| PHYS115 | Final Exam | Qassim University جامعة القصيم | Student's name.............................. .... ID.......................................…………… |
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**Time (120 minutes)**

## Choose the best answer:

1. An electric motor lifts an elevator 35 m in 28 s by exerting an upward force of $6.4 \times 10^4$ N. What power does the motor produce in kilowatts?

a) 32.8 kW 　　　　　 b) 23 kW 　　　　　 c) 2.5 kW 　　　　　 d) 80 kW

2. The angular momentum of a particle with respect to the origin is a vector quantity defined as:

a) $\vec{\ell} = \vec{r} \cdot \vec{p}$ 　　　　 b) $\vec{\ell} = \vec{r} \times \vec{p}$ 　　　　 c) $\vec{\ell} = m \times \vec{p}$ 　　　　 d) $\vec{\ell} = \vec{v} \times \vec{p}$

3. The rear wheel on a clown's bicycle has twice the radius of the front wheel. When the bicycle is moving, is the angular speed of the rear wheel greater than, less than, or the same as that of the front wheel?

a) Greater than 　　　　　 b) Less than 　　　　　 c) Equal to

4. A disk is rotating about its central axis like a merry-go-round. The angular position of a reference line on the disk is given by $\theta = -2 + 0.8\, t - 0.3\, t^2$ . What is the angular speed of the disk after 10 seconds?

a) 7.4 rad/s 　　　　 b) 10.22 rad/s 　　　　 c) -12.4 rad/s 　　　　 d) -5.2 rad/s

5. Clockwise rotation in rotational motion is positive:

a) False 　　　　　　　　　　 b) True

6. If two bodies stick together when colliding, then the collision is called:

a) Inelastic collision 　　　　 b) Elastic collision 　　　　 c) Completely inelastic collision

7. The linear momentum of a system of particles is equal to the product of the total _____ of the system and the velocity of the center of mass.

a) Displacement 　　　　 b) Force 　　　　 c) Energy 　　　　 d) Mass

8. If a force is angled upward by $65^0$ to the floor and magnitude *24 N* acting on an object. The speed of the object is *5 m/s*. What is the power?

a) 50.7 W 　　　　 b) 22.4 W 　　　　 c) 123 W 　　　　 d) 26 kW

9. A 1800 kg car speeds up from 16 m/s to 20 m/s. How much work was done on the car to increase its speed?

a) $8.68 \times 10^5$ J 　　 b) $19.62 \times 10^3$ J 　　 c) $16.35 \times 10^4$ J 　　 d) $12.96 \times 10^4$ J

10. Force product velocity, gives:

a) Work 　　　　　 b) Energy 　　　　　 c) Power

11. A body of mass 120 kg is moving with a speed of 8 m/s. What is the kinetic energy of the body?

a) 2012.5 J 　　　　 b) 3840 J 　　　　 c) 3122.5 J 　　　　 d) 1740 J

12. Pushing a stranded dolphin back to sea requires a constant force of 600 N over a distance of 30 meters. How much work is done on the dolphin?

a) 16 kJ 　　　　　 b) 18 kJ 　　　　　 c) 17 kJ

13. _____ is energy transferred to or from an object by means of a force acting on the object.

a) Torque      b) Work      c) Impulse      d) Moment of Inertia

14. The force component perpendicular to the displacement does _____ work.

a) Zero      b) Positive      c) Negative

15. The SI unit of angular momentum is:

a) kg.m/s      b) kg.m$^2$/s      c) kg.m/s$^2$      d) kg.m$^2$/s$^2$

16. The equation that represents gravitational potential energy is _____.

a) $U(y) = my$      b) $U(y)=(1/2)my^2$      c) $U(y) =mgy$      d) $U(y) = E + KE$

17. The net work done by a conservative force on a particle moving around any closed path is _____ zero.

a) greater than      b) smaller than      c) equal to

18. When there are no torques acting on a body, its angular momentum is constant.

a) True      b) False

19. Mechanical Energy is:

a) The sum of kinetic energy and thermal energy

b) The sum of gravitational energy and potential energy

c) The sum of kinetic energy and potential energy

d) The sum of kinetic energy and momentum

20. A child of mass (m) is released from rest at the top of a water slide, at height of 22 m above the bottom of the slide. Assuming that the slide is frictionless, find the child's speed at the bottom of the slide?

a) 33.4 m/s      b) 28.2 m/s      c) 12.5 m/s      d) 20.8 m/s

21. Energy associated with compression or extension of a spring is called:

a) Gravitational Energy      b) Kinetic Energy      c) Elastic Potential Energy

22. _____ is the product of the average force on an object and the time interval over which it acts.

a) Angular velocity      b) Impulse      c) Kinetic Energy      d) Angular momentum

23. In an accident on a slippery road, a compact car with a mass of 2225 kg moving at 16 m/s smashes into the back end of a car with mass 3400 kg moving at 8 m/s in the same direction. What is the final velocity if the damaged cars stick together?

a) 2.64 m/s      b) 1.25 m/s      c) 11.16 m/s      d) 17.6 m/s

24. For an upward displacement, the gravitational force does negative work on the object.

a) True      b) False

25. Newton's second law for rotation is given by:

a) $\tau = \omega.\alpha$      b) $\omega = I.\theta$      c) $\theta = \omega.\alpha$      d) $\tau = I.\alpha$

26. The torque acting on an object is given by:

a) $\tau = r.F.\sin\theta$      b) $\tau = r.F.\cos\theta$      c) $\tau = v.F.\sin\theta$

27. A compact car with mass 460 kg is moving at 25 m/s towards east. The magnitude of its momentum is:

a) 29514 kg.m/s      b) 11500 kg.m/s      c) 54435 kg/s

28. Momentum may be expressed in:

a) kg/m          b) gram/s          c) N.s          d) kg/(m/s)

29. Angular speed of 6 rev/min is the same as:

a) 0.63 rad/s          b) 57 rad/s          c) 3.14 rad/s          d) $6\pi$ rad/s

30. An object rotates from $\theta_1$ to $\theta_2$ through an angle that is less than $2\pi$ radians. Which of the following represents its angular displacement?

a) $\theta_2$          b) $\theta_1 - \theta_2$          c) $\theta_2 - \theta_1$          d) $\theta_1 + \theta_2$

31. If a disk turning at a constant rate completes 220 revolutions in 12 s its angular speed is:

a) 44.31 rad/s          b) 94.2 rad/s          c) 10 rad/s          d) 115.13 rad/s

32. 15 seconds after an electric fan is turned on, the fan rotates at 450 rev/min. Its average angular acceleration is:

a) 50 rev/min$^2$          b) 0.33 rad/s$^2$          c) 3.14 rad/s$^2$          d) 33.14 rad/s$^2$

33. A wheel initially has an angular velocity of 64 rad/s but after 8.0 s its angular velocity is 25 rad/s. If its angular acceleration is constant the value is:

a) 2.0 rad/s$^2$          b) $-4.9$ rad/s$^2$          c) 6.0 rad/s$^2$          d) $-0.4$ rad/s$^2$

34. For only conservative forces within an isolated system, _____ energy is conserved.

a) Mechanical          b) Kinetic          c) Potential          d) Thermal

35. The relationship between linear velocity and angular velocity is given by:

a) $v = d\theta$          b) $v = ra$          c) $a = r\alpha$          d) $v = r\omega$

36. The equation of rotational kinetic energy is given by:

a) $1/2 \ (m\omega^2)$          b) $1/2 \ (I\omega^2)$          c) $m.v$          d) $1/2 \ (Iv^2)$

37. The spring force is _____.

a) Conservative          b) Non-conservative

38. Two bodies, A and B, have equal kinetic energies. The mass of A is four times that of B. The ratio of the momentum of A to that of B is:

a) 1:9          b) 1:3          c) 1:2          d) 2:1

39. Kinetic energy is related to the:

a) Velocity of the object          b) Height of the object

c) Acceleration of the object          d) Velocity square of the object

40. Object 1 and Object 2 are in a completely inelastic collision. What is their final momentum if their initial momenta are respectively 24 kg.m/s and 13 kg.m/s .

a) 11 kg.m/s          b) 37 kg.m/s          c) 312 kg.m/s