

FEDERAL UNIVERSITY OYE EKITI

**MTH 104** : Introduction to 3 Credit Unit Time allowed : 1 ½ hr

Mechanics and property of matter

**INSTRUCTION**: Tick your answers on the answer sheet

1. The dimensional equations of surface tension can be written as

(a) M0L3T0  (b) M1L1T-1  (c) ML0T-2 (d) ML2T-2

2. A boat initially at rest moving at 20m/s is only moving at 2 m/s in the same direction, 25 seconds later. Assuming that the boat’s acceleration was constant, what was the boats acceleration during this time?

(a) 0.72m/s2 (b) 7.2m/s2 (c) 1.6m/s2 (d) 0.88m/s2

3. A car drive for 2h at 40km/h , then for another 2h at 60km/h. What is the car average speed?

(a) 50km/h (b) 25km/h (c) 75km/h (d) 100km/h

4 A runner covers one lap of a circular track 40.0m in diameter in 62.55 secs. For that lap, what were her average speed and average velocity?

(a) 2m/s , 6.2m/s (b) 0m/s , 2m/s (c) 2m/s , 0m/s (d) 1m/s , 6.2m/s

5. Let the position of a particle P be given at time t seconds by r(t) = 2t i + (t2 -1) j + 3k , find the displacement of P at the end of 2 seconds

(a) 4i +3j + 3k (b) –k + 3j (c) 2i +2j +6k (d) 4i +4j

6. The path of a particle is given by r(t) = (t2-t)I + (t2 +t)j, the particle is at (0,2,0) when t is?

(a) -1 (b)1 (c)-2 (d)2

7. The position vector of a particle is given at time t by r(t) = 2t i – 3t2 j , calculate the velocity of the particle

(a) 2-6t (b) 2√1 +9t2 (c) 2√4t (d) t2- 4t

8. A ball is thrown vertically upward on the moon returns to its starting point in 4.0s. The acceleration due to gravity there is 1.6m/s2 downward. Find the ball’s original speed

(a) 6.4m/s (b) 1.6m/s (c) 3.2m/s (d) 1.0m/s

9. A body moves with varied acceleration a =6t – 4 and at a time t=0 the body is moving with velocity 3m/s and has a displacement 5m from the origin. Find in terms of t expression for the velocity of the particle

(a) 2t -0 (b) 4t2 + 4t+2 (c) 2t2 +3t +5 (d) 3t2- 4t +3

10. A stone which is thrown vertically upward with an initial speed of 80m/s is acted upon by an acceleration called gravity 10ms-2 in the downward direction. Find the maximum height above the point of projection which is attained by the stone

(a) 460m (b)320m (c) 640m (d) 230m

11. The speed of a car increases from 10m/s to 15m/s and its kinetic energy increases by E1 later the speed of the car increases from 15m/s to 25m/s and its kinetic energy increase by E2. What is the ratio E1/E2? By

(a) 1 (b)2 (c) 3 (d) 4

12. A man of mass 70kg climbs a ladder to the top of 15m height. Calculate the workdone by the weight.

(a) – 8.83Kj (b) -4.66Kj (c) 1.05 Kj (d) – 3.11kj

13. A 10kg box falls at an angle 230 from a height 12m. calculate the workdone by gravity (a) – 120 J (b) – 52.2J (c) 20J (d) 27.6 J

14. A crate of mass 100kg is sliding down the slope that is at an angle of 30o. A frictional force of 90N acts on the slope , calculate the net force acting on the incline

(a) 400N (b) 450N (c) 200N (d) 34.33N

15. A wheel is rotating at 180rpm. Find its moment of inertia if its mass is 10Kg and radius of gyration is 25cm

(a)450Kgm2 (b) 5.91Kgm2 (c) 0.625Kgm2 (d) 12.5 Kgm2

16. Calculate excess pressure in an air bubble of radius 6mm. Surface tension of liquid is 0.58N/m

(a) 172N/m2 (b) 542N/m2 (c) 624N/m2 (d) 387N/m2

17. A body of mass 12kg hangs from a string and is pulled aside by horizontal force of 30N. Find the tension in the string

(a) 632N (b)360N (c) 170N (d) 121N

18. An experiment to measure the force of gravity is set up using two large spheres. The spheres are both 100kg and their mass are 2m apart. What is the force of gravity between these two spheres

(a) 1. 27 x 105 (b) 16.675 x 105  (c) 6.65 x 104  (d) 12. 221 x 103

19. A stone of mass 0.1Kg is skimmed across ice. It starts at 5m/s and across to rest after 50m, Find the coefficient of friction

(a) 0.025 (b) 0.25 (c)0.25 (d) 1.20

20. What is the radius of gyration of a circular plate of diameter 26cm?

(a) 35.6m (b) 0.54m (c) 0.42m (d) 1.90m

21. Given a particle moves from point 0 with velocity v = 3t2 -6t +3 and that when t=1, and s=2m find the expression for the acceleration of the particle

(a) 3t2 – 4t +3 (b) 6t – 6 (c) 4t + 2t (d) t2 +4

22. A body travelling with a speed of 10m/s has kinetic energy 1500J. If the speed of the body is increased to 40ms-1, what is its new kinetic energy?

(a) 240J (b) 2400J (c) 24000J (d) 240000J

23. If a 150g ball is tied to a pole with a rope of length 1.5m and it spins around the pole at 30m/s. what is the centripetal force?

(a) 90N (b) 48N (c) 68N (d) 120N

24. Two steel boxes weighing 3kg and 5Kg are tied to the end of the strings. Calculate the tension in the string

(a) 42N (b) 2.45N (c) 3.75N (d) 2.23N

25. The position vector of a particle is give at time t by r(t) = 2t i + (t2 -1) j + 3k

Find the position vector at t= 2

(a) 4i +3j +3k (b) 2i + 4k +5j (c) –j (d) 2i -3j

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