1	1000	6	2000
2	1300	7	2200
3	1800	8	2600
4	2000	9	2900
5	2000	10	3200

- (a) Compute the 'next period' forecasts for the given period using a three years moving average method, and a simple exponential smoothing method assuming alpha value to be 0.20.
- (b) Which of these methods is better? You may wish to decide based on your estimation of the BIAS (mean deviation) and the MAD.
- (c) Looking at the demand data, could there be an even better method of forecasting in this case?
- B2. The weekly requirement of furnace oil in a foundry has mean of 3,000 litres and a standard deviation of 900 litres. A litre of furnace oil costs Rs. 400 and the annual carrying cost is 25%. If the foundry uses a continuous review system with a desired service level of 90%, then
- (a) What will be the reorder point and safety stock for furnace oil if the lead time for supply is 1 week?
- (b) What will be the service level if the reorder point is changed to 3,100 litres?
- (c) If the reorder point is left unchanged when there is a 5% increase in the mean demand, how will it affect the service level?
- B3.
- (a) Discuss any four tools of quality. Develop a fish bone diagram for the possible causes of a flight delay.
- (b) Name the generic competitive priorities (performance objectives). Give two examples to describe how firms can use operations decision areas as competitive weapons.

Section C: 15 marks

SeeCo is a TV manufacturer in need of an aggregate plan for July through December. The company has gathered the following data:

COSTS	
Holding cost	Rs.400/TV/month
Regular-time labour	Rs.500/hour
Hiring cost	Rs.2000/worker
Layoff cost	Rs.4000/worker

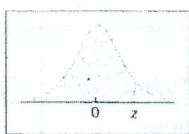
DEMAND	
Jul	400
Aug	500
Sep	550
Oct	700
Nov	800
Dec	700

OTHER DATA	
Current workforce	8 people
Labour hours/TV	4 hours
Workdays/month	20 days
Regular hours/day	8 hours
Beginning inventory	150 TVs

What will the two following strategies cost?

- a. Vary the workforce to have exact production to meet the forecast demand. Begin with eight workers at the end of June. No overtime is allowed.
- b. Start with 15 workers instead of 8, and do level production (regular hours each day) while holding inventory. No hiring or layoff is allowed.

Cumulative Areas under the Standard Normal Curve (continued)



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	0.5398	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	0.7518	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	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99897	0.99900
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983
3.6	0.99984	0.99985	0.99985	0.99986	0.99986	0.99987	0.99987	0.99988	0.99988	0.99989
3.7	0.99989	0.99990	0.99990	0.99990	0.99991	0.99991	0.99992	0.99992	0.99992	0.99992
3.8	0.99993	0.99993	0.99993	0.99994	0.99994	0.99994	0.99994	0.99995	0.99995	0.99995
3.9	0.99995	0.99995	0.99996	0.99996	0.99996	0.99996	0.99996	0.99996	0.99997	0.99997