



FACULTY OF SCIENCE

DEPARTMENT OF APPLIED PHYSICS AND ENGINEERING MATHEMATICS

B. TECH IN: EMERGENCY MEDICAL CARE AND PODIATRY

MODULE: PHY 1ALT AND PHY 1BAA1

CAMPUS: DFC

JULY EXAMINATION 2014

ASSESSOR: Dr L. Reddy

MARKS: 100

INTERNAL MODERATOR: Mr T. Mathe

Number of pages: 9 pages, including the information sheet

Instructions: Calculators are permitted

Requirements: UJ multiple choice answer sheet

One answer script per student

Instructions: Answer SECTION A in full in the answer script provided

Answer SECTION B in the UJ multiple choice answer sheet
provided

Place the multiple choice answer sheet inside the answer script

Section A – answer in full

Question One

1. State or define

1.1. A resultant vector (2)

1.2. Newton's 2nd law of motion (3)

1.3. Momentum (2)

1.4. A joule (2)

Question Two

2.1 A dolphin in an aquarium jumps vertically upwards out of the water with a velocity of 13 m/s.

2.1.1 What is the maximum height the dolphin reaches above the water?

2.1.2 For how long was the dolphin in the air? (6)

2.2 A bullet with a mass of 0.02 kg travels horizontally at a speed of 200 m/s and is stopped by a 0.2 m layer of sand. Calculate the

2.2.1 Magnitude of the deceleration (3)

2.2.2 Magnitude of the average force responsible for the deceleration (2)

Question Three

A rectangular block of dimensions 3 cm x 2 cm x 5 cm and mass 5 kg rests on the table. Calculate the

3.1 volume of the block in m^3 (3)

3.2 weight of the block (2)

3.3 density of the block (3)

3.4 RD of the block (2)

3.5 weight of the block if it is fully submerged in the water (5)

Question Four

250 cm³ of hydrogen gas at a temperature of 17⁰ C is at a pressure of 196 k Pa. Calculate the volume of hydrogen if the temperature is raised to 67⁰ C and the pressure is decreased to 80 k Pa. (5)

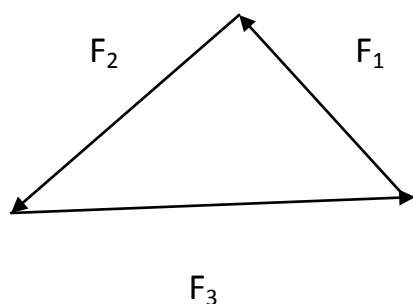
(20)

Section B – Multiple choice questions

1. Two forces of magnitudes 3 N and 4 N respectively act on a body. The maximum possible magnitude of the resultant of these forces is

- A. 12
- B. 7 N
- C. 5 N
- D. 1 N

2. According to the vector diagram below

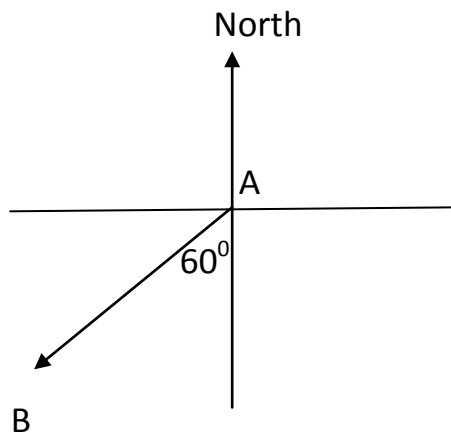


Which is correct?

- A. $F_2 + F_3 = F_1$
- B. $F_1 + F_2 = F_3$
- C. $F_1 + F_3 = F_2$
- D. $F_1 + F_2 + F_3 = 0$

3. Which one of the following statements is CORRECT?

The direction of the vector AB on the sketch can be written as a bearing of



- A. 240°
- B. 120°
- C. 210°
- D. 060°

4. Which one of the following situations is impossible to have?

- A. Object is moving with uniform velocity but non-uniform acceleration
- B. Object moving to the east with velocity (v) and acceleration (a) towards the west
- C. Object is moving with uniform velocity but non-uniform acceleration
- D. Object is moving with uniform speed but variable acceleration

5. According to newton's 2nd law of motion, the acceleration of a body is

- A. inversely proportional to the size of the force causing it
- B. inversely proportional to the mass of the body
- C. directly proportional to the body's mass
- D. never constant

6. The unit of momentum can be written as

- A. kg m s^{-2}

B. $W\ s$

C. $N\ s$

D. $N\ m^{-1}$

7. A body is projected upwards with a velocity of 98 m/s. It will strike the ground in

A. 25 sec

B. 15 sec

C. 10 sec

D. 20 sec

8. An object is thrown straight up. Which of the following is true about the sign of the work done by the gravitational force while the object moves up and then down?

A. work is positive on the way up, work is positive on the way down

B. work is negative on the way up, work is negative on the way down

C. work is negative on the way up, work is positive on the way down

D. work is positive on the way up, work is negative on the way down

9. An object of mass 6 kg falls freely from rest for a period of 8 seconds. The change in kinetic energy which the body experiences is

A. 30 kJ

B. 18.4 kJ

C. 25.3 kJ

D. 32.1 kJ

10. A block and tackle system consists of 6 pulleys. What will be the efficiency of the system if a force of 200 N is required to lift a load of 800 N?

A. 40 %

B. 66.6 %

C. 33.33 %

D. 20 %

11. The diameters of the upper 2 pulleys in a differential pulley system, are 29 cm and 30 cm respectively. Calculate the force required to lift a load of 800 N if the efficiency of the system is 52 %

A. 220.25 N

B. 300 N

C. 160 N

D. 251.28 N

12. If the water column in a water barometer has a height of 8.6 m. The atmospheric pressure according to this barometer is

A. 84.3 k Pa

B. 84.3 Pa

C. 84300 k Pa

D. 843 k Pa

13. The RD of iron is 7.2. The density of iron is

A. 7.2 kg m^{-3}

B. 7200 g cm^{-3}

C. 7200 kg m^{-3}

D. 0.0072 kg m^{-3}

14. An object has a weight of 15 N in air but when fully immersed in an unknown liquid, it has a weight of 10.1 N. If the object occupies a volume of $5 \times 10^{-3} \text{ m}^3$ of space, then the RD of the liquid is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

15. A given mass of gas in a rigid container is heated from 113° to 500° C. Which of the following responses best describes what will happen to the pressure of the gas?

A. The pressure will decrease by a factor of 5

B. The pressure will increase by a factor of 5

C. The pressure will increase by a factor of 2

D. The pressure will increase by a factor of 8

16. If the volume of a confined gas is doubled while the temperature remains constant, what change (if any) would be observed in the pressure?

A. it would be half as large

B. it would double

C. it would be 4 times as large

D. it would remain the same

17. During the process of convection, heat transfer takes place in

A. liquids and solids

B. liquids only

C. liquids and gases

D. solids only

18. Under conditions of fixed temperature and fixed amount of gas, Boyle's law requires that

1. $p_1V_1 = p_2V_2$

2. $pV = \text{constant}$

3. $p_1/p_2 = V_2/V_1$

A. 1 only

B. 2 only

C. 3 only

D. 1, 2 and 3

19. An enclosed gas has a volume of 8 m^3 at 25°C and a pressure of 120 kPa . Calculate the temperature of the gas if the pressure and volume are 140 kPa and 12 m^3 , respectively

A. 140.3°C

B. 160.2°C

C. 200°C

D. 248.5°C

20. A 10 kg mass floats in a liquid. The upthrust on the mass is

A. 11 N

B. 10 N

C. 0 N

D. 100

$20 \times 4 = 80$