Subject: -Industrial Engineering and Quality Control (22657)

SYLLABUS

Chapter No.	Name of chapter	Marks With Option
1	Work Study	20
2	Process Engineering	14
3	Ergonomics	16
4	Quality Control and Inspection	20
5	Statistical Quality Control	32
	Total Marks: -	**102**

BOARD THEORY PAPER PATTERN FOR TOM (22438)

Q.1		**Attempt any FIVE 5*2=10**
	a)	Define Method Study. State its objectives.
	b)	State the factors of production
	c)	Enlist various QC tools
	d)	Name the various control charts in SQC
	e)	State the types and location of display.
	f)	State the characteristics of Quality
	g)	State the merits of acceptance sampling
Q.2		**Attempt any THREE 4*3=12**
	a)	Explain in brief different "Recording Techniques" used in Method study
	b)	Describe 'Part Print Analysis' with suitable example.
	c)	Explain Ergonomic considerations applied to types and location of display
	d)	Differentiate between Inspection & quality control
Q.3		**Attempt any THREE 4*3=12**
	a)	Define process chart .draw the symbols used in process chart
	b)	Prepare a two handed process chart for a task of sharpening the pencil with appropriate process chart symbol
	c)	State considerations for selection of manufacturing processes for a given product
	d)	Apply ergonomics aspect for designing Lever for hand Press Machine

<table>
<tr><td>Q.4</td><td></td><td>Attempt any TWO 6*2=12</td></tr>
<tr><td></td><td>a)</td><td>Write different steps to be followed for Ergonomic consideration in Machine design.</td></tr>
<tr><td></td><td>b)</td><td>Apply Ergonomic principles for designing Display unit of Reciprocating air Compressor.</td></tr>
<tr><td></td><td>c)</td><td>With suitable example explain the criterion for machine selection</td></tr>
<tr><td></td><td>d)</td><td>Explain in detail OC curve and show following element on OC curve. i) α-Risk ii) β-Risk iii) AOQ iv) LTPD</td></tr>
<tr><td></td><td>e)</td><td>In a manufacturing process the number of defectives found in the inspection of 10 lots of 400 items each are given below
<table>
<tr><td>lot Number</td><td>01</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>No. of defectives</td><td>2</td><td>0</td><td>14</td><td>3</td><td>1</td><td>18</td><td>6</td><td>0</td><td>3</td><td>6</td></tr>
</table>
Determine the trial control limits for np chart.</td></tr>
<tr><td>Q. 5</td><td></td><td>Attempt any TWO 6*2=12</td></tr>
<tr><td></td><td>a)</td><td>Outline an appropriate process chart for the activity "replace old battery of car</td></tr>
<tr><td></td><td>b)</td><td>Draw and explain Histogram, Pareto chart and Scatter diagram.</td></tr>
<tr><td></td><td>c)</td><td>10 samples of size 5 have been collected with following observations :
<table>
<tr><td>Sr. No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>– X</td><td>2.011</td><td>2.008</td><td>2.001</td><td>2.003</td><td>1.998</td><td>1.995</td><td>1.997</td><td>1.997</td><td>2.002</td><td>2.003</td></tr>
<tr><td>R</td><td>0.011</td><td>0.017</td><td>0.009</td><td>0.026</td><td>0.27</td><td>0.21</td><td>0.014</td><td>0.017</td><td>0.023</td><td>0.015</td></tr>
</table>
Given A2 = 0.577, D3 = 0, D4 = 2.114
Draw the appropriate control chart</td></tr>
<tr><td>Q.6</td><td></td><td>Attempt any TWO 6*2=12</td></tr>
<tr><td></td><td>a)</td><td>Draw the X –R control chart and explain the following terms on it
i. Extreme variations ii. Shift iii. Indication of trend.</td></tr>
<tr><td></td><td>b)</td><td>The following table gives the no. of defects in alignment observed at the final inspection of a certain model of an aero plane, prepare a C-chart and comment on it.
<table>
<tr><td>Aeroplane Number</td><td>01</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr>
<tr><td>No. of alignment defect</td><td>07</td><td>6</td><td>6</td><td>7</td><td>4</td><td>7</td><td>8</td><td>12</td><td>9</td><td>9</td><td>8</td><td>5</td><td>5</td></tr>
</table></td></tr>
<tr><td></td><td>c)</td><td>Two machines producing components are checked up for the statistical stability. Draw the 'P' chart for both machines and comment upon the processes. Sample size for both machines are 200.</td></tr>
</table>

CLASS TEST - I

PAPER PATTERN

COURSE: - Industrial Engineering and Quality Control (22657)

PROGRAMME: -Mechanical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	**Work Study**	**CO-657.01**
2	**Process Engineering**	**CO-657.02**
3	**Ergonomics**	**CO-657.03**

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
a)	Define Method Study. State its objectives.	CO-657.01
b)	Explain Need Industrial Engineering	CO-657.01
c)	State the factors of production	CO-657.02
d)	Define Supply Chain Management	CO-657.02
e)	Define Ergonomics. State Its Need	CO-657.03
f)	Explain ergonomic of control members for bush button	CO-657.03
Q.2	**Attempt any THREE 3*4=12 Marks**	
a)	Explain in brief different "Recording Techniques" used in Method study	CO-657.01

b)	Prepare a two handed process chart for a task of sharpening the pencil with appropriate process chart symbol	CO-657.01
c)	State considerations for selection of manufacturing processes for a given product	CO-657.02
d)	Apply ergonomics aspect for designing Lever for hand Press Machine	CO-657.03

CLASS TEST - II

PAPER PATTERN

COURSE: - Industrial Engineering and Quality Control (22657)

PROGRAMME: -Mechanical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
4	**Quality Control and Inspection**	**CO-657.04**
5	**Statistical Quality Control**	**CO-657.05**

Q.1	**Attempt any FOUR 4*2=8Marks**	**Course Outcome (CO)**
a)	Enlist various QC tools	CO-657.04
b)	State the characteristics of Quality	CO-657.04
c)	Define TQM Method	CO-657.04
d)	State the types and location of display.	CO-657.05
e)	State the merits of acceptance sampling	CO-657.05
f)	Name the various control charts in SQC	CO-657.05
Q.2	**Attempt any THREE 3*4=12 Marks**	
a)	Differentiate between Inspection & quality control	CO-657.04
b)	Draw and explain Histogram, Pareto chart and Scatter diagram.	CO-657.04

c)	Explain in detail OC curve and show following element on OC curve. i) α-Risk ii) β-Risk iii) AOQ iv) LTPD	CO-657.05
d)	Draw the X –R control chart and explain the following terms on it i. Extreme variations ii. Shift iii. Indication of trend.	CO-657.05

COURSE OUTCOME
(CO)

COURSE: - Industrial Engineering and Quality Control (22657)

PROGRAMME: -Mechanical Engineering

CO.NO.	Course Outcome
CO-657.01	Apply work study techniques to optimize manufacturing process
CO-657.02	Prepared the detailed sequence of operations for manufacturing of components
CO-657.03	Apply Ergonomics principle for designing simple mechanical component
CO-657.04	Interpret the data obtained from the different quality control processes
CO-657.05	Interpret the control chart for variable and attribute data

1. Work Study

Position in Question Paper **Total Marks-16**

Q.1. a) 2-Marks.
Q.2. a) 4-Marks.
Q.3. a) 4-Marks.
Q.3. b) 4-Marks.
Q.5. a) 6-Marks.

Descriptive Question

1. Define Method Study. State its objectives.

2. Explain in brief different "Recording Techniques" used in Method study

3. Define process chart .draw the symbols used in process chart

4. Outline an appropriate process chart for the activity "replace old battery of car

5. Prepare a two handed process chart for a task of sharpening the pencil with appropriate process chart symbol

MCQ Question

(Total number of Question=Marks*3=16*3=48)

Note: Correct answer is marked with **bold.**

1.Work study consists of
a) Effective use of plant and equipment
b) Effective use of human effort
c) Evaluation of human work
d)All of the above

2.Work study is also recognised as
a) Time study
b) Motion study
c) both 'a' and 'b'
d) None of the above

3.The correct order of procedure in method study is
a) Select – Record – Examine – Develop – Define – Install – Maintain
b) Select – Define – Examine – Develop – Record – Install – Maintain
c) Select – Record – Develop – Examine – Define – Install – Maintain
d) Select – Record – Examine – Define – Develop – Install – Maintain

4.The following factor(s) must be considered while selecting the work for method study
a) Economic considerations
b) Technical considerations
c) Human reactions
d) All of the above

5.In process charts, the symbol used for storage is
a) Circle
b) Square
c) Arrow
d) Triangle

7.In process charts, the symbol used for inspection is
a) Circle
b) Square
c) Arrow
d) Triangle

8.In outline process chart, the horizontal lines represents
a) general flow of process
b) materials being introduced
c) both 'a' and 'b'
d) None of the above

9.The outline (operation) process chart, the following symbols are used
a) operation and inspection
b) operation and transportation
c) inspection and transportation
d) operation and storage

10. Two hand process chart is commonly used for
a) repetitive operations
b) short operations
c) both 'a' and 'b'
d) none of the above

11. The following chart(s) record the movements
a) operation process chart
b) flow process chart
c) both 'a' and 'b'
d) None of the above

12. Which of the following is a scale plan
a) String diagram
b) Flow process chart

c) Operation process chart
d) All of the above

13. In THERBLIGS, colour for 'search' is
a) black
c) red
b) grey
d) green

14. In THERBLIGS, '→' symbol is used for
a) Search
c) Position
b) Find
d) Select

15. In SIMO chart, the movements are recorded against time measured in _____.
a) Minutes
c) Micro seconds
b) Seconds
d**) Winks**

16. As per principle of motion economy
a) Motion of arms should be symmetrical and in opposite direction
b) both the hand should not remain idle except during rest period
c) both hands should start and complete their work simultaneously
d) All of the above

17. Process layout is employed for
a) batch production
c) effective utilization of machines
b) continuous type of product
d) all of the above

18. Work study is concerned with
a) improving present method and finding standard time
b) motivation of workers
c) improving production capability
d) improving production planning and control

19. Basic tool in work study is
a) graph paper
c) planning chart
b) process chart
d) stop watch

20. What does symbol 'O' imply in work study
a) operation
c) transport
b) inspection
d) delay/temporary storage

21. What does symbol 'D' imply in work study
a) inspection
c) delay/temporary storage
b) transport
d) permanent storage

22. What does symbol 'V' employ in work study
a) operation
c) delay/ temporary Storage
b) inspection
d) permanent storage

23. Material handling in automobile industry is done by
a) overhead crane
c) belt conveyor
b) trolley
d) all of the above

24. String diagram is used when

a) team of workers is working
c) idle time is to be reduced
b) material handling is to be done
d) all of the above

25. Work study is most useful
a) where production activities are involved
b) in judging the rating of machines
c) in improving industrial relations
d) in judging the output of a man and improving it

26. Micro motion study is
a) enlarged view of motion study
b) analysis of one stage of motion study
c) minute and detailed motion study
d) subdivision of an operation into therbligs and their analysis

27. In micro motion study, therblig is described by
a) a symbol
c) an activity
b) an event
d) standard symbol and color.

28. The allowed time for a job equals standard time plus
a) policy allowance
c) process allowance
b) interference allowance
d) learning allowance

29. Micro motion study involves following number of fundamental hand motions
a) 8
c) 16
b) 12
d) 20

30. The standard time for a job is
a) total work content
b) base time + relaxation time
c) total work content + basic time
d) total work content + delay contingency allowance

31. Work study is done with the help of
a) process chart
c) stop watch
b) material handling
d) all of the above

32. Scheduling gives information about
a) work should start and how much work completed during a certain period
b) when work should complete
c) that how idle time can be minimized
d) proper utilization of machines

33. Expediting function consists in keeping a watch on
a) operator's activity
b) flow of material and in case of trouble locate source of trouble
c) minimizing the delays
d) making efficient dispatching

34. Choose the wrong statement Time study is used to

a) determine overhead expenses
c) determine standard costs
b) provide a basis for setting piece prices
d) compare alternative methods.

35. Job evaluation is the method-of determining the
a) relative worth of jobs
c) contribution of a worker
b) skills required by a worker
d) contribution of a job

36. Micro motion study is
a) analysis of a man-work method by using a motion picture camera with a timing device in the field of view
b) motion study observed on enhanced time intervals
c) motion study of a sequence of operations conducted systematically
d) study of man and machine conducted simultaneously

37. Per cent idle time for men or machines is found by
a) work sampling
c) method study
b) time study
d) work study

38. TMU in method time measurement stands for
a) time motion unit
c) time movement unit
b) time measurement unit
d) technique measurement unit

39. Time study is
a) the appraisal, in terms of time, of the value of work involving human effort
b) machine setting time
c) time taken by workers to do a job
d) method of fixing time for workers

40. Work sampling observations are taken on the basis of
a) detailed calculations
c) table of random numbers
b) convenience
d) past experience

41. One time measurement unit (TMU) in method time measurement system equals
a) 0.0001 minute
c) 0.006 minute
b) 0.0006 minute
d) 0.001 minute

42. Gnatt chart provides information about the
a) material handling
c) production schedule
b) proper utilization of manpower
d) efficient working of machine

2. Process Engineering

Position in Question Paper **Total Marks-12**

Q.1. c) 2-Marks.

Q.2. b) 4-Marks.

Q.3. c) 4-Marks.

Q.4. c) 4-Marks.

Descriptive Question

1. State the factors of production

2. Describe 'Part Print Analysis' with suitable example.

3. State considerations for selection of manufacturing processes for a given product

4. With suitable example explain the criterion for machine selection.

MCQ Question

(Total number of Question=Marks*3=12*3=36)

1.Fixtures are used
a) For holding and guiding the tool in drilling, reaming or tapping operations
b) **For holding the work in milling, grinding, planning or turning operations**
c) To check the accuracy of work piece
d) None of the above

2.The obtuse angle, included between the chisel edge and the lip as viewed from the end of a drill, is called
a) Helix or rake angle
b) Point angle
c) **Chisel edge angle**
d) Lip clearance angle

3.In a shaper, the length of stroke is increased by
a) **Increasing the centre distance of bull gear and crank pin**
b) Decreasing the centre distance of bull gear and crank pin
c) Increasing the length of the arm
d) Decreasing the length of the slot in the slotted lever

4.Which manufacturing process includes the powder metallurgy
a) casting
b) forming and shaping
c) machining
d) joining

5.Which of the following is included in machining process
a) extrusion
b) soldering
c) drilling
d) coating

6.In ____type of manufacturing process, material is wasted. It is in the form of chips.
a) machining process
b) casting process
c) joining process
d) forming and shaping process

7.Which of the following processes are included in finishing
a) honing and welding
b) polishing and lapping
c) coating and milling
d) molding and plating

8._____is define as set of interrelated resources and activities that transform input into outputs.
a) Line balancing
b) Process
c) Product
d) Schedule

9.Technical objective of line balancing are
a) minimizing the total idle time
b) maximizing the net profit

c) minimizing the labour cost per unit
d) minimize total in process inventory

10. Economic objective are

a) Minimizing the number of workstation for a given cycle
b) Minimizing the balance delay
c) Maximizing the balancing efficiency
d) Minimizing the combine cost of labour, workstation and product incompleteness

11. What is the particular task performance in CPM known as

a) Dummy
c) Activity
b) Event
d) Contract

12. What is the earliest start time rule

a) It compares the activity's starting time for an activity successor.
b) It compares the activity's end time for an activity predecessor.
c) It directs when a project can start.
d) It regulates when a project must begin.

13. What is a critical path

a) the starting node to the end node.
c) It is the longest path
b) It is a mixture of all the paths
d) It is the shortest path

14. Completion of a CPM network diagram activity is commonly known as

a) Event
c) Connector
b) Node
d) All the above

15. The critical path .....

a) Is the longest path
c) Is a mixture of all paths
b) Is the shortest path
d) the starting node to the end node

16.CPM was developed in which country

a) Japan
c) USA
b) China
d) Russia

17.CPM is the

a) Time oriented technique
c) Target oriented technique
b) Event oriented technique
d) Activity oriented technique

18. Identify Micro process planning

a) Process and machine selection
b) Analysis of part-process-work-holding design trade off
c) accessibility of manufacturing features
d) workpiece set-up planning

19. The main difference between PERT and CPM techniques is

a) **PERT is probabilistic whereas CPM is deterministic**
b) PERT lays emphasis on cost whereas CPM lays emphasis on time
c) PERT is event oriented whereas CPM is activity oriented
d) PERT uses activity on Node diagram; whereas CPM uses Activity on Arrow diagram

20. Gantt chart is mostly used for
a) Inspection and quality control
b) Follow up
c) **Scheduling**
d) Routing

21. Main property of cutting fluid is
a) Specific gravity
b) Specific heat
c) Ductility
d) Viscosity

22.A tool which is used to enlarge a previously drilled hole is known as
a) Boring tool
b) Turning tool
c) Form tool
d) Facing tool

23. Which one of the following tapers is used for making shank of lathe centres.
a) Jerno tapers
b) Non-standard taper
c) Brown and Sharp taper
d) Morse standard taper

24. Slotter machine is specified by
a) Table diameter
b) Maximum stroke of its arm
c) Number of stroke per minute
d) All of the above

25. Drill sleeve is used when the taper shank of the drill is
a) Smaller than the machine spindle
b) Larger than the machine spindle
c) Equal to the machine spindle
d) None of the above

26. Which one of the following processes is used for removing scratches from previous operations.
a) Painting
b) Oxidation
c) Polishing
d) Enameling

27. Which one of the following properties is the most essential for the metals in the process of casting, welding, brazing and soldering.
a) Fusibility
b) Malleability
c) Tenacity
d) Plasticity

28. Lathe bed is made of
a) High speed steel
b) High carbon steel
c) Mild steel
d) Cast iron

29. Back gear is used in cone pulley head stock on lathe
a) To increase speed
b) To decrease speed
c) To change the direction of speed
d) None of these

30. Which type of chuck is used for self alignment.
a) Magnetic chuck
b) Three jaw chuck
c) Four jaw chuck
d) None of these

31. Jig and Fixture are made in such type that
a) To guide the cutting tool
b) To hold the job strongly
c) To prevent the job from slipping
d) To get the maximum production in short time

32. Main use of coolant on machine tool
a) To minimize the friction between two mating parts
b) To cool the parts of machine
c) To wet the two mating parts
d) To save the machine tool from heating

33. Counter boring is done for
a) Accommodating socket head screws
b) Finishing bored holes
c) Enlarging holes to accurate size
d) Debarring hole ends

34. Quick return mechanism is provided on shaper to reduce the time required for
a) Forward stroke
b) Return stroke
c) Forward and Return stroke
d) None of these

35. Cutting tool used in planning machine is
a) Multipoint cutting tool
b) Single point cutting tool
c) End mill cutter
d) None of the above

36. The size of a planer is determined by the maximum length of the
a) Housing
b) Work piece
c) Stroke
d) Bed

3. Ergonomics

Position in Question Paper **Total Marks-12**

Q.2. c) 4-Marks.

Q.3. d) 4-Marks.

Q.4. a) 4-Marks.

Q.4. b) 4-Marks.

Descriptive Question

1. Apply ergonomics aspect for designing Lever for hand Press Machine

2. Explain Ergonomic considerations applied to types and location of display

3. Write different steps to be followed for Ergonomic consideration in Machine design.

4. Write different steps to be followed for Ergonomic consideration in Machine design.

MCQ Question

(Total number of Question=Marks*3=12*3=36)

1.Ergonomics' is related to human
a) Comfort
b) Safety
c) Both 'a' and 'b'
d) None of the above

2.The following subject(s) is (are) related to 'Ergonomics
a) Anthropology
b) Physiology
c) Psychology
d) All of the above

3.Ergonomics principle suggests th
a) Monitoring displays should be placed outside peripheral limitations
b) Glow-in-the dark dials made of reflective substances are good for viewing in the nights
c) Visual systems should be preferred over auditory systems in noisy locations
d) All of the above

4.In designing an efficient workspace, the left hand will cover
a) Maximum working area
b) Normal working area
c) Minimal working area
d) Any of the above

5.The most frequently used components are arranged in
a) Left side
b) Right side
c) Central location
d) Any of the above

6.For controlling the rotation through more than 360 degree, we use
a) Knob
b) Selector
c) Crank
d) Wheel

7.If natural light is used as the principal means of illumination at workspace,windows area needs to be equal to ___ percent of floor area.
a) 20
b) 30
c) 40
d) 50

8.Ergonomics is defined as
a) The research and analysis of the mechanics of living organisms.
b) The measurement and collection of data concerning the different sizes of men,women and children.
c) The research and analysis of the mechanics of living organisms
d) The application of scientific information concerning the relationship of human beingsto the design of objects, systems and environments

9.The safe exposure limits for noise levels for 08 hours of working/day i
a) 90 dBA
b) 110 dBA
c) 130 dBA
d) 150 dBA

10. The international limits for chemical substances in air is known as
a) Maximum limit value
b) Minimum limit value

c) Optimum limit value **d) Threshold limit value**

11. The people can carry out continuous task without fatigue if the energyrequirement for the task is less than _____ .

a) 250Watt c) 750Watt

b) 500 Watt d) 1000Watt

12. The state of the worker by which the capacity and willingness for doingwork is reduced is called

a) Stress c) Creep

b) Fatigue d) None of the above

13. Ergonomics is a body of knowledge concerned with:

a) Human abilities

b) Design of tools, machines, systems, tasks, jobs, and environments

c) Fitting the job or task to the person

d) All of the above

14. Which of the following could be considered an engineering control for anoffice ergonomics hazard:

a) Implementing a stretching program

b) Switching to a chair with greater adjustability

c) Implementing a pre-work screening process

d) Purchasing wrist braces

15. The greater the match between worker capabilities and task demands:

a) The greater the chance of worker injury/illness

b) The lower the chance of worker injury/illness

c) Has no impact on chance of worker injury/illness

d)The greater the chance of being exposed to high risk jobs

16. Which of the following would not be considered a physical workcharacteristic

a) A drill

b) A 300-pound supervisor

c) A bushel of potatoes in a produce warehouse

d) A workplace temperature of 40 degrees Fahrenheit

17.Psychophysical experiments from Liberty Mutual Insurance Companyhave determined the maximum acceptable weight or force for:

a) Lifting, lowering, carrying, and hammering tasks

b) Lifting, carrying, pushing, and female wrist flexion and extension tasks

c) Lifting, lowering, walking, and pulling tasks

d) Lifting, driving, and pushing and pulling tasks

18. Four commonly recognized computer workstation postures are:

a) Sitting, standing on both feet, standing with one foot resting, reclined

b) Standing, sitting tilted forward, sitting upright, sitting tilted back

c) Standing forward, laying down, sitting up, sitting on knees

d) Sitting with arms supported, standing with no arm support, seated with footsupport, seated with no foot suppor

19. Examples of administrative controls include all except:

a) Rest breaks

b) Rotating workers through different jobs

c) Installation of an adjustable height keyboard tray

d) An effective tool maintenance program

20. Engineering controls involve

a) Workplace policy, procedures, and practices that minimize the exposure of workers to risk conditions

b) A change in the physical features of the workplace

c) Application of proper personal protective equipment

d) Medical management

21. What angle should your arms be bent to keyboard safely and comfortably?

a) 180 degrees

c) 45 Degrees

b) 90 Degrees

d) 0 Degrees

22. When typing, your wrists should remain _____.

a) Twisted

c) Bent

b) Straight

d) Motionless

23. How often should you take breaks from keyboarding to stretch your hands and wrists.

a) Every 30 minutes

c) Once a day

b) Every 4 hours

d) Twice a day

24. How far should your monitor be from your eyes?

a) 8” to 24”

c) 30” –48”

b) 18”-30”

d) At least 48”

25. The mouse should be _____ the keyboard.

a) Higher than

c) Beneath

b) Lower than

d) On the same level

26. If you notice tingling, soreness or stiffness in your hands and wrists while typing you should:

a) Correct your typing technique.

c) Take frequent mini-breaks

b) Adjust your workstation.

d) All of the Above.

27. Which of the following can contribute to Carpal Tunnel Syndrome.

a) Incorrect typing technique

c) Striking the keys too hard.

b) Poor posture

d) All of the Above

28. The basic definition of Ergonomics is.

a) Using relaxed posture

b) Fitting the employee to the workstation

c) Fitting the workstation to the employee

d) Either B or C

29.MSD risk factors include:

a) Long duration
b)Too short a recovery time
c) Frequent force
d) **All of the above**

30. Your body can be stressed by:

a) Vibration
b) Cold
c) Bad lighting
d) **All of the above**

31. Neutral position is:

a) **The position that places the least amount of stress on the body**
b) The most difficult position for the body to hold
c) A safe position that protects only the back
d) The only position you can work in

32. You're at risk of an MSD if you:

a) **Keep repeating a forceful task**
b) Use hand tools once a year
c) Rest between repetitive tasks
d) None of the above

33. Ergonomic conditions are disorders of the soft tissues, specifically of which of the following:

a) Muscles, nerves and tendons
b) Ligaments, joints and cartilage
c) Blood vessels and spinal discs
d) All the above

34. The main categories of ergonomic risk are:

a) Environment – risks found in your work environment
b) Equipment – risks associated with the equipment you use and proper fit/adjustment
c) Work practices – risks caused by work requirements, processes or procedures
d) All the above

35. Some conditions that can cause musculoskeletal disorders can be brought on by:

a) Sudden increase in your workload
b) Introduction of a new process to your work routine
c) Use of vibrating tools
d) All the above

36. In the age of high technology, what is the key to the most significant and enduring productivity improvement.

a) Robotic involvement
b) Human involvement
c) Computer involvement
d) Laser beam involvement

4. Quality Control and Inspection

Position in Question Paper **Total Marks-16**

Q.1. c) 2-Marks.
Q.1. f) 2-Marks.
Q.2. d) 4-Marks.
Q.5. b) 6-Marks.
Q.6. b) 6-Marks.

Descriptive Question

1. Enlist various QC tools

2. State the characteristics of Quality

3. Differentiate between Inspection & quality control

4. Draw and explain Histogram, Pareto chart and Scatter diagram.

5. The following table gives the no. of defects in alignment observed at the final inspection of a certain model of an aero plane, prepare a C-chart and comment on it

Aeroplane Number	01	2	3	4	5	6	7	8	9	10	11	12	13
No. of alignment defect	07	6	6	7	4	7	8	12	9	9	8	5	5

MCQ Question

(Total number of Question=Marks*3=14*3=42)

1.Process control is carried out
a) before production
b) during production
c) after production control
d) All of the above

2.Low cost, higher volume items requires
a) no inspection
b) little inspection
c) intensive inspection
d) 100% inspection

3.High cost, low volume items requires
a) no inspection
b) little inspection
c) intensive inspection
d) 100% inspection

4.The mean of sampling distribution is
a) less than mean of process distribution
b) more than mean of process distribution
c) equal to mean of process distribution
d) any of the above

5.The percent of the sample means will have values that are within ±3 standard deviations of the distribution mean is
a) 95.5
b) 96.7
c) 97.6
d) 99.7

6.The dividing lines between random and non random deviations from mean of the distribution are known as
a) upper control limit
b) lower control limit
c) control limits
d) two sigma limits

7.The chart used to monitor variable is
a) Range chart
b) p-chart
c) c-chart
d) All of the above

8.The chart used to monitor attributes is
a) Range chart
b) Mean chart
c) p-chart
d) All of the above

9.Central tendency of a process is monitored in
a) Range chart
b) Mean chart
c) p-chart
d) c-chart

10. Dispersion of a process in monitored in
a) Range chart
b) Mean chart
c) p-chart
d) c-chart

11. The control chart used for the fraction of defective items in a sample is
a) Range chart
b) Mean chart

c) p-chart d) c-chart

11. The control chart used for the number of defects per unit is

a) Range chart c) p-chart

b) Mean chart **d) c-chart**

12. The process capability is calculated as

a) (USL-LSL)/3σ **c) (USL-LSL)/6σ**

b) (USL+LSL)/3σ d) (USL+LSL)/6σ

13.A six sigma process has defect level below _____ defects per million opportunities.

a) 3.4 c) 5.6

b) 4.5 d) 6.7

14. What does QA and QC stand for.

a) Quality Assurance and Queuing Control

b) Quality Adjustment and Quality completion

c) Quality Assurance and Quality control

d) Quality Adjustment and Queuing control

15. What is QA.

a) It is the measurement of degree to which a product satisfies the need

b) Any systematic process used to ensure quality in the process

c) Process of identifying defects

d) It is a corrective tool

16. Which of the following option is correct regarding QA and QC.

a) QC is an integral part of QA **c) QA and QC are independent**

b) QA is an integral part of QC d) QC may or may not depend on QA

17. Which of the following option involves material and component control.

a) Development of standards **c) Quality control**

b) Development of specification d) Feedback

18. Arrange the steps of QA in ascending order.

a) Customer needs, material control, design development, process control, marketing

b) Material control, process control, customer need, design development, finished product

c) Customer needs, design development, material control, process control, finished product

d) Material control, servicing, process control, material control, design development

19. What is the first step of QA.

a) Development of standards c) Servicing

b) Identification of customer need d) Material control

20. Which of the following is an example of QA.

a) Verification b) Software testing

c) Validation
d) Documentation

21. Which of the following option is not correct regarding QA and QC.

a) Process capabilities should be monitored on intermittent basis

b) Measuring equipment's must have a calibration certificate

c) Normally many inspections are done during the process of manufacturing

d) QA depends on the activities of the entire company

22. What is meant by hitch hiking.

a) procedure of secret voting to select the most appropriate idea

b) enlisting ideas in specific format considering similarities

c) ideas suggested based on other ideas

d) none of the above

23. What does N, P and L mean in N.P.L. Gauge interferometer.

a) Nikon pulsed laser
c) National Physics Laboratory
b) Nuclear plasma laboratory
d) Nuclear physics laboratory

24. The aim of Just-In-Time manufacturing principle is to eliminate

a) time wastage
c) cost of excessive inventory
b) labour wastage
d) all of the above

25. Which quality management program is related to the maintenance of plants and equipments**.**

a) Environmental management systems
c) Failure mode effect analysis
b) Fault tree analysis
d) Total productive maintenance

26. Which of the following statements is/are true for sampling inspection**.**

a) Acceptance sampling does not involve any risk

b) Characteristics of the entire lot can be truly specified

c) Less fatigue results in less mistakes

d) All the above statements are true

27. What is capability ratio**.**

a) The ratio of process capability and number of units inspected

b) The ratio of specification range and process capability

c) The ratio of number of defectives and process capability

d) The ratio of number of defectives and number of units inspected

28.What is meant by P, D, S and A in PDSA cycle.

a) Progress Development Study Act
c) Project Development Study Act
b) Plan Do Study Act
d) Prevention Do Study Act

29. What is the full form of TQM.

a) True quality machining
c) True quantitative machining
b) Total quality management
d) Total queue management

30. Which part in quality management is the critical part.

a) Process thinking
c) Customer's view
b) Performance measurement
d) Systematic approach

31. What are the core principles of the TQM in a company-wide effort.
a) Customer and process orientation only
b) Continuous improvement only
c) Process orientation and continuous improvement only
d) Continuous improvement, process and customer orientation

32. Which drivers are used in TQM system?
a) Competition, Survival and export drive
b) Teamwork participation and customer satisfaction
c) Quality tools and technique
d) Management commitment and vision

33. What is included in the quality assessment in TQM.
a) Strategic quality planning
c) Quality and operational results
b) Management of process quality
d) Information and analysis

34. How many stages are needed for inspection and testing in TQM as per ISO 9001.
a) 1
c) 3
b) 2
d) 4

35. Which factor is the basis of Decision making in TQM?
a) Facts only
c) Facts and opinions both
b) Opinions only
d) Neither facts nor opinions

36. What is the primary focus of the quality management system.
a) Customer focus
c) Process approach
b) Engagement of people
d) Improvement

37. What are the responsibilities of management in quality system management.
a) Frequently change responsibilities of employees for flexibility
b) Frequently change authorities for flexibility
c) Authority changes but fixed responsibility
d) Fix authority and responsibility

38. What is quality control.
a) Process of recognition of entire manufacturing process
b) Concerned with the integration of all the efforts in organisation
c) Detection of defects in a product
d) Minimization of material level

39. What is the purpose of ISO standards created for quality management systems.

a) To certify the process
b) To certify the quality of a product
c) To certify the quality of service
d) To certify the quantity used for product

40. Combination of Six Sigma and Lean manufacturing is known as
a) Advanced Six Sigma
b) Lean Six Sigma
c) Operational Six Sigma
d) None of the above

41. In "DMAIC", M stands for
a) Method
b) Measure
c) Machine
d) Manpower

42. Poka Yoke means
a) mistake proofing
b) standardization
c) process control
d) none of the above

43. The first standard published by the International Standard Organization (ISO) defining a Six Sigma process.
a) ISO 13053:2009
b) ISO 13053:2010
c**) ISO 13053:2011**
d) ISO 13053:201

44. The concept of Six Sigma was developed by the following company.
a) General Electric
b) Motorola
c) Honeywell
d) DuPont

45. Which of the following is appropriate to graph a single categorical variable?
a) Histogram
b) Bar chart
c) Boxplot
d) Scatterplot

46. Which of the following is appropriate to graph a single continuous variable?
a) Waffle chart
b) Histogram
c) Bar chart
d) Pie chart

47. Kaizen refers to _____
a) Continuous improvement
b) Intermittent improvement
c) Discontinuous improvement
d) Stop improvement

48. Which of the following is not an aspect of Kaizen philosophy.
a) Process driven
b) Quality awareness, quality control
c) Standardization
d) Ineffective leadership

5. Statistical Quality Control

Position in Question Paper **Total Marks-18**

Q.1. d) 2-Marks.
Q.1. e) 2-Marks.
Q.1. g) 2-Marks.
Q.4. d) 4-Marks.
Q.4. e) 4-Marks.
Q.5. c) 6-Marks.
Q.6. a) 6-Marks.
Q.6. b) 6-Marks.

Descriptive Question

1. State the types and location of display.

2. State the merits of acceptance sampling.

3. Name the various control charts in SQC

4. Explain in detail OC curve and show following element on OC curve.

i) α-Risk

ii) β-Risk

iii) AOQ

iv) LTPD

5. In a manufacturing process the number of defectives found in the inspection of 10 lots of 400 items each are given below

lot Number	01	2	3	4	5	6	7	8	9	10
No. of defectives	2	0	14	3	1	18	6	0	3	6

6. 10 samples of size 5 have been collected with following observations :

Sr. No.	1	2	3	4	5	6	7	8	9	10
– X	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0

	11	08	01	03	98	95	97	97	02	03
R	0.011	0.017	0.009	0.026	0.27	0.21	0.014	0.017	0.023	0.015

7. Draw the X –R control chart and explain the following terms on it

i. Extreme variations

ii. Shift

iii.Indication of trend.

8. Two machines producing components are checked up for the statistical stability. Draw the 'P' chart for both machines and comment upon the processes. Sample size for both machines are 200.

Machine A: Sample No.	1	2	3	4	5	6	7	8	9	10
Defectives	25	28	30	30	20	29	31	26	31	27

MCQ Question

(Total number of Question=Marks*3=18*3=54)

1.Moving the UCL and LCL line far from the Center line means ____

a) Decreasing the possibility of type I error

b) Increasing the possibility of type II error

c) Increasing the possibility of type I error

d) Decreasing the possibility of type II error

2.If we decrease the distance between LCL and UCL, what will happen?

a) Decreasing the possibility of type I error

b) Increasing the possibility of type II error

c) Increasing the possibility of type I error

d) Decreasing the possibility of type II error

3.If "two sets of limits" approach is taken to construct a control chart, what are the outer set of limits called?

a) Action Limits

b) Warning Limits

c) Variable Limits

d) Constant Limits

4.The inner limits in the "Two sets of limits" approach of the construction of control chart are called _____

a) Action Limits

b) Variable Limits

c) Constant Limits

d) Warning Limits

5.ARL is termed as _____

a) Average Run Length

b) Allocating Run Length

c) Affected Run Length

d) Assumed Run Length

6.The probability of a point to exceed the control limits for a control chart is 0.0040. What will be the ARL for this case

a) 250

b) 278

c) 210

d) 216

7.For an average run length of 370, what will be the probability of a point falling out of the area between the control limits

a) 0.0027

b) 0.0013

c) 0.0045

d) 0.0040

8.What is the full-form of ATS.

a) Average time to Stop

b) Average Time to Start

c) Average Time to Signal

d) Average Time to Select

9.If for a process, the samples are taken 5 hrs apart and its ARL is 24.24, What will be ATS for it.

a) 121.2
c) 113.3
b) 110.0
d) 137.8

10. Decreasing sample size will _____

a) Decrease the slope of OC curve
b) Increase the slope of OC curve
c) First decrease then increase the slope of OC curve
d) Makes OC curve have 0 slope

11. Which of these is not one of the sensitizing Western Electric rules that indicate "action needed" for Shewhart control charts?

a) One or more points near a warning limit/control limit
b) One point plots outside 3-sigma control limits
c) Eight consecutive points plot on one side of the control line
d) Two of 3 consecutive points plot beyond the 2-sigma warning limits

12. The distribution of measured data can be studied by using

a) X chart
c) both X and R chart
b) R chart
d) None of the above

13. Which of the following gives actual measurement of any specific dimension**.**

a) Inspection by variables
c) Both a. and b.
b) Inspection by attributes
d) None of the above

14. Sample size of 1 m^2 is observed in which type of chart

a) C chart
c) nP chart
b) P chart
d) R chart

15. Which control chart pattern is/are used for assignable causes.

a) Trend pattern
c) Extreme variation pattern
b) Shift pattern
d) All of the above

16. What is capability ratio

a) The ratio of process capability and number of units inspected
b) The ratio of specification range and process capability
c) The ratio of number of defectives and process capability
d) The ratio of number of defectives and number of units inspected

17.LCL for the R chart is given by _____

a) D_3 R
c) R – D_3 R
b) D_2 R
d) d_2 R

18. In phase I application of x and R chart, the control limits obtained from the equations are treated as _____

a) Final limits
c) Warning limits
b) Trial limits
d) Pattern limits

19. Which term is having a closest meaning as Sampling Distributions?

a) Control charts
c) Whole lot inspection
b) On site inspection
d) Acceptance sampling

20. Process capability generally uses _____

a) Specifications
c) Process standard deviation
b) Control Limits
d) Mean of any one sample

21. The process standard deviation is given by _____

a) R/d_2
c) $1/d_2$
b) Rd_2
d) R/d

22. For any process, the sample ranges are, 1.2,1.5,1.1,1.4,1.5. The subgroup size is 5. What will be the process standard deviation? Given: d_2=2.326 and A_2=0.577

a) 0.576
c) 0.511
b) 2.322
d) 2.463

23.A tolerance diagram is also called _____

a) Scatter diagram
c) Histogram
b) Defect concentration diagram
d) Tier chart

24. Control limits are _____

a) Limits defined by customers
b) Limits driven by the natural variability of the process
c) Limits driven by the inherent variability of the process
d) Statistical limits

25. The natural variability of the process is measured by _____

a) Process mean
c) Process standard deviation
b) Sample standard deviation
d) Sample mean

26. What type of chart will be used to plot the number of defectives in the output of any process.

a) x bar chart
c) c chart
b) R chart
d) p chart

27. Quantities that can be numerically measured, can be plotted on a _____ control chart.

a) X bar
c) C chart
b) P chart
d) np chart

28.A single measureable quality characteristic, such as dimension, weight, or volume, is called _____

a) Variable
c) Variable and an Attribute
b) Attribute
d) Mean and variability

29.A variable quality characteristic will have both _____

a) Mean and variability
c) Zero and infinite value
b) Discrete and continuous values
d) One or zero

30. Control of the process average or mean quality level is usually done with the _____control chart.

a) X bar control chart
c) R chart
b) S control chart
d) P chart

31.S chart is used to monitor _____ of a quality characteristic.

a) Mean
c) Variability
b) Range
d) Attributes

32. Toughness of a bolt mount on a tank is _____

a) An attribute
c) Variable and an attribute
b) A variable
d) Variability

33.X chart is a _____

a) Attribute control chart
b) Variable control chart
c) Neither a variable control chart nor an attribute control chart
d) Falls in the category of both variable and attribute control charts

34. If a process is said to be in control, what can we say about the variation?

a) Random
c) Attribute
b) Normal
d) Assignable

35. Tolerances are said to be _____

a) limits of natural variability
b) Statistical limits of variability
c) Limits determined by the customers of the product
d) Limits of inherent process variability

36. The center line for a $\bar{x}$ chart denotes _____

a) Mean of any sample
c) Mean of any sample + 0.5
b) Mean of means of the sample
d) (Mean of any sample) / 0.5

37. Specifications have the same meaning as _____

a) Control limits
c) LCL
b) UCL
d) Tolerances

38. For a random variable having a normal distribution, the ratio of its range to the standard deviation is called _____
a) Relative range
c) Major range
b) Absolute range
d) Minor range

39. Once a set of reliable control limits is obtained, we use the control chart for monitoring future production. This is called _____
a) Phase I control chart usage
c) Phase III control chart usage
b) Phase II control chart usage
d) Phase IV control chart usage

40. When R chart is out of control, we _____
a) Eliminate the out-of-control points and recalculate the control limits
b) Take one more sample and recalculate the control limits
c) Eliminate the out-of-control points and the nearest two points, and recalculate the control limits
d) Take no action

41. When the upper and lower natural tolerance limits are equal to the upper and lower specification limits, the process capability ratio, c_p is _____
a) Greater than 1
c) Less than 1
b) 0
d) Equal to 1

42.X bar chart monitors _____
a) Between-sample variability
b) Within-sample variability
c) Neither between-sample nor within-sample variability
d) Both between-sample variability and within-sample variability

43. For standard values of mean and standard deviation used, what does the center line of the R chart represent?
a) R bar
c) $D_2\ \sigma$
b) $d_2\ \sigma$
d) d_2 R

44. The control limits obtained by specifying the type I error level for the test, are called __
a) Probability limits
c) Error limits
b) Trial limits
d) Unreliable limits

45.Which of these is a cause of trend patterns on a control chart.
a) Gradual wearing out of some critical process component
b) Operator fatigue

c) Environmental changes
d) Over-control

46. Shift in process level can be seen on the control charts when _____
a) Operator fatigue occurs
b) Temperature changes
c) Over-control of process
d) New workers introduction

47. Stratification is defined as _____
a) Tendency for the points to cluster artificially around the center line
b) Shift in the process level
c) Continuous movement of points in one direction
d) When the points fall near or slightly outside the control limits

48. Stratification of points on a control chart indicates ___ of natural variability of the process.
a) Lack
b) Increase
c) Constancy
d) Randomness

49. The 3 sigma limits on x bar control charts imply that the type I error probability is ___
a) 0.0012
b) 0.0072
c) 0.0027
d) 0.0037

50. Of the following sampling methods, which is a probability method.
a) Judgment
b) Quota
c) Simple random
d) Convenience

51. Which among the following is the benefit of using simple random sampling.
a) The results are always representative.
b) Interviewers can choose respondents freely.
c) Informants can refuse to participate.
d) We can calculate the accuracy of the results.

52. Sample is regarded as a subset of.
a) Data
b) Set
c) Distribution
d) Population

53. The difference between a statistic and the parameter is called_____
a) Non-random
b) Probability
c) Sampling error
d) Random

54. The distribution that is formed by all possible values of a statistics is known as:
a) Hyper geometric distribution
b) Normal distribution
c) Sampling distribution
d) Binomial distribution