Chettinad College of Engineering & Technology
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Department of Mechanical Engineering

ME 8492 – Kinematics of Machinery

Unit I – Introduction to Mechanism - MCQ Bank

1. In a reciprocating steam engine, which of the following forms a kinematic link ?
(*a*) cylinder and piston
(*b*) piston rod and connecting rod
(*c*) crank shaft and flywheel
(*d*) flywheel and engine frame
Answer: (*c*)

2. The motion of a piston in the cylinder of a steam engine is an example of
(*a*) completely constrained motion
(*b*) incompletely constrained motion
(*c*) successfully constrained motion
(*d*) none of these
Answer: (*a*)

3. The motion transmitted between the teeth of gears in mesh is
(*a*) sliding
(*b*) rolling
(*c*) may be rolling or sliding depending upon the shape of teeth
(*d*) partly sliding and partly rolling
Answer: (*d*)

4. The cam and follower without a spring forms a
(*a*) lower pair
(*b*) higher pair
(*c*) self closed pair
(*d*) force closed pair
Answer: (*c*)

5. A ball and a socket joint forms a
(*a*) turning pair
(*b*) rolling pair
(*c*) sliding pair
(*d*) spherical pair
Answer: (*d*)

6. The lead screw of a lathe with nut forms a
(*a*) sliding pair
(*b*) rolling pair
(*c*) screw pair
(*d*) turning pair

Answer: (*c*)

7. When the elements of the pair are kept in contact by the action of external forces, the pair is said to be a
(*a*) lower pair
(*b*) higher pair
(*c*) self closed pair
(*d*) force closed pair
Answer: (*d*)

8. Which of the following is a turning pair ?
(*a*) Piston and cylinder of a reciprocating steam engine
(*b*) Shaft with collars at both ends fitted in a circular hole
(*c*) Lead screw of a lathe with nut
(*d*) Ball and socket joint
Answer: (*b*)

9. A combination of kinematic pairs, joined in such a way that the relative motion between the links is completely constrained, is called a
(*a*) structure
(*b*) mechanism
(*c*) kinematic chain
(*d*) inversion
Answer: (*c*)

10. The relation between the number of pairs (p) forming a kinematic chain and the number of links (l) is
(*a*) $l = 2p - 2$
(*b*) $l = 2p - 3$
(*c*) $l = 2p - 4$
(*d*) $l = 2p - 5$
Answer: (*c*)

11. The relation between the number of links (l) and the number of binary joints (j) for a kinematic chain having constrained motion is given by $j = 3/2\ l - 2$ If the left hand side of this equation is greater than right hand side, then the chain is
(*a*) locked chain
(*b*) completely constrained chain
(*c*) successfully constrained chain
(*d*) incompletely constrained chain
Answer: (*a*)

12. In a kinematic chain, a quaternary joint is equivalent to
(*a*) one binary joint
(*b*) two binary joints
(*c*) three binary joints
(*d*) four binary joints
Answer: (*c*)

13. If *n* links are connected at the same joint, the joint is equivalent to
(*a*) (*n* – 1) binary joints
(*b*) (*n* – 2) binary joints
(*c*) (2*n* – 1) binary joints
(*d*) none of these
Answer: (*a*)

14. In a 4 – bar linkage, if the lengths of shortest, longest and the other two links are denoted by *s*, *l*, *p* and *q*, then it would result in Grashof's linkage provided that
(*a*) $l + p < s + q$
(*b*) $l + s < p + q$
(*c*) $l + p = s + q$
(*d*) none of these
Answer: (*b*)

15. A kinematic chain is known as a mechanism when
(*a*) none of the links is fixed
(*b*) one of the links is fixed
(*c*) two of the links are fixed
(*d*) all of the links are fixed
Answer: (*b*)

16. The Grubler's criterion for determining the degrees of freedom (*n*) of a mechanism having plane motion is_____. where *l* = Number of links, and *j* = Number of binary joints.
(*a*) $n = (l – 1) – j$
(*b*) $n = 2 (l – 1) – 2j$
(*c*) $n = 3 (l – 1) – 2j$
(*d*) $n = 4 (l – 1) – 3j$
Answer: (*c*)

17. The mechanism forms a structure, when the number of degrees of freedom (*n*) is equal to
(*a*) 0
(*b*) 1
(*c*) 2
(*d*) – 1
Answer: (*a*)

18. In a four bar chain or quadric cycle chain
(*a*) each of the four pairs is a turning pair
(*b*) one is a turning pair and three are sliding pairs
(*c*) three are turning pairs and one is sliding pair
(*d*) each of the four pairs is a sliding pair.
Answer: (*a*)

19. Which of the following is an inversion of single slider crank chain ?
(*a*) Beam engine
(*b*) Watt's indicator mechanism

(*c*) Elliptical trammels
(*d*) Whitworth quick return motion mechanism
Answer: (*d*)

20. Which of the following is an inversion of double slider crank chain ?
(*a*) Coupling rod of a locomotive
(*b*) Pendulum pump
(*c*) Elliptical trammels
(*d*) Oscillating cylinder engine
Answer: (*c*)

21. In a pantograph, all the pairs are
(*a*) turning pairs
(*b*) sliding pairs
(*c*) spherical pairs
(*d*) self-closed pairs
Answer: (*a*)

22. Which of the following mechanism is made up of turning pairs ?
(*a*) Scott Russel's mechanism
(*b*) Peaucellier's mechanism
(*c*) Hart's mechanism
(*d*) both (*b*) and (*c*)
Answer: (*d*)

23. Which of the following mechanism is used to enlarge or reduce the size of a drawing ?
(*a*) Grasshopper mechanism
(*b*) Watt mechanism
(*c*) Pantograph
(*d*) none of these
Answer: (*c*)

24. The Ackerman steering gear mechanism is preferred to the Davis steering gear mechanism, because
(*a*) whole of the mechanism in the Ackerman steering gear is on the back of the front wheels.
(*b*) the Ackerman steering gear consists of turning pairs
(*c*) the Ackerman steering gear is most economical
(*d*) both (*a*) and (*b*)
Answer: (*d*)

25. The driving and driven shafts connected by a Hooke's joint will have equal speeds, if
(*a*) $\cos \theta = \sin \alpha$
(*b*) $\sin \theta = \pm \sqrt{\tan \alpha}$
(*c*) $\tan \theta = \pm \sqrt{\cos \alpha}$
(*d*) $\cot \theta = \cos \alpha$
where θ = Angle through which the driving shaft turns, and
α = Angle of inclination of the driving and driven shafts.
Answer: (*c*)