EXAMOBJECTIVE

online preperation

1. The ratio of the actual damping coefficient to the critical damping coefficient is called damping factor.

   A. Yes

   B. No

   Answer: Option **A**

2. When a body moves with simple harmonic motion, the product of its periodic time and frequency is equal to

   A. zero

   B. one

   C. π/2

   D. π

Answer: Option **B**

3. In a vibrating system, if the actual damping coefficient is 40 N/m/s and critical damping coefficient is 420 N/m/s, then logarithmic decrement is equal to

   A. 0.2

   B. 0.4

   C. 0.6

   D. 0.8

   Answer: Option **C**

4. For high-speed engines, the cam follower should move with

   A. uniform velocity

   B. simple harmonic motion

   C. uniform acceleration and retardation

   D. cycloidal motion

   Answer: Option **D**

5. In a coupling rod of a locomotive, each of the four pairs is a _____ _____ pair.

   A. sliding

   B. turning

   C. rolling

   D. screw

   Answer: Option **B**

6. If ω/ω_n is very high for a body vibrating under steady state vibrations, the phase angle for all values of damping factors, will tend to approach

   A. 0°

   B. 90°

   C. 180°

   D. 360°

   Answer: Option **C**

7. In a circular arc cam with roller follower, the acceleration in any position of the lift will depend only upon

   A. total lift, total angle of lift, minimum radius of cam and cam speed

   B. radius of circular arc, cam speed, location of centre of circular arc and roller diameter

   C. mass of cam follower linkage, spring stiffness and cam speed

   D. total lift, centre of gravity of the cam and cam speed

   Answer: Option **A**

8. When the relation between the controlling force (F_c) and radius of rotation (r) for a spring-controlled governor is $F_c = ar + b$, then the governor will be

   A. stable

   B. unstable

   C. isochronous

   D. none of these

   Answer: Option **B**

9. The factor which affects the critical speed of a shaft is

   A. diameter of disc

   B. span of shaft

   C. eccentricity

   D. all of these

   Answer: Option **D**

10. The partial balancing of reciprocating parts in locomotives produces

    A. hammer blow

    B. swaying couple

    C. variation in tractive force along the line of stroke

    D. all of the above

    Answer: Option **D**

11. The pair is known as a higher pair, when the relative motion between the elements of a pair is

A. turning only

B. sliding only

C. rolling only

D. partly turning and partly sliding

Answer: Option **D**

12. When the connection between the two elements is such that only required kind of relative motion occurs, it is known as self-closed pair.

A. Right

B. Wrong

Answer: Option **A**

13. The Whitworth quick return motion mechanism is formed in a slider crank chain when the

A. coupler link is fixed

B. longest link is a fixed link

C. slider is a fixed link

D. smallest link is a fixed link

Answer: Option **A**

14. The primary unbalanced force is maximum when the angle of inclination of the crank with the line of stroke is

A. 0° and 90°

B. 0° and 180°

C. 90° and 180°

D. 180° and 360°

Answer: Option **B**

15. The acceleration of the particle moving with simple harmonic motion is inversely proportional to the displacement of the particle from the mean position.

A. Yes

B. No

Answer: Option **B**

16. In vibration isolation system, the transmissibility will be equal to unity, for all values of damping factor, if ω/ω_n is

    A. equal to one

    B. equal to $(2)^{1/2}$

    C. less than $(2)^{1/2}$

    D. greater than $(2)^{1/2}$

    Answer: Option **B**

17. The two links *OA* and *OB* are connected by a pin joint at *O*. If the link *OA* turns with angular velocity ω_1 rad/s in the clockwise direction and the link *OB* turns with angular velocity ω_2 rad/s in the clockwise direction, then the rubbing velocity at the pin joint *O* is (where *r* = Radius of the pin at *O*)

    A. $\omega_1.\omega_2.r$

    B. $(\omega_1 - \omega_2)r$

    C. $(\omega_1 + \omega_2)r$

    D. $(\omega_1 - \omega_2)2r$

    Answer: Option **B**

18. If $\omega/\omega_n = 2$, where co is the frequency of excitation and ω_n is the natural frequency of vibrations, then the transmissibility of vibration will the

    A. 0.5

    B. 1

    C. 1.5

    D. 2

    Answer: Option **B**

19. A disturbing mass m1 attached to the rotating shaft may be balanced by a single mass m_2 attached in the same plane of rotation as that of m_1, such that (where r_1 and r_2 are the radii of rotation of m_1 and m_2 respectively)

    A. $m_1r_2 = m_2r_1$

    B. $m_1r_1 = m_2r_2$

C. $m_1 m_2 = r_1 r_2$

D. none of these

Answer: Option **B**

20. In railway axle boxes, the bearing used is

A. deep groove ball bearing

B. double row self-aligning ball bearing

C. double row spherical roller bearing

D. cylindrical roller bearing

Answer: Option **C**

21. When the two elements of a pair have a surface contact when relative motion takes place and the surface of one element slides over the surface of the other, the pair formed is known as a

A. lower pair

B. higher pair

C. self-closed pair

D. force-closed pair

Answer: Option **A**

22. The centre distance between two meshing involute gears is equal to

A. $\frac{\text{sum of base circle radii}}{\cos \varphi}$

B. $\frac{\text{difference of base circle radii}}{\cos \varphi}$

C. $\frac{\text{sum of pitch circle radii}}{\cos \varphi}$

D. $\frac{\text{difference of pitch circle radii}}{\cos \varphi}$

Answer: Option **A**

23. The two elements of a pair are said to form a _____ when they permit relative motion between them.

A. open pair

B. kinematic pair

Answer: Option **B**

24. When the axes of the shafts, over which the gears are mounted, move relative to a fixed axis, then the train is known as reverted gear train.

    A. Right

    B. Wrong

    Answer: Option **B**

25. In under damped vibrating system, the amplitude of vibration

    A. decreases linearly with time

    B. increases linearly with time

    C. decreases exponentially with time

    D. increases exponentially with time

    Answer: Option **C**

26. The dynamic friction is the friction experienced by a body, when the body

    A. is in motion

    B. is at rest

    C. just begins to slide over the surface of the other body

    D. none of the above

    Answer: Option **A**

27. The steering of a ship means

    A. movement of a complete ship up and down in vertical plane about transverse axis

    B. turning of a complete ship in a curve towards right or left, while it moves forward

    C. rolling of a complete ship side-ways

    D. none of the above

    Answer: Option **B**

28. The tractive force in a locomotive with two cylinders is given by (where c = Fraction of reciprocating parts per cylinder, m = Mass of reciprocating parts, ω = Angular speed of

crank, r = Radius of crank, and θ = Angle of inclination of crank to the line of stroke)

A. $m.\omega^2.r \cos \theta$

B. $c.m.\omega^2.r \sin \theta$

C. $(1 - c)m.\omega^2.r(\cos \theta - \sin \theta)$

D. $m.\omega^2.r(\cos \theta - \sin \theta)$

Answer: Option **C**

29. The radial distance of a tooth from the pitch circle to the bottom of the tooth is called

A. dedendum

B. addendum

C. clearance

D. working depth

Answer: Option **A**

30. When the crank is at the inner dead centre, in a reciprocating steam engine, then the velocity of the piston will be

A. minimum

B. zero

C. maximum

D. none of these

Answer: Option **B**

31. The gears are termed as medium velocity gears, if their peripheral velocity is

A. 1 - 3 m/s

B. 3 - 15 m/s

C. 15 - 30 m/s

D. 30 - 50 m/s

Answer: Option **B**

32. For a twin cylinder *V*-engine, the crank positions for primary reverse cranks and secondary direct cranks are shown in the below figure. The engine is a

A. 30° *V*-engine

B. 60° *V*-engine

C. 120° *V*-engine

D. 150° *V*-engine

Answer: Option **A**

33. The frequency of damped vibrations with viscous damping is _____ the frequency of undamped vibrations.

A. more than

B. less than

C. same as

Answer: Option **B**

34. Whitworth quick return motion mechanism consists of three turning pairs and one sliding pair.

A. Right

B. Wrong

Answer: Option **A**

35. The rotor of a ship rotates in clockwise direction when viewed from

stern and the ship takes a right turn. The effect of gyroscopic couple

acting on it will be to raise the stern and lower the bow.

A. Agree

B. Disagree

Answer: Option **A**

36. The sliding pairs, turning pairs and screw pairs form lower pairs.

A. True

B. False

Answer: Option **A**

37. When a particle moves round the circumference of a circle of radius r with ω rad/s, then its maximum acceleration is $\omega^2 r$.

A. Right

B. Wrong

Answer: Option **A**

38. The static friction

A. bears a constant ratio to the normal reaction between the two surfaces

B. is independent of the area of contact, between the two surfaces

C. always acts in a direction, opposite to that in which the body tends to move

D. all of the above

Answer: Option **D**

39. A shaft has an attached disc at the centre of its length. The disc has its centre of gravity located at a distance of 2 mm from the axis of the shaft. When the shaft is allowed to vibrate in its natural bow-shaped mode, it has a frequency of vibration of 10 rad/s. When the shaft is rotated at 300 r.p.m., it will whirl with a radius of

A. 2 mm

B. 2.22 mm

C. 2.50 mm

D. 3.0 mm

Answer: Option **B**

40. The swaying couple is maximum or minimum when the angle of inclination of the crank to the line of stroke (θ) is equal to

A. 90° and 180°

B. 45° and 225°

C. 180° and 270°

D. 270° and 360°

Answer: Option **B**

41. The pressure angle of a cam is the angle between the direction of the follower motion and a normal to the

A. pitch circle

B. base circle

C. pitch curve

D. prime circle

Answer: Option **C**

42. A pair of friction discs is an example of rolling pair.

A. True

B. False

Answer: Option **B**

43. In order to balance the reciprocating masses,

A. primary forces and couples must be balanced

B. secondary forces and couples must be balanced

C. both (a) and (b)

D. none of these

Answer: Option **C**

44. In a screw jack, the effort required to lower the load W is given by

A. $P = W \tan(\alpha - \varphi)$

B. $P = W \tan(\alpha + \varphi)$

C. $P = W \tan(\varphi - \alpha)$

D. $P = W \cos(\alpha + \varphi)$

Answer: Option **C**

45. An automobile steering gear is an example of

A. sliding pair

B. rolling pair

C. lower pair

D. higher pair

Answer: Option **C**

46. The frictional torque transmitted in a multi-collared shaft is same as that of a single collared shaft.

A. Right

B. Wrong

Answer: Option **A**

47. In order to give the primary balance of the reciprocating parts of a multi-cylinder in-line engines,

A. the algebraic sum of the primary forces must be equal to zero

B. the algebraic sum of the couples about any point in the plane of the primary forces must be equal to zero

C. both (a) and (b)

D. none of these

Answer: Option **C**

48. The gear train usually employed in clocks is a

A. simple gear train

B. reverted gear train

C. sun and planet gear

D. differential gear

Answer: Option **B**

49. A mass of 1 kg is attached to the end of a spring with a stiffness of 0.7 N/mm. The critical damping coefficient of this system is

A. 1.4 N-s/m

B. 18.52 N-s/m

C. 52.92 N-s/m

D. 529.2 N-s/m

Answer: Option **C**

50. The cam follower generally used in automobile engines is

A. knife edge follower

B. fiat faced follower

C. spherical faced follower

D. roller follower

Answer: Option **C**

Question Bank Part-2

1. The maximum or minimum value of the swaying couple is

A. $\pm\, c.m.\omega^2.r$

B. $\pm\, a(1 - c)m.\omega^2.r$

C. $\pm\, \frac{a}{\sqrt{2}}(1 - c)m.\omega^2.r$

D. $\pm\, 2a(1 - c)m.\omega^2.r$

Answer: Option **C**

2. For an involute gear, the ratio of base circle radius and pitch circle radius is equal to

A. sin φ

B. cos φ

C. sec φ

D. cosec φ

Answer: Option **B**

3. A chain consisting of four links and four joints is called a kinematic chain.

A. Yes

B. No

Answer: Option **A**

4. Which of the following is an open pair?

A. Ball and socket joint

B. Journal bearing

C. Lead screw and nut

D. Cam and follower

Answer: Option **D**

5. The frictional torque transmitted in a flat pivot bearing with assumption of uniform pressure is _____ as compared to uniform wear.

A. less

B. more

C. same

Answer: Option **B**

6. A reed type tachometer use the principle of

A. longitudinal vibration

B. torsional vibration

C. transverse vibration

D. damped free vibration

Answer: Option **C**

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7. The natural frequency of free transverse vibrations due to a point load acting over a simply supported shaft is equal to (where δ = Static deflection of a simply supported shaft due to the point load)

A. $\frac{0.4985}{\sqrt{\delta}}$

B. $\frac{0.5615}{\sqrt{\delta}}$

C. $\frac{0.571}{\sqrt{\delta}}$

D. $\frac{0.6253}{\sqrt{\delta}}$

Answer: Option **A**

8. When the sleeve of a Porter governor moves upwards, the governor speed

A. increases

B. decreases

C. remains unaffected

D. first increases and then decreases

Answer: Option **A**

9. The retardation of a flat faced follower when it has contact at the apex of the nose of a circular arc cam, is given by (where *OQ* = Distance between the centre of circular flank and centre of nose)

A. $\omega^2 \times OQ$

B. $\omega^2 \times OQ \sin \theta$

C. $\omega^2 \times OQ \cos \theta$

D. $\omega^2 \times OQ \tan \theta$

Answer: Option **A**

10. A thin circular disc is rolling with a uniform linear speed, along a straight path on a plane surface. Which of the following statement is correct in this regard ?

A. All points of the disc have the same velocity

B. The centre of the disc has zero acceleration

C. The centre of the disc has centrifugal acceleration

D. The point on the disc making contact with the plane surface has zero acceleration

Answer: Option **B**

11. Which of the following statement is correct ?

A. The periodic time of a particle moving with simple harmonic motion is the time taken by a particle for one complete oscillation.

B. The periodic time of a particle moving with simple harmonic motion is directly proportional to its angular velocity.

C. The velocity of a particle moving with simple harmonic motion is zero at the mean position.

D. The acceleration of the particle moving with simple harmonic motion is maximum at the mean position.

Answer: Option **A**

12. When the speed of the engine fluctuates continuously above and below the mean speed, the governor is said to be

    A. stable

    B. unstable

    C. isochronous

    D. hunt

    Answer: Option **D**

13. When two pulleys of different diameters are connected by means of an open belt, the angle of contact at the _____ pulley must be taken into consideration.

    A. smaller

    B. larger

    Answer: Option **A**

14. The maximum frictional force, which comes into play, when an body just begins to slide over the surface of the other body, is known as

    A. static friction

    B. dynamic friction

    C. limiting friction

    D. coefficient of friction

    Answer: Option **C**

15. In a four stroke I.C. engine, the turning moment during the

    compression stroke is

    A. positive throughout

    B. negative throughout

    C. positive during major portion of the stroke

    D. negative during major portion of the stroke

Answer: Option **B**

16. A body will begin to move down an inclined plane, if the angle of inclination of the plane is _____ the angle of friction.

    A. equal to

    B. less than

    C. greater than

    Answer: Option **C**

17. The fundamental equation for correct steering is (where φ and α = Angle through which the axis of the outer wheel and inner wheel turns respectively, *c* = Distance between the pivots of the front axles, and *d* = Wheel base)

    A. $\sin \varphi + \sin \alpha = \frac{b}{c}$

    B. $\cos \varphi - \sin \alpha = \frac{c}{b}$

    C. $\cot \varphi - \cot \alpha = \frac{c}{b}$

    D. $\tan \varphi + \cot \alpha = \frac{b}{c}$

    Answer: Option **C**

18. The height of a Watt's governor is

    A. directly proportional to speed

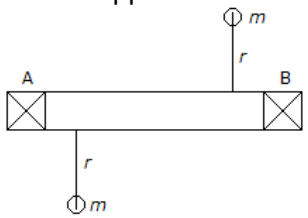
    B. directly proportional to $(\text{speed})^2$

    C. inversely proportional to speed

    D. inversely proportional to $(\text{speed})^2$

    Answer: Option **D**

19. A rotor supported at *A* and *B* carries two masses as shown in the below figure. The rotor is



A. dynamically balanced

B. statically balanced

C. statically and dynamically balanced

D. not balanced

Answer: Option **C**

20. For an isochronous Hartnell governor (where r_1 and r_2 = Maximum and minimum radius of rotation of balls respectively, S_1 and S_2 = Maximum and minimum force exerted on the sleeve respectively, and M = Mass on the sleeve)

A. $\frac{m.g + S_1}{m.g + S_2} = \frac{r_1}{r_2}$

B. $\frac{m.g - S_1}{m.g - S_2} = \frac{r_2}{r_1}$

C. $\frac{S_1}{S_2} = \frac{r_1}{r_2}$

D. $\frac{S_2}{S_1} = \frac{r_1}{r_2}$

Answer: Option **A**

21. Which of the following is a higher pair?

A. Belt and pulley

B. Turning pair

C. both open belt drive and crossed belt drive is recommended

D. the drive is recommended depending upon the torque transmitted

Answer: Option **B**

46. A flywheel is fitted to the crankshaft of an engine having W as the amount of indicated work per revolution and permissible limits of coefficient of fluctuation of energy and speed as C_E and C_S respectively. The kinetic energy of the flywheel is given by

A. $\frac{2\,W\,C_E}{C_S}$

B. $\frac{W\,C_E}{2\,C_S}$

C. $\frac{W\,C_E}{C_S}$

D. $\frac{W\,C_S}{2\,C_E}$

Answer: Option **B**

47. When the connection between the elements forming a pair is such that the constrained motion is not completed by itself, but by some other means, the motion is said to be a completely constrained motion,

A. Yes

B. No

Answer: Option **B**

48. In gears, interference takes place when

A. the tip of a tooth of a mating gear digs into the portion between base and root circles

B. gears do not move smoothly in the absence of lubrication

C. pitch of the gears is not same

D. gear teeth are undercut

Answer: Option **A**

49. The ratio of maximum fluctuation of speed to the mean speed is called

A. fluctuation of speed

B. maximum fluctuation of speed

C. coefficient of fluctuation of speed

D. none of these

Answer: Option **C**

50. Which of the following statement is correct for involute gears?

A. The interference is inherently absent.

B. The variation in centre distance of shafts increases radial force.

C. A convex flank is always in contact with concave flank.

D. The pressure angle is constant throughout the teeth engagement.

Answer: Option **D**

Question Bank Part-10

1. The pitching of a ship produces forces on the bearings which act _____ to the motion of the ship.

A. vertically and parallel

B. vertically and perpendicular

C. horizontally and parallel

D. horizontally and perpendicular

Answer: Option **D**

2. The contact ratio is given by

   A. $\frac{\text{Length of the path of approach}}{\text{Circular pitch}}$

   B. $\frac{\text{Length of the path of recess}}{\text{Circular pitch}}$

   C. $\frac{\text{Length of the arc of contact}}{\text{Circular pitch}}$

   D. $\frac{\text{Length of the arc of approach}}{\cos \varphi}$

   Answer: Option **C**

3. At the node, the shaft remains unaffected by the vibration.

   A. Agree

   B. Disagree

   Answer: Option **A**

4. The two links *OA* and *OB* are connected by a pin joint at *O*. If the link *OA* turns with angular velocity ω_1 rad/s in the clockwise direction and the link *OB* turns with angular velocity ω_2 rad/s in the anti-clockwise direction, then the rubbing velocity at the pin joint *O* is (where *r* = Radius of the pin at *O*)

   A. $\omega_1.\omega_2.r$

   B. $(\omega_1 - \omega_2)r$

   C. $(\omega_1 + \omega_2)r$

   D. $(\omega_1 - \omega_2)2r$

   Answer: Option **C**

5. When the two elements of a pair have _____ when in motion,

   it is said to a lower pair.

   A. line or point contact

   B. surface contact

Answer: Option **B**

6. The sensitiveness of a governor depends upon the lift of the sleeve.

   A. Right

   B. Wrong

   Answer: Option **A**

7. The ratio of maximum fluctuation of energy to the workdone per cycle is called

   A. fluctuation of energy

   B. maximum fluctuation of energy

   C. coefficient of fluctuation of energy

   D. none of these

   Answer: Option **C**

8. In a steam engine, the earlier cut-off with a simple slide valve may be obtained by increasing the steam lap and the angle of advance of the eccentric but keeping constant the travel and lead of the valve, This method will

   A. cause withdrawing or throttling of steam

   B. reduce length of effective stroke of piston

   C. reduce maximum opening of port to steam

   D. all of these

   Answer: Option **C**

9. The centre of suspension and centre of percussion are not interchangeable.

   A. Correct

   B. Incorrect

   Answer: Option **B**

10. The size of cam depends upon

A. base circle

B. pitch circle

C. prime circle

D. pitch curve

Answer: Option **A**

11. The acceleration of a flat-faced follower when it has contact with

the flank of a circular arc cam, is given by

A. $\omega^2 R \cos \theta$

B. $\omega^2 (R - r_1) \cos \theta$

C. $\omega^2 (R - r_1) \sin \theta$

D. $\omega^2 r_1 \sin \theta$

Answer: Option **B**

12. 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: Option **A**

13. The sense of Coriolis component 2 ωv is same as that of the relative velocity vector v rotated at

A. 45° in the direction of rotation of the link containing the path

B. 45° in the direction opposite to the rotation of the link containing the path

C. 90° in the direction of rotation of the link containing the path

D. 180° in the direction opposite to the rotation of the link containing the path

Answer: Option **C**

14. The condition for correct steering of a Davis steering gear is (where α = Angle of inclination of the links to the vertical)

A. $\sin \alpha = \frac{b}{c}$

B. $\cos \alpha = \frac{c}{b}$

C. $\tan \alpha = \frac{c}{2b}$

D. $\cot \alpha = \frac{c}{2b}$

Answer: Option **C**

15. The frequency of oscillation of a torsional pendulum is

A. $\frac{2\pi k}{r}\sqrt{\frac{g}{l}}$

B. $\frac{r}{2\pi k}\sqrt{\frac{l}{g}}$

C. $\frac{2\pi r}{k}\sqrt{\frac{g}{l}}$

D. $\frac{r}{2\pi k}\sqrt{\frac{g}{l}}$

Answer: Option **D**

16. Two pulleys of radii r_1 and r_2 and at distance x apart are connected

by means of an open belt drive. The length of the belt is

A. $\pi (r_1 + r_2) + \frac{(r_1 + r_2)^2}{x} + 2x$

B. $\pi (r_1 + r_2) + \frac{(r_1 - r_2)^2}{x} + 2x$

C. $\pi (r_1 - r_2) + \frac{(r_1 - r_2)^2}{x} + 2x$

D. $\pi (r_1 - r_2) + \frac{(r_1 + r_2)^2}{x} + 2x$

Answer: Option **B**

17. The centre of percussion is below the centre of gravity of the body and is at a distance equal to

A. h/k_G

B. h^2/k_G

C. k_G^2/h

D. $h \times k_G$

Answer: Option **C**

18. A governor is said to be isochronous when range of speed is zero for all radii of rotation of the balls within the working range, neglecting friction.

A. Yes

B. No

Answer: Option **A**

19. An overdamped system, when disturbed from the equilibrium position, will not cross the equilibrium position.

A. Right

B. Wrong

Answer: Option **A**

20. The efficiency of a screw jack is dependent upon the load raised or

lowered.

A. True

B. False

Answer: Option **B**

21. The instantaneous centres, which moves as the mechanism moves

butjoints are of permanent nature, are called permanent

instantaneous centres.

A. Yes

B. No

Answer: Option **A**

22. A pair is said to be a kinematic pair, if the relative motion between them is completely or successfully constrained.

A. Correct

B. Incorrect

Answer: Option **A**

23. The pitching of a ship is assumed to take place with simple harmonic motion.

A. Yes

B. No

Answer: Option **A**

24. The natural frequency of free transverse vibrations due to uniformly distributed load acting over a simply supported shaft is (where δ_s = Static deflection of simply supported shaft due to uniformly distributed load)

A. $\frac{0.4985}{\sqrt{\delta_s}}$

B. $\frac{0.5615}{\sqrt{\delta_s}}$

C. $\frac{0.571}{\sqrt{\delta_s}}$

D. $\frac{0.6253}{\sqrt{\delta_s}}$

Answer: Option **B**

25. A motor car moving at a certain speed takes a left turn in a curved path. If the engine rotates in the same direction as that of wheels, men due to centrifugal force

A. the reaction on me inner wheels increases and on the outer wheels decreases

B. the reaction on the outer wheels increases and on the inner wheels decreases

C. the reaction on the front wheels increases and on the rear wheels decreases

D. the reaction on the rear wheels increases and on the front wheels decreases

Answer: Option **B**

26. *A* point *B* on a rigid link *AB* moves with respect to *A* with angular velocity ω rad/s. The angular acceleration of the link *AB* is (where a^r_{BA} and a^t_{BA} = Radial and tangential components of the acceleration of *B* with respect to *A*)

A. $\frac{a^r_{BA}}{AB}$

B. $\frac{a^t_{BA}}{AB}$

C. v_{BA} x *AB*

D.

$\frac{v^2_{BA}}{AB}$

Answer: Option **B**

27. In order to give a complete secondary balance of a multi-cylinder in-line engine,

    A. the algebraic sum of the secondary forces must be equal to zero

    B. the algebraic sum of the couples about any point in the plane of the secondary forces must be equal to zero

    C. both (a) and (b)

    D. none of these

    Answer: Option **C**

28. *A* point *B* on a rigid link *AB* moves with respect to *A* with angular velocity ω rad/s. The total acceleration of *B* with respect to *A* will be equal to

    A. vector sum of radial component and coriolis component

    B. vector sum of tangential component and coriolis component

    C. vector sum of radial component and tangential component

    D. vector difference of radial component and tangential component

    Answer: Option **C**

29. A spring controlled governor is said to be stable if the controlling force line when produced intersects the Y-axis

    A. at the origin

    B. below the origin

    C. above the origin

    D. any one of these

    Answer: Option **B**

30. When the radius of rotation of balls _____ as the equilibrium

speed increases, the governor is said to be unstable.

A. remains constant

B. decreases

C. increases

Answer: Option **B**

31. The engine of an aeroplane rotates in clockwise direction when seen from the tail end and the aeroplane takes a turn to the left. The effect of gyroscopic couple on the aeroplane will be

A. to dip the nose and tail

B. to raise the nose and tail

C. to raise the nose and dip the tail

D. to dip the nose and raise the tail

Answer: Option **C**

32. A mechanism is an assemblage of

A. two links

B. three links

C. four or more than four links

D. all of these

Answer: Option **C**

33. In a simple harmonic motion, the velocity vector with respect to displacement vector

A. is in phase

B. leads by 90°

C. leads by 180°

D. lags by 90°

Answer: Option **D**

34. When a point moves along a straight line, its acceleration will have

A. radial component only

B. tangential component only

C. coriolis component only

D. radial and tangential components both

Answer: Option **B**

35. The primary unbalanced force of reciprocating masses is inversely proportional to the crank radius.

A. Yes

B. No

Answer: Option **B**

36. The load cup of a screw jack is made separate from the head of the spindle to

A. enhance the load carrying capacity of the jack

B. reduce the effort needed for lifting the working load

C. reduce the value of frictional torque required to be countered for lifting the load

D. prevent the rotation of load being lifted

Answer: Option **D**

37. In an open pair, the two elements of a pair

A. have a surface contact when in motion

B. have a line or point contact when in motion

C. are kept in contact by the action of external forces, when in motion

D. are not held together mechanically

Answer: Option **D**

38. The frictional torque transmitted in a flat collar bearing, considering uniform pressure, is (where r_1 and r_2 = External and internal radii of collar respectively)

A. $\frac{1}{2} \mu W (r_1 + r_2)$

B. $\frac{2}{3} \mu W (r_1 + r_2)$

C. $\frac{1}{2} \mu W \left(\frac{r_1^3 - r_2^3}{r_1^2 - r_2^2} \right)$

D. $\frac{2}{3} \mu W \left(\frac{r_1^3 - r_2^3}{r_1^2 - r_2^2} \right)$

Answer: Option **D**

39. Efficiency of a screw jack is given by

A. $\frac{\tan(\alpha + \varphi)}{\tan \alpha}$

B. $\frac{\tan \alpha}{\tan(\alpha + \varphi)}$

C. $\frac{\tan(\alpha - \varphi)}{\tan \alpha}$

D. $\frac{\tan \alpha}{\tan(\alpha - \varphi)}$

Answer: Option **B**

40. The ratio of the driving tensions for V-belts is _____ times that

of flat belts. (where β = Semi-angle of the groove)

A. sin β

B. cos β

C. cosec β

D. sec β

Answer: Option **C**

41. The secondary unbalanced force is _____ the primary unbalanced force.

A. one-half

B. two-third

C. *n* times

D. 1/*n* times

Answer: Option **D**

42. 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: Option **D**

43. The two links are said to have a pure rolling contact, when their instantaneous centre _____ on their point of contact.

A. lies

B. does not lie

Answer: Option **A**

44. One end of a helical spring is fixed while the other end carries the load *W* which moves with simple harmonic motion. The frequency of motion is given by (where δ = Deflection of the spring)

A. $2\pi\sqrt{\frac{g}{\delta}}$

B. $\frac{1}{2\pi}\sqrt{\frac{g}{\delta}}$

C. $2\pi\sqrt{\frac{\delta}{g}}$

D. $\frac{1}{2\pi}\sqrt{\frac{\delta}{g}}$

Answer: Option **B**

45. The brake commonly used in motor cars is internal expanding brake.

A. True

B. False

Answer: Option **A**

46. The instantaneous centre of a rigid thin disc rolling on a plane rigid surface is located at

A. the centre of the disc

B. the point of contact

C. an infinite distance on the plane surface

D. the point on the circumference situated vertically opposite to the contact point

Answer: Option **B**

47. In a flat collar pivot bearing, the moment due to friction is proportional to

A. $\left(\frac{r_1^2 - r_2^2}{r_1 - r_2}\right)$

B. $\left(\frac{r_1^2 - r_2^2}{r_1 + r_2}\right)$

C. $\left(\frac{r_1^3 - r_2^3}{r_1^2 - r_2^2}\right)$

D. $\left(\frac{r_1^3 - r_2^3}{r_1 - r_2}\right)$

Answer: Option **C**

48. The coefficient of fluctuation of speed is _____ of maximum fluctuation of speed and the mean speed.

A. sum

B. difference

C. product

D. ratio

Answer: Option **D**

49. A rigid body, under the action of external forces, can be replaced by two masses placed at a fixed distance apart. The two masses form an equivalent dynamical system, if

A. the sum of the two masses is equal to the total mass of body

B. the centre of gravity of the two masses coincides with that of the body

C. the sum of mass moment of inertia of the masses about their centre of gravity is equal to the mass moment of inertia of the body

D. all of the above

Answer: Option **D**

50. When two pulleys are connected by means of a cross belt drive, then

both the pulleys will rotate in _____ directions.

A. same

B. opposite

Answer: Option **B**

51. The ratio of velocities of the shafts connected by Hooke's joint is given by (where N and N_1 = Speed of driving and driven shafts (in r.p.m.) respectively, θ = Angle through which the arms of the cross turn, and α = Angle of inclination between the two shafts)

A. $\frac{N}{N_1} = \frac{1 - \cos^2 \theta \sin^2 \alpha}{\cos \alpha}$

B. $\frac{N}{N_1} = \frac{1 - \cos^2 \alpha \sin^2 \theta}{\cos \alpha}$

C. $\frac{N}{N_1} = \frac{\cos \alpha}{1 - \cos^2 \theta \sin^2 \alpha}$

D. $\frac{N}{N_1} = \frac{\cos \alpha}{1 - \cos^2 \alpha \sin^2 \theta}$

Answer: Option **A**

52. The equation of motion for a vibrating system with viscous damping is $\frac{d^2x}{dt^2} + \frac{c}{m} \times \frac{dx}{dt} + \frac{s}{m} \times x = 0$, if the roots of the equation are _____ then the system will be under damped.

A. equal

B. real

C. complex conjugate

Answer: Option **C**