Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Total Quality Management **Semester: IV**
Program: BBA-OM **Time : 03 hrs.**
Course Code: LSCM 2019 **Max. Marks: 100**

Instructions:

SECTION A
10Qx2M=20Marks

S. No.		Marks	CO
Q1	Discrete data is also known as _____ a) Continuous data b) Disputed data c) Variable data d) Attribute data	**2 Marks**	**CO1**
Q2	Quality is fitness for use. Identify the quality guru who said this. a) Deming b) Crosby c) Juran d) Taguchi	**2 Marks**	**CO1**
Q3	It is important to know about _____ for quality planning. a) Customer needs b) Customer quality c) Customer satisfaction d) Manager satisfaction	**2 Marks**	**CO1**
Q4	Which of the following does not belong to the 'Define' activity in the DMAIC Model of Six Sigma? a) Determination of customer requirements b) Determination of CTQs	**2 Marks**	**CO1**

	c) Validating the measurements d) Mapping the process		
Q5	The Six Sigma model used for improving the existing process/product is _____ a) DMAIC b) DMAAD c) DMADV d) DMAAX	**2 Marks**	**CO1**
Q6	Specification limits are also known as _____ of the product. a) Mode b) Median c) Tolerances d) Allowances	**2 Marks**	**CO1**
Q7	The control chart that determines the fraction of rejected parts as non-conforming is _____ a) R-chart b) S-chart c) P-chart d) C-chart	**2 Marks**	**CO1**
Q8	In which among the following is the Six Sigma process not applicable? a) Healthcare b) Business administration c) Selecting the best employee of the year d) Supply Chain	**2 Marks**	**CO1**
Q9	PDCA cycle is used for _____ a) Continuous improvement b) Discontinuous improvement c) Intermittent improvement d) Seldom improvement	**2 Marks**	**CO1**

Q10	Ryan works in a company that follows TQM and produces nuts and bolts. The company has not moved much from its old design of nuts and bolts. Ryan's creativity leads him to a better and effective design of nuts and bolts at the same production cost as before. It can increase the productivity without compromising quality. Should the company implement Ryan's design? a) Yes, everyone is recognized in a company which follows TQM b) No, everyone is not recognized in a company which follows TQM c) Design implementation is the responsibility of the design team only d) Modern trends must not dominate and make the company lose its originality	**2 Marks**	**CO1**
SECTION B **4Qx5M= 20 Marks**			
Q1	Find the C_p and C_{pk}, Whose USL, LSL, σ, and μ are 12, 7, 4 and 10.	**5 Marks**	**CO2**
Q2	Illustrate is the random and assignable variation in quality control.	**5 Marks**	**CO2**
Q3	Suppose we observe 200 letters delivered incorrectly to the wrong addresses in a small city during a single day when a total of 200,000 letters were delivered. What is the DPMO in this situation?	**5 Marks**	**CO2**
Q4	Explain the Taguchi loss function.	**5 Marks**	**CO2**
SECTION-C **3Qx10M=30 Marks**			
Q1	Describes the Six-Sigma phases and their tools. Also explains the difference between DMAIC vs DMADV.	**10 Marks**	**CO3**
Q2	Write a short note on ISO 9000 and ISO14000.	**10 Marks**	**CO3**
Q4	Frozen orange juice concentrate is packed in 6-oz cardboard cans. These cans are formed on a machine by spinning them from cardboard stock and attaching a metal bottom panel. By inspection of a can, we may determine whether, when filled, it could possibly leak either on the side seam or around the bottom joint. Such a nonconforming can has an improper seal	**10 Marks**	**CO3**

on either the side seam or the bottom panel. Set up a control chart to improve the fraction of nonconforming cans produced by this machine. Consider Sample Size n=50.

Table 1 Data for trial Control limits.

Sample	Number of Nonconforming Cans
1	12
2	15
3	8
4	10
5	4
6	7
7	16
8	9
9	14
10	10
11	5
12	6
13	17
14	12
15	22
16	8
17	10
18	5
19	13
20	11
21	20
22	18
23	24
24	15
25	9
26	12
27	7
28	13
29	9
30	6

SECTION-D
2Qx15M= 30 Marks

<table>
<tr>
<td>Q1</td>
<td>Customer tolerances for the height of a steering mechanism are 1.5± 0.020 m. For a product that just exceeds these limits, the cost to the customer for getting fixed is Rs 50. Ten products are randomly selected and yield the following heights (in meters) : 1.53,1.49,1.50,1.49,1.48,1.52,1.54,1.53,1.51 and 1.52. Find the average loss per product item.
OR
Table 2. presents the number of nonconformities observed in 26 successive samples of 100 printed circuit boards. Note that, for reasons of convenience, the inspection unit is defined as 100 boards. Set up a C-chart for these data.

Table 2. Data on the Number of Nonconformities in Sample of 100 Printed Circuit Board.
<table>
<tr><th>Sample Number</th><th>Number of Non-Conforming</th><th>Sample Number</th><th>Number of Nonconforming</th></tr>
<tr><td>1</td><td>21</td><td>14</td><td>19</td></tr>
<tr><td>2</td><td>24</td><td>15</td><td>10</td></tr>
<tr><td>3</td><td>16</td><td>16</td><td>17</td></tr>
<tr><td>4</td><td>12</td><td>17</td><td>13</td></tr>
<tr><td>5</td><td>15</td><td>18</td><td>22</td></tr>
<tr><td>6</td><td>5</td><td>19</td><td>18</td></tr>
<tr><td>7</td><td>28</td><td>20</td><td>39</td></tr>
<tr><td>8</td><td>20</td><td>21</td><td>30</td></tr>
<tr><td>9</td><td>31</td><td>22</td><td>24</td></tr>
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<tr><td>12</td><td>24</td><td>25</td><td>17</td></tr>
<tr><td>13</td><td>16</td><td>26</td><td>15</td></tr>
</table>
</td>
<td>15 Marks</td>
<td>CO4</td>
</tr>
<tr>
<td>Q2</td>
<td>The mortgage loan processing unit of a bank monitors the costs of processing loan applications. The quantity tracked is the average weekly processing costs, obtained by dividing total weekly costs by the number of loans processed during the week. The processing costs for the most recent</td>
<td>15 Marks</td>
<td>CO4</td>
</tr>
</table>

20 weeks are shown in Table 3. Set up individual and moving range control charts for these data.

Consider,

$d_2 = 1.128$
$D_3 = 0$
$D_4 = 3.267$

Table 3. Cost of Processing Mortgage Loan Application.

Weeks	Cost
1	310
2	288
3	297
4	298
5	307
6	303
7	294
8	297
9	308
10	306
11	294
12	299
13	297
14	299
15	314
16	295
17	293
18	306
19	301
20	304