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SET 2 – System of Particles and Rotational Motion

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1. The centre of mass of a uniform semicircular ring lies at a distance of:
(a) 2R/π from the centre
(b) R/2
(c) R/π
(d) R

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2. Torque is equal to:
(a) Force × displacement
(b) Force × moment arm
(c) Force / radius
(d) Force × mass

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3. A couple consists of:
(a) one force only
(b) two equal and opposite forces
(c) two unequal forces
(d) one torque

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4. If net torque on a body is zero, its angular momentum:
(a) remains constant
(b) increases
(c) decreases
(d) becomes zero

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5. For a system of particles, centre of mass moves as if:
(a) all forces act at that point
(b) no external force acts
(c) only torque acts
(d) one particle has all mass

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6. Moment of inertia depends upon:
(a) mass only
(b) distribution of mass only

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(c) axis of rotation
(d) both (b) and (c)

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7. The unit of moment of inertia is:
(a) kg·m
(b) kg·m²
(c) kg/m²
(d) J·s

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8. A rigid body is in rotational equilibrium if:
(a) net force = 0
(b) net torque = 0
(c) both (a) and (b)
(d) either (a) or (b)

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9. The angular momentum of a rotating body is given by:
(a) L = Iω
(b) L = Fω
(c) L = Iα
(d) L = I/F

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10. The moment of inertia of a solid cylinder about its axis is:
(a) ½ MR²
(b) MR²
(c) ⅓ MR²
(d) 2/5 MR²

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11. The parallel axis theorem relates moment of inertia about:
(a) centre and tangent
(b) two parallel axes
(c) perpendicular axes
(d) any arbitrary axes

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12. The perpendicular axis theorem is valid for:
(a) 1D bodies
(b) 2D lamina

(c) 3D bodies
(d) fluids

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13. Angular momentum is conserved if:
(a) net external force = 0
(b) net external torque = 0
(c) total energy = constant
(d) total force = constant

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14. The angular velocity is the time rate of change of:
(a) angular displacement
(b) angular acceleration
(c) torque
(d) inertia

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15. Rotational kinetic energy of a body is:
(a) ½ $I\omega^2$
(b) $I\omega^2$
(c) ½ $I\alpha^2$
(d) I/ω

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16. The unit of angular velocity is:
(a) rad/s
(b) m/s
(c) s/m
(d) rad/s^2

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17. The motion of the centre of mass of a system is governed by:
(a) internal forces
(b) external forces
(c) both
(d) none

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18. If the mass of a body increases, its moment of inertia:
(a) decreases
(b) increases

(c) remains same
(d) first increases then decreases

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19. The moment of inertia of a disc about an axis through its centre and perpendicular to its plane is:
(a) ½ MR^2
(b) MR^2
(c) ⅔ MR^2
(d) 3/5 MR^2

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20. The torque on a particle is zero when:
(a) r and F are parallel
(b) r and F are perpendicular
(c) r = 0
(d) both (a) and (c)

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21. When a spinning skater pulls in her arms, her:
(a) angular velocity increases
(b) angular velocity decreases
(c) torque increases
(d) moment of inertia increases

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22. The law of conservation of angular momentum is used in:
(a) acrobatics
(b) dancing
(c) diving
(d) all of these

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23. The moment of inertia of a rod about one end is:
(a) $ML^2/3$
(b) $ML^2/12$
(c) $2ML^2/3$
(d) ML^2

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24. A rotating rigid body has angular acceleration when:
(a) constant torque acts
(b) torque = 0

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(c) torque varies
(d) no force acts

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25. The rotational analogue of mass is:
(a) inertia
(b) angular velocity
(c) moment of inertia
(d) torque

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26. If torque = 0, angular acceleration = ?
(a) 0
(b) infinite
(c) constant
(d) variable

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27. The total kinetic energy of a rolling body =
(a) translational + rotational
(b) translational − rotational
(c) rotational only
(d) translational only

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28. If ω is angular velocity and T is time period, then ω = ?
(a) $2\pi/T$
(b) $T/2\pi$
(c) $2\pi T$
(d) $1/T^2$

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29. The angular momentum of Earth around the Sun is:
(a) constant
(b) increasing
(c) decreasing
(d) zero

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30. The moment of inertia of a thin rod about an axis perpendicular to it through its centre is:
(a) $ML^2/12$
(b) $ML^2/3$

(c) ½ ML^2
(d) $ML^2/4$

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31. A body is said to be in static equilibrium when:
(a) it is at rest
(b) it moves with uniform velocity
(c) it rotates
(d) it vibrates

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32. For pure rolling, the condition is:
(a) $v = \omega R$
(b) $v = \omega/R$
(c) $v = R/\omega$
(d) $\omega = vR$

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33. Torque produces:
(a) linear motion
(b) angular acceleration
(c) linear acceleration
(d) translational velocity

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34. The relation between torque and angular momentum is:
(a) $\tau = dL/dt$
(b) $\tau = L/t$
(c) $\tau = Lt$
(d) $\tau = L/t^2$

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35. The radius of gyration of a ring about its axis =
(a) R
(b) $R/\sqrt{2}$
(c) 2R
(d) R/2

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36. For a rotating disc, angular velocity is same for:
(a) all points
(b) only at rim

(c) only at centre
(d) depends on radius

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37. The kinetic energy of a rolling body is maximum when:
(a) sliding
(b) pure rolling
(c) spinning
(d) at rest

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38. The rotational analogue of Newton's second law is:
(a) $\tau = I\alpha$
(b) $F = ma$
(c) $I = F\alpha$
(d) $\tau = F/I$

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39. The perpendicular axis theorem states that:
(a) $Iz = Ix + Iy$
(b) $Ix = Iy + Iz$
(c) $Iy = Ix - Iz$
(d) $Iz = Ix - Iy$

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40. The linear momentum of a system of particles =
(a) M × velocity of centre of mass
(b) $I\omega$
(c) torque × time
(d) angular momentum

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41. If the external torque is zero, then:
(a) angular momentum is conserved
(b) energy is conserved
(c) torque is conserved
(d) force is conserved

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42. The unit of angular momentum is:
(a) $kg \cdot m^2/s$
(b) $N \cdot m$

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(c) J/s
(d) N·s

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43. When a wheel rotates with constant angular velocity, its angular acceleration is:
(a) zero
(b) constant
(c) increasing
(d) decreasing

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44. For rotational motion, work done =
(a) τθ
(b) Fd
(c) mgh
(d) Iω²

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45. For equilibrium, the sum of clockwise and anticlockwise moments must be:
(a) zero
(b) maximum
(c) constant
(d) equal

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46. If all particles of a system move parallel to each other, the motion is:
(a) rotational
(b) translational
(c) vibrational
(d) circular

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47. When a rigid body is in rotational motion, all its particles have the same:
(a) angular velocity
(b) linear velocity
(c) linear acceleration
(d) position

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48. For a circular disc of radius R and mass M, I about tangent =
(a) 3/2 MR²
(b) ½ MR²

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(c) MR^2
(d) 2/5 MR^2

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49. A flywheel is used to store:
(a) rotational kinetic energy
(b) potential energy
(c) mechanical energy
(d) both (a) and (c)

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50. The moment of inertia of a thin circular ring about a diameter =
(a) ½ MR^2
(b) MR^2
(c) ⅔ MR^2
(d) ⅝ MR^2

✅ ANSWERS – SET 2

1 (a)	2 (b)	3 (b)	4 (a)	5 (a)	6 (d)	7 (b)	8 (b)	9 (a)	10 (a)
11 (b)	12 (b)	13 (b)	14 (a)	15 (a)	16 (a)	17 (b)	18 (b)	19 (a)	20 (d)
21 (a)	22 (d)	23 (a)	24 (a)	25 (c)	26 (a)	27 (a)	28 (a)	29 (a)	30 (a)
31 (a)	32 (a)	33 (b)	34 (a)	35 (a)	36 (a)	37 (b)	38 (a)	39 (a)	40 (a)
41 (a)	42 (a)	43 (a)	44 (a)	45 (a)	46 (b)	47 (a)	48 (a)	49 (d)	50 (a)