MECHANICAL PART

SEMESTER:-5TH

BRANCH:-AUTOMOBILE AND MECHANICAL ENGINEERING

ER.PRADYUMNA KUMAR KHILAR

SEMESTER 5TH

MECHATRONICS (TH 4)

Unit 3.1

ACTUATORS-MECHANICAL

2 MARKS QUESTION

1. Define Actuator.

2. What is Mechanical Actuators?

3. Define Machine.

4. What is link?

5. What is Kinematic Link?
6. What is pair?
7. What is kinematic pair?
8. What is Slider crank Mechanism?
9. What is mechanism?
10. What is a Gear?
11. Define Spur gear?
12. Define Bevel gear.
13. Define helical gear.

14. Define worm gear.

15. Explain the different types of Gearbox.

16. Define Belt.

17. Define Belt drive.

18. Write the different types of belts.

19. Write the types of Belt Drives.

20. Define Bearing.

5 AND 10 MARKS QUESTION

1. Explain the the difference types of belts.

2. Define and explain about kinematic link.

3. What is Kinematic Pair? Explain different types of kinematic pair.

4. Explain the type's slider crank mechanism.

5. Write the different types of Bearing.

SEMESTER 5TH

MECHATRONICS (TH 4)

5.0 ELEMENTS OF CNC MACHINES

2 MARKS QUESTION

1. Define NC machine.

3. Define CAD.

2. Define CNC.

4. Define CAM.

5. Define CIM.

6. Function of CAD.

7. Function of CAM.

8. What is the software used in CAD?

9. Write the Hardware of CAD.

10. What are Function of CAD and CAM ?

11. Write the application of CAD and CAM system.

12. What is guide-ways /slide-ways in CNC ?

13. What are the guide-ways are used in CNC machining?

14. What are the Factors required for design of guide-ways ?

15. What is spindle drive?

16. What Is a CNC Spindle & How Does It Function?
17. what is feed drive in CNC?

5 AND 10 MARKS QUESTION

1. What are the different types of spindle bearings are used in CNC?

2. Write the types of Guide-ways used in CNC.

SEMESTER 5TH

MECHATRONICS (TH 4)

6.0 ROBOTICS

2 MARKS QUESTION

1. Define Robot.

2. Write the laws of robotics.

3. What are the functions of a Robot?

4. Define Robotic systems.

5. The Sensors:
6. What are the advantages and disadvantages of Robot?

5 AND 10 MARKS QUESTION

1. Write the types of industrial robots.
2. What are the basic parts of a robot?

3. What are the joints used in Robots?

4. What are the basic coordinate systems in industrial robot

MECHANICAL AND AUTOMOBILE ENGINEERING

SEMESTER=5TH

TH.4 MECHATRONICS

6.0 ROBOTICS

1. Robot is derived from Czech word

a. Rabota b. Robota c. Rebota d. Ribota

- **A**

2. A Robot is a

a. Programmable b. Multi functional manipulator

c. Both a and b d. None of the above

- **C**

3. The main objective(s) of Industrial robot is to

a. To minimize the labour requirement

b. To increase productivity

c. To enhance the life of production machines

d. All of the above

- **D**

4. The following is true for a Robot and NC Machine

a. Similar power drive technology is used in both

b. Different feedback systems are used in both

c. Programming is same for both

d. All of the above

- **A**

5. Match the following

Robot part	Function
a. Manipulator arm	1. For holding a piece or tool
b. Controllers	2. Move the manipulator arm and end effector
c. Drives	3. Number of degrees of freedom of movement
d. Gripper	4. Delivers commands to the actuators

a. a. 1, b. 4, c. 2, d. 3

b. a. 3, b. 4, c. 2, d. 1

c. a. 3, b. 2, c. 4, d. 1

d. a. 4, b. 3, c. 2, d. 1

- **B**

6. Drives are also known as

a. Actuators b. Controller c. Sensors d. Manipulator

- **A**

7. Clockwise of Anti clockwise rotation about the vertical axis to the perpendicular arm is provided through

a. Shoulder swivel b. Elbow extension c. Arm sweep d. Wrist bend

- **C**

8. Radial movement (in & out) to the manipulator arm is provided by

a. Elbow extension b. Wrist bend c. Wrist swivel d. Wrist yaw

- **A**

9. Industrial Robots are generally designed to carry which of the following coordinate system(s).

a. Cartesian coordinate systems b. Polar coordinate systems

c. Cylindrical coordinate system d. All of the above

- **D**

10. The Robot designed with Cartesian coordinate systems has

a. Three linear movements b. Three rotational movements

c. Two linear and one rotational movement d. Two rotational and one linear movement

- **A**

11. The Robot designed with Polar coordinate systems has

a. Three linear movements

b. Three rotational movements

c. Two linear and one rotational movement

d. Two rotational and one linear movement

- **D**

12. The Robot designed with cylindrical coordinate systems has

a. Three linear movements

b. Three rotational movements

c. Two linear and one rotational movement

d. Two rotational and one linear movement

- **C**

13. Which of the following work is done by General purpose robot?

a. Part picking b. Welding c. Spray painting d. All of the above

- **D**

14. The following drive is used for lighter class of Robot.

a. Pneumatic drive b. Hydraulic drive c. Electric drive d. All of the above

- **A**

15. Internal state sensors are used for measuring _____ of the end effectors.

a. Position b. Position & Velocity

c. Velocity & Acceleration d. Position, Velocity & Acceleration

- **D**

16. Which of the following sensors determines the relationship of the robot and its environment and the objects handled by it

a. Internal State sensors b. External State sensors

c. Both a and b d. None of the above

- **C**

17. Which of the following is not a programming language for computer controlled robot?

a. AMU b. VAL c. RAIL d. HELP

- **A**

18. In which of the following operations Continuous Path System is used

a. Pick and Place b. Loading and Unloading

c. Continuous welding d. All of the above

- **C**

19. Which of the following branch process with sensory feedback in robotics?

a. Computer Engineering b. Mechanical Engineering
c. Electrical Engineering d. Electronics Engineering

- **A**

20. Which of the following sensor work based on radio detection and ranging?

a. Sonar b. Radar c. Inertial d. Biosensor

- **B**

21. Which of the following is the component of machine that is responsible for controlling a mechanism system?

a. Sensor b. Middleware c. Actuator d. Transducer

- **C**

22. The Signals which represent 2D & 3D objects gathered from sensor data are referred as.

a. Relational maps b. Sensorial maps c. Perceptual maps d. Geometric Maps

- **D**

23. Which of the following sensor is not used to measure the distance?

a. Radar b. Sonar c. Laser Rangefinder d. Inertial Sensor

- **D**

24. Why do the robot need sensor?

a. To collect information from environment

b. To map environment attribute to a quantitative measurement

c. only option 1 is true

d. Both option 1 and 2 are true

- **D**

25. The device that is used to convert energy from one form to another is called.

a. Emitter b. Transducer c. Transmitter d. Receiver

- **B**

26. If something is open or closed in the system then it is informed by following sensor.

a. Contact Sensor b. Inertial Sensor c. Sonar Sensor d. Biosensor

- **A**

MECHANICAL AND AUTOMOBILE ENGINEERING
SEMESTER=5TH
TH.4 MECHATRONICS
5.0 ELEMENTS OF CNC MACHINES

1. What is the full form of CNC?

a) Computer numerical control b) Computer number control

c) Computer network control d) Computer numbers count

- **A**

2. What does CNC machine use to control motion and speed?

a) Numerical b) Programs, as well as computer keyboard, Graphical user interface

c) Feedback system d) GUI

- **B**

3. The function of the feedback system is to record the data from the sensor and compare it with output data.

a) True b) False

- **B**

4. What is the function of the GUI(Graphical user interface)?

a) To control motion and speed

b) Converts program into the action of the driver

c) To record the data from the sensor

d) To understand the position of the tool according to the input program

- **D**

5. The punch tape reader in a CNC machine is ____

a) feedback system b) input device

c) program d) driving system

- **B**

6. Machine control unit implements interpolation commands to generate axial motion commands.

a) True b) False

- **A**

7. What is the function of the driving system in CNC?

a) Auxiliary control functions such as coolant

b) Speed and position control

c) Consist of amplifier circuits, driving motors and ball lead screw

d) To understand the position of the tool according to the input program

- **C**

8. Sensors used in measurement systems are ____

a) speed and position sensor b) consist of amplifier circuits, driving motors and ball lead screw c) numerical control sensors d) measurement sensors

- **A**

9. Speed and Position in CNC can be controlled using _____

a) slide table and spindle b) machine code unit

c) feedback system d) graphic user interface

- **A**

10. In the block diagram of the CNC machine, data processing and control loop are a part of ____

a) speed and position sensor b) feedback system

c) machine control unit d) input device

- **C**

11. CAD is a

a. Software tool
b. Hardware tool
c. Both software and hardware tools
d. None

ANS: (a)

12. CAD prepares 2D and 3 D drawings which are

a. Non digital
b. Digital
c. Both digital and non digital
d. None

ANS: (b)

13.CAD is

a. Computer aided drafting
b. Computer aided design
c. Both drafting and design
d. None

ANS: (c)

14.CAD prepares models with computer which are

a. Dynamic patterns
b. Static patterns

c. Geometric patterns
d. None

ANS: (c)

15.Types of CAD software in existence

a. 6
b. 9
c. 3
d. None

ANS: (b)

16.CADD stands for

a. Firstly Computer aided drawing and design
b. Secondly Computer aided design and drawing
c. Computer aided design and drafting
d. None

ANS: (c)

17.CAD technology is used in the design of

a. Tools and machines
b. All types of buildings
c. Both (a) & (b)
d. None

ANS: (c)

18.Most of the CAD require a

a. One special hardware
b. No special hardware
c. Two special hardware
d. None

ANS: (b)

19.Computer Aided Manufacturing (CAM) is

a. The use of software to automate a manufacturing process

b. The use computer aided machinery to automate a manufacturing process

c. Both (a) & (b)

d. None

ANS: (c)

20. Identify the fact

a. CAM can work without CAD

b. CAD can work without CAM
c. Both (a) & (b)
d. None

ANS: (b)

21.CAM is computer aided manufacturing which is

a. Manual
b. Semi-automatic
c. Fully automatic
d. None

ANS: (c)

22.CAM is a

a. Fast process
b. Slow process
c. Mixture of slow and fast process
d. None

ANS: (a)

23.Components manufactured by CAM needs

a. Further machining to achieve the final product
b. No further machining required
c. Very light machining is required
d. None

ANS: (b)

24.A CNC machine translates

a. CAD into CAM
b. CAM into CAD
c. Both (a) & (b)
d. None

ANS: (a)

25.Computer Aided Manufacturing is

a. Firstly Computer aided modeling
b. Secondly Computer aided machining
c. Both (a) & (b)
d. None

ANS: (c)

26.Energy requirements with CAM is

a. > than conventional machining
b. < than conventional machining
c. = conventional machining
d. None

ANS: (b)

27.Wastage of material during CAM is

a. > than conventional machining
b. < than conventional machining
c. = conventional machining
d. None

ANS: (b)

28.In computer aided manufacture

a. CAD comes first.
b. CAM comes first
c. Both work simultaneously
d. None

ANS: (a)

29.CAM requires

a. Skilled professionals
b. Unskilled professionals
c. Both (a) & (b)
d. None

ANS: (a)

30.CAM uses

a. G-codes
b. M-codes
c. Both G & M codes
d. None

ANS: (c)

31.G-code is a

a. Formula in computers
b. Machining process in computers
c. Language of a computer
d. None

ANS: (c)

32. CAD/CAM design and manufacture

a. Prototype & Finished products
b. Finished products & Production runs of products
c. Production runs of products, finished products & prototypes
d. None

ANS: (c)

33. CAD/CAM is used for the manufacture of

a. Aircrafts, missiles & satellites
b. Digitization of dental structure and oral cavity
c. Both (a) & (b)
d. None

ANS: (c)

34. CAD/CAM is used for the manufacture of

a. Mass production in fashion companies
b. Create 3 D prototypes of new automobile body
c. Both (a) & (b)
d. None

ANS: (c)

35. Computer Aided manufacturing is also known as

a. Firstly Computer Aided modeling
b. Secondly Computer Aided Machining
c. Both (a) & (b)
d. None

ANS: (c)

36. Which is not a part of Computer monitoring & control?

a. Firstly Computer process monitoring
b. Secondly Computer process control
c. Computer design control
d. None

ANS: (c)

37. Fundamental reasons for using CAD are

a. To increase the productivity of the designer and to improve communication
b. To improve the quality of design and to create a database for CAM
c. Both (a) & (b)
d. None

ANS: (c)

38. Major components of CAD are

a. Computer design and manufacturing
b. Interactive computer graphics and human designer
c. Both (a) & (b)
d. None

ANS: (b)

39. Objectives of CAM are

a. Computers guide the industrial processes and reduce error rate
b. To maintain uniformity of products high and high precision of the manufacturing processes
c. Both (a) & (b)
d. None

ANS: (c)

40. G-code is a CAM tool which converts a

a. Firstly Model into machining operations
b. Secondly Model into the language of the machine

c. Both (a) & (b)
d. None

ANS: (b)

41. CIM in CAM stands for

a. Firstly Computer industrial manufacturing
b. Secondly Computer infrastructure machining
c. Computer integrated machining
d. None

ANS: (c)

42. DNC in CAM stands for

a. Direct numerical control
b. Direct numeral control
c. Digital numerical control
d. None

ANS: (b)

43. FMS in CAM stands for

a. Forward manufacturing system
b. Floatable manufacturing system
c. Flexible manufacturing system
d. None

ANS: (c)

MECHANICAL AND AUTOMOBILE ENGINEERING

SEMESTER=5TH

TH.4 MECHATRONICS

3.0 ACTUATORS-MECHANICAL

1. **Which of the following disciplines provides study of inertia forces arising from the combined effect of the mass and the motion of the parts**

(a) theory of machines
(b) applied mechanics
(c) mechanisms
(d) kinetics
(e) kinematics.

Ans: d

2. Which of the following disciplines provides study of relative motion between the parts of a machine

(a) theory of machines
(b) applied mechanics
(c) mechanisms
(d) kinetics
(e) kinematics.

Ans: e

3. Which of the following disciplines provides study of the relative motion between the parts of a machine and the forces acting on the parts

(a) theory of machines
(b) applied mechanics
(c) mechanisms
(d) kinetics
(e) kinematics.

Ans: a

4. The type of pair formed by two elements which are so connected that one is constrained to turn or revolve about a fixed axis of another element is known as

(a) turning pair
(b) rolling pair
(c) sliding pair
(d) spherical pair
(e) lower pair,

Ans: a

5. Which of the following is a lower pair

(a) ball and socket i
(b) piston and cylinder
(c) cam and follower
(d) (a) and (b) above
(e) belt drive.

Ans: d

6. If two moving elements have surface contact in motion, such pair is known as

(a) sliding pair
(b) rolling pair
(c) surface pair
(d) lower pair
(e) higher pair.

Ans: e

7. The example of lower pair is

(a) shaft revolving in a bearing

(b) straight line motion mechanisms
(c) automobile steering gear
(d) all of the above
(e) none of the above.

Ans: d

8. Pulley in a belt drive acts as

(a) cylindrical pair
(b) turning pair
(c) rolling pair
(d) sliding pair
(e) surface pair.

Ans: c

9. The example of rolling pair is

(a) bolt and nut
(b) lead screw of a lathe
(c) ball and socket joint
(d) ball bearing and roller bearing
(e) all of the above.

Ans: d

10. The purpose of a link is to

(a) transmit motion
(b) guide other links
(c) act as a support
(d) all of the above
(e) none of the above.

Ans: d

11. A universal joint is an example of

(a) higher pair
(b) lower pair
(c) rolling pair
(d) sliding pair
(e) turning pair.

Ans: b

12. Rectilinear motion of piston is converted into rotary by

(a) cross head
(b) slider crank
(c) connecting rod
(d) gudgeon pin
(e) four bar chain mechanism.

Ans: b

13. The example of spherical pair is

(a) bolt and nut

(b) lead screw of a lathe
(c) ball and socket joint
(d) ball bearing and roller bearing
(e) none of the above.

Ans: c

14. Cross head and guides form a

(a) lower pair
(b) higher pair
(c) turning pair
(d) rolling pair
(e) sliding pair.

Ans: e

15. A circular bar moving in a round hole is an example of

(a) incompletely constrained motion
(b) partially constrained motion
(c) completely constrained motion
(d) successfully constrained motion
(e) none of the above

Ans: a

16. The lower pair is a

(a) open pair
(b) closed pair
(c) sliding pair
(d) point contact pair
(e) does not exist.

Ans: b

17. Automobile steering gear is an example of

(a) higher pair
(b) sliding pair
(c) turning pair
(d) rotary pair
(e) lower pair.

Ans: e

18. In higher pair, the relative motion is

(a) purely turning
(b) purely sliding
(c) purely rotary
(d) purely surface contact
(e) combination of sliding and turning.

Ans: e

19. Which of the following has sliding motion

(a) crank

(b) connecting rod
(c) crank pin
(d) cross-head
(e) cross head guide.

Ans: d

20. The example of higher pair is

(a) belt, rope and chain drives
(b) gears, cams
(c) ball and roller bearings
(d) all of the above
(e) none of the above.

Ans: d

21. Which of the following would constitute a link

(a) piston, piston rings and gudgeon pin
(b) piston, and piston rod
(c) piston rod and cross head
(d) piston, crank pin and crank shaft
(e) piston, piston-rod and cross head.

Ans: e

22. A completely constrained motion can be transmitted with .

(a) 1 link with pin joints
(b) 2 links with pin joints
(c) 3 links with pin joints
(d) 4 links with pin joints
(e) all of the above.

Ans: d

23. A mechanism is an assemblage of

(a) two links
(b) three links
(c) four links or more than four links
(d) all of the above
(e) none of the above.

Ans: c

24. The number of links in pantograph mechanism is equal to

(a) 2
(b) 3
(c) 4
(d) 5
(e) 6.

Ans: c

25. Elements of pairs held together mechanically is known as

(a) closed pair

(b) open pair
(c) mechanical pair
(d) rolling pair
(e) none of the above.
Ans: a

25. A slider crank chain consists of following numbers of turning and sliding pairs

(a) I, 3
(b) 2, 2
(c) 3, 1
(d) 4, 0
(e) 0, 4.
Ans: c

27. Relationship between the number of links (L) and number of pairs (P) is

(a) P = 2L-4
(b) P = 2L + 4
(c) P = 2L+2
(d) P = 2L-2
(e) P = L-4.
Ans: c

28. In an ideal machine, the output as compared to input is

(a) less
(b) more
(c) equal
(d) may be less or more depending on efficiency
(e) always less.
Ans: c

29. Governor is used in automobile to

(a) decrease the variation of speed
(b) to control
(c) to control SN
(d) all of the above
(e) none of the above.
Ans: c

30. Crowning on pulleys helps

(a) in increasing velocity ratio
(b) in decreasing the slip of the belt
(c) for automatic adjustment of belt position so that belt runs centrally
(d) increase belt and pulley life

(e) none of the above.

Ans: c

31. Idler pulley is used

(a) for changing the direction of motion of the belt

(b) for applying tension

(c) for increasing -velocity ratio

(d) all of the above

(e) none of the above.

Ans: b

32. In multi-V-belt transmission, if one of the belt is broken, we have to change the

(a) broken belt

(b) broken belt and its adjacent belts

(c) all the belts

(d) there is no need of changing any one as remaining belts can take care of transmission of load

(e) all the weak belts.

Ans: c

33. The moment on the pulley which produces rotation is called

(a) inertia

(b) momentum

(c) moment of momentum

(d) work

(e) torque.

Ans: e

34. To transmit power from one rotating shaft to another whose axes are neither parallel nor intersecting, use

(a) spur gear

(b) spiral gear

(c) bevel gear

(d) worm gear

(e) crown gear.

Ans: d

35. Throw of a cam is the maximum distance of the follower from

(a) base circle

(b) pitch circle

(c) root circle

(d) prime circle

(e) inner circle.

Ans: a

36. Lower pairs are those which have

(a) point or line contact between the two elements when in motion

(b) surface contact between the two elements when in motion
(c) elements of pairs not -held together mechanically
(d) two elements that permit relative motion
(e) none of the above.

Ans: b

37. A pantograph is a mechanism with

(a) lower pairs
(b) higher pairs
(c) rolling pairs
(d) turning pairs
(e) spherical pairs.

Ans: a

38. Kinematic pairs are those which have

(a) point or line contact between the two elements when in motion
(b) surface contact between the two elements when in motion
(c) elements of pairs not held together mechanically
(d) two elements that permit relative motion
(e) none of the above.

Ans: d

39. If the opposite links of a four bar linkage are equal, the links will always form a

(a) triangle
(b) rectangle
(c) parallelogram
(d) pentagon
(e) trapezoid.

Ans: c

40. Higher pairs are those which have

(a) point or line contact between the two elements when in motion
(b) surface contact between the two elements when in motion
(c) elements of pairs not held together mechanically
(d) two elements that permit relative motion
(e) none of the above.

Ans: a

41. A cam mechanism imparts following motion

(a) rotating
(b) oscillating
(c) reciprocating
(d) all of the above
(e) none of the above.

Ans: d

42. The approximate straight line mechanism is a

(a) four bar linkage
(b) 6 bar linkage
(c) 8 bar linkage
(d) 3 bar linkage
(e) 5 bar linkage.

Ans: a

43. "Open pairs are those which have

(a) point or line contact between the two elements when in motion
(b) surface contact between the two elements when in motion
(c) elements of pairs not held together mechanically
(d) two elements that permit relative motion
(e) none of the above.

Ans: c

44. Peaucellier mechanism has

(a) eight links
(b) six links
(c) four links
(d) twelve links
(e) five links.

Ans: a

45. Hart mechanism has

(a) eight links
(b) six links
(c) four links
(d) twelve links
(e) five links.

Ans: b

46. A chain comprises of 5 links having 5 joints. Is it kinematic chain ?

(a) yes
(b) no
(c) it is a marginal case
(d) data are insufficient to determine it
(e) unpredictable.

Ans: b

47. The main disadvantage of the sliding pair is that it is

(a) bulky
(b) wears rapidly
(c) difficult to manufacture
(d) (a) and (b) above
(e) (a) and (c) above.

Ans: d

48. For a kinematic chain to be considered as mechanism

(a) two links should be fixed
(b) one link should be fixed
(c) none of the links should be fixed
(d) there is no such criterion
(e) none of the above.

Ans: b

49.Whitworth quick return mechanism is obtained by inversion of (a) slider crank mechanism

(b) kinematic chain
(c) five link mechanism
(d) roller cam mechanism
(e) none of the above.

Ans: a

50. In a mechanism, usually one link is fixed. If the fixed link is changed in a kinematic chain, then relative motion of other links

(a) will remain same
(b) will change
(c) could change or remain unaltered depending oh which link is fixed (d) will not occur
(e) none of the above.

Ans: a

51. A kinematic chain requires at least

(a) 2 links and 3 turning pairs
(b) 3 links and 4 turning pairs
(c) 4 links and 4 turning pairs
(d) 5 links and 4 turning pairs
(e) none of the above.

Ans: c

52. The following is the inversion of slider crank chain mechanism

(a) Whitworth quick return mechanism
(b) hand pump
(c) oscillating cylinder engine
(d) all of the above
(e) none of the above.

Ans: d

53. Kinematic pairs are those which have

(a) two elements held together mechanically
(b) two elements having relative motion
(c) two elements having Coroili's component
(d) minimum of two instantaneous centres
(e) all of the above.

Ans: b

54. Instantaneous center of rotation of a link in a four bar mechanism lies on

(a) right side pivot of this link

(b) lift side pivot of this link

(c) a point obtained by intersection on extending adjoining links

(d) can't occur

(e) none of the above.

Ans: c

55.The number of centers in a crank driven slider crank mechanism are

(a) 0

(b) 2

(c) 4

(d) 6

(e) may be any number depending upon position of mechanism.

Ans: b