Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	PHYSICS FOR ELECTRICAL ENGINEERING
COURSE CODE	:	DAE 13103
PROGRAMME CODE	:	DAE
EXAMINATION DATE	:	DECEMBER 2019/ JANUARY 2020
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	**PART A:** ANSWER OBJECTIVE QUESTIONS IN THE OMR FORM **PART B:** ANSWER ALL QUESTIONS IN THE QUESTION BOOKLET

THIS QUESTION PAPER CONSISTS OF **EIGHTEEN (18)** PAGES

PART A: ANSWER ALL QUESTIONS IN THE OMR FORM

(1 mark each)

Q1 Physical quantities are also known as

A. Derived quantities
B. Base quantities
C. SI quantities
D. Physics quantities

Q2 A physical quantity consists of a

A. Analogical magnitude
B. Numerical magnitude
C. Alphabetical magnitude
D. Symbolic magnitude

Q3 SI unit for time is

A. Minutes
B. Hours
C. Seconds
D. Days

Q4 SI unit stands for

A. Symbolically Integrated unit
B. Standard Integrated unit
C. Scientific International unit
D. Standard International unit

Q5 The measurement of length of two different rods, rod A and rod B is recorded as 2.32 cm and 4.562 cm respectively. Calculate the difference in length between the two rods.

A. 2.24 cm
B. 2.242 cm
C. 2.2 cm
D. 2.0 cm

Q6 Find the volume of a cube with edges measurement of 31.30 cm, 28 cm and 51.85 cm using the correct number of significant figures

A. 45441.340 cm^3
B. 45441.34 cm^3
C. 4.50×10^4 cm^3
D. 4.5×10^4 cm^3

Q7 Peter is 2.00 yard tall. Using the fact that 1 inch is exactly 2.54 cm, how tall is Peter in cm. Given 1 ft and 1 yard is 12 inch and 3 ft respectively.

A. 182 cm
B. 183 cm
C. 127 cm
D. 126 cm

Q8 Convert 35 cm^2 into SI unit with scientific notation.

A. 35×10^{-4} m^2
B. 0.0035 m^2
C. 3.5×10^{-3} m^2
D. 3.5×10^{-4} m^2

Q9 The quantity which has the only magnitude is called

A. A vector quantity
B. A scalar quantity
C. A magnitude quantity
D. A scale quantity

Q10 Identify which of the following quantities can be described by their magnitude and direction.

A. mass
B. speed
C. work
D. force

Q11 Two forces act on an object as in **Figure Q11**. Calculate the magnitude of the resultant force.

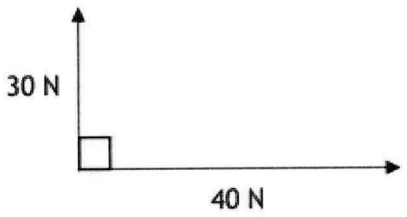


Figure Q11

A. 10 N
B. 30 N
C. 40 N
D. 50 N

Q12 Adding of two vectors to get a single vector is termed as

A. Final vector
B. Resultant vector
C. Dominant vector
D. Addition vector

Q13 If two forces of 20 N towards north and 12 N towards south are acting on an object, resultant force will be

A. 8 N towards north
B. 20 N towards north
C. 32 N towards south
D. 32 N toward north

Q14 Volume is a

A. Scalar quantity
B. Base quantity
C. Derived quantity
D. Vector quantity

Q15 In scalar, there is only addition and subtraction of

A. Number
B. Number according to direction
C. Number according to unit
D. B and C both

Q16 An object moves at a constant speed of 6 m/s. This means that the object;

A. Increases its speed by 6 m/s every second
B. Decreases its speed by 6 m/s every second
C. Has a positive acceleration
D. Moves 6 meters every second

Q17 **Figure Q17** shows a snapshot of three racing cars. All three cars start the race at the same time, at the same place and move along a straight track. As they approach the finish line, which car has the lowest average speed?

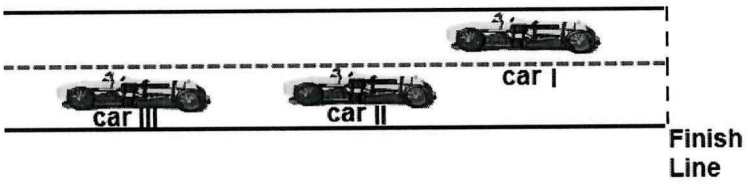


Figure Q17

A. Car I
B. Car II
C. Car III
D. All three cars have the same average speed

Q18 An object is released from rest and falls in the absence of air resistance. Which of the following is true about its motion?

A. Its acceleration is zero
B. Its acceleration is constant
C. Its velocity is constant
D. Its acceleration is increasing

Q19 **Figure Q19** represents the relationship between velocity and time for an object moving in a straight line. Which of the following statements is true?

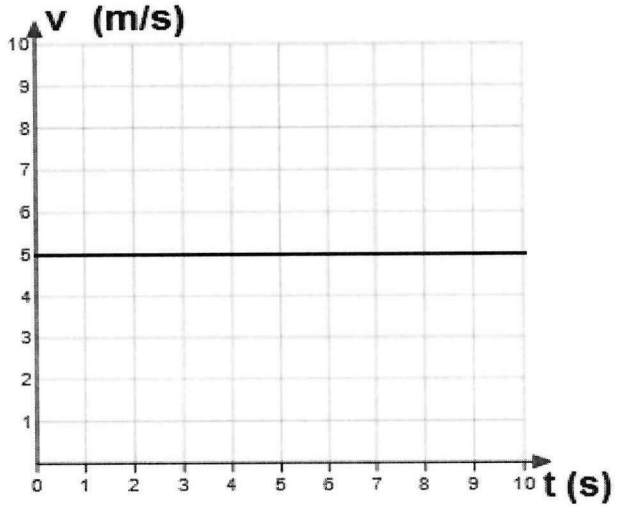


Figure Q19

A. The object speeds up
B. The object slows down
C. The object moves with a constant velocity
D. The object stays at rest

Q20 By referring to **Figure Q19**, what is the velocity of the object at 5 s?

A. 1 m/s
B. 2 m/s
C. 3 m/s
D. 5 m/s

Q21 The position vs. time graph of a moving object is shown in **Figure Q21**. What is the average speed from 0 s to 4 s?

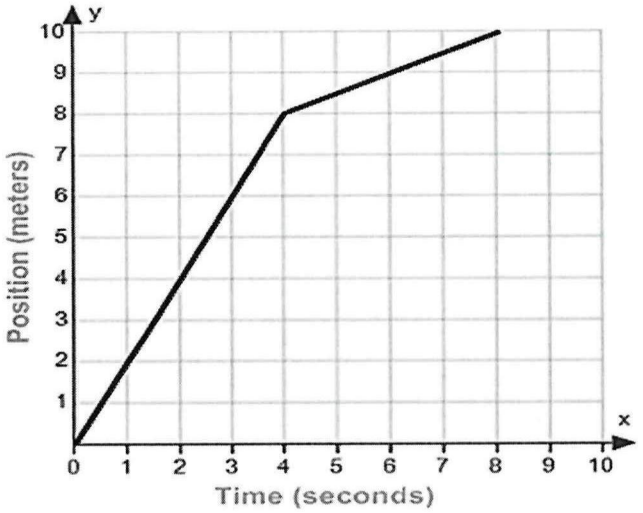


Figure Q21

A. 0.5 m/s
B. 1.0 m/s
C. 2.0 m/s
D. 3.0 m/s

Q22 What is the average speed from 4 s to 8 s based on **Figure Q21**?

A. 0.5 m/s
B. 1.0 m/s
C. 2.0 m/s
D. 3.0 m/s

Q23 What is the object's position at 6 s based on **Figure Q21**?

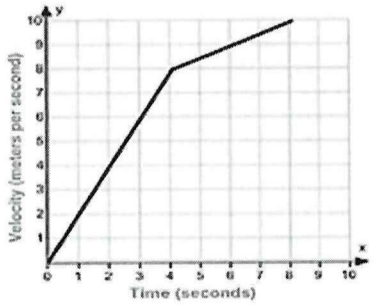
A. 2 m
B. 1 m
C. 3 m
D. 9 m

Q24 What is the average acceleration from 4 s to 8 s based on **Figure Q21**?

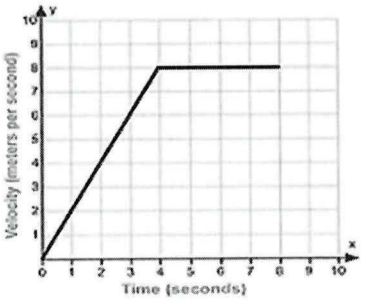
A. 0 m/s
B. 1.0 m/s
C. 2.0 m/s
D. 3.0 m/s

Q25 Which of the following is the velocity vs time graph?

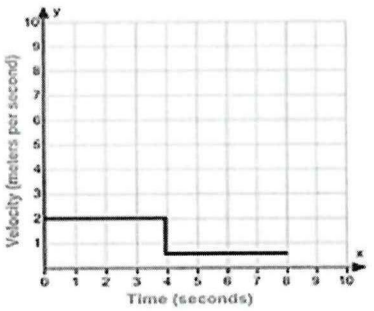
A.



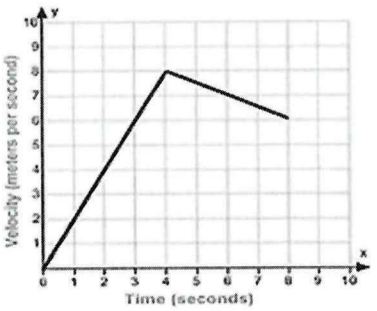
C.



B.



D.



Q26 An object is thrown straight up. Which of the following is true about the sign of 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

Q27 Potential energy and kinetic energy are types of

A. Electrical energy

B. Magnetic energy

C. Thermal energy

D. Mechanical energy

Q28 **Figure Q28** shows a truck driver is trying to push a loaded truck with an applied force. Unfortunately, his attempt was unsuccessful the truck stays stationary no matter how hard the driver pushes. How much work is done by the driver?

Figure Q28

A. Fd

B. –Fd

C. F/d

D. Zero

Q29 **Figure Q29** shows a block of mass m is moved over a distance d. An applied force F is directed perpendicularly to the block's displacement. How much work is done on the block by the force F?

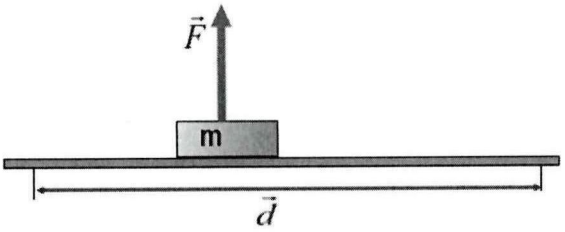


Figure Q29

A. mFd
B. Zero
C. Fd
D. F/d

Q30 A container with a mass of 5 kg is lifted to a height of 8 m and then returned back to the ground level. How much work is done by the gravitational force?

A. 400 J
B. -400 J
C. Zero
D. 50 J

Q31 Heat is closely related with

A. Liquids
B. Energy
C. Temperature
D. Entropy

Q32 Choose the wrong case, heat flowing from one side to other depends directly on

A. Face area
B. Time
C. Thickness
D. Temperature difference

Q33 Metal are good conductors of heat because

A. Their atoms collide frequently
B. Their atom relatively far apart
C. They contain free electron
D. They have high density

Q34 When heat transferred from one particle of hot body to another by actual motion of the heated particles, it is referred to as heat transfer by

A. Conduction
B. Convection
C. Radiation
D. Conduction and convection

Q35 When heat is transferred from hot body to cold body, in straight line without affecting the intervening medium, it is referred as heat transfer by

A. Conduction
B. Convection
C. Radiation
D. Conduction and radiation

Q36 Heat transfer in liquid and gases takes place by

A. Conduction
B. Radiation
C. Convection
D. Conduction and convection

Q37 Latent heat of fusion is the heat required to

A. Change solid into liquid
B. Change liquid into vapour
C. Convert water into steam
D. Convert saturated steam into dry steam

Q38 Which of the following represents the electric field map due to a single positive charge?

A. Electric field is radially outward
B. Electric field radially in toward
C. Electric field is radially outward and in toward
D. None of the above

Q39 An electric field due to positive charge is represented by **Figure Q39**. Find which of the following points is the electric field is strongest in magnitude.

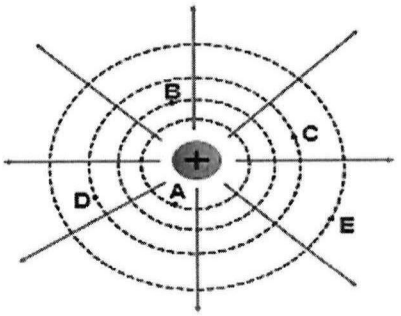


Figure Q39

A. A
B. B
C. C
D. D

Q40 Two positive charges Q1 and Q2 are separated by a distance r shown by **Figure Q40**. The charges repel each other with a force F. If the distance between the charges is cut to one-fourth, find the new force acting on each charge.

Figure Q40

A. 16 F
B. 2 F
C. 4 F
D. 1/16 F

Q41 A neutral object *A* is placed at a distance r = 0.01 m away from a charge *B* of +1 uC. Calculate the electric field at point *A*.

A. 90×10^6 N/C
B. 9×10^6 N/C
C. 81×10^6 N/C
D. 0.9×10^6 N/C

Q42 Definition Gauss's law;

A. relates the total electric flux through a closed surface with the net electric charge enclosed within the surface.

B. is completely equivalent to the inverse square law for the electric field due to a point charge.

C. implies that in static situations any excess charge on a conductor must lie on its surface.

D. is very useful for charge configurations with symmetry.

Q43 Two point charges, 2.5 x 10^{-6} C and -5.0 x 10^{-6} C, are placed 3.0 m as shown in **Figure Q43**, calculate the magnitude of electric field at Point P.

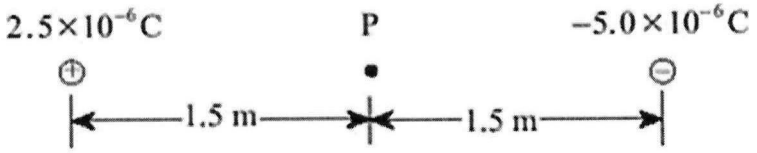


Figure Q43

A. 0 N/C

B. 1.0 x 10^4 N /C

C. 2.0 x 10^4 N/C

D. 3.0 x 10^4 N/C

Q44 Determine the magnitude of the electric field at point P due to the two fixed charges as shown in **Figure Q44**.

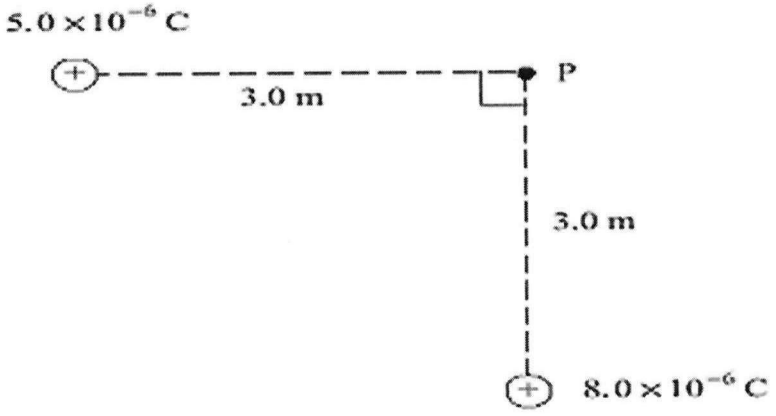


Figure Q44

A. 3.0 x 10^3 N/C

B. 3.9 x 10^4 N/C

C. 1.3 x 10^4 N/C

D. 9.4 x 10^3 N/C

Q45 Choose of the following represents correct units for electric field strength;

A. T

B. J / C

C. $N \cdot m^2 \cdot C^{-2}$

D. N/C

Q46 Which procedure below will increase the capacitance of a parallel-plate capacitor?

A. Increase the distance of separation between the two plates

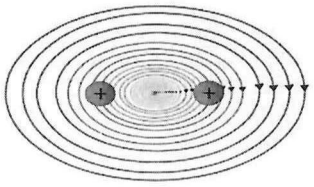
B. Reduce the surface area of the plate

C. Insert an insulator between the two plates

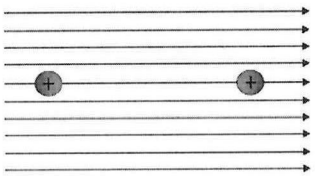
D. Insert a conductor between the two plates

Q47 Which of the following represents the electric field map due to a combination of two positive charges?

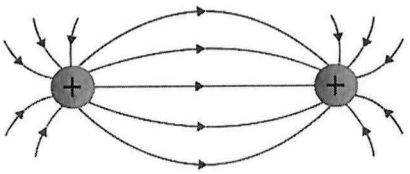
A.



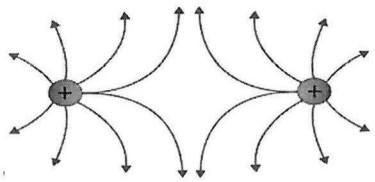
B.



C.



D.



Q48 Compare the Gravitational Field and the Electric Field produced by a proton.

A. The Gravitational Field is the same strength as the Electric Field.

B. The Electric Field is stronger and is in the same direction as the Gravitational Field.

C. The Electric Field is stronger and in the opposite direction of the Gravitational Field

D. The Gravitational Field is stronger and is in the same direction as the Electric Field.

Q49 Based on **Figure Q49**, the electric potential at point A is V. What is the electric potential at point B in terms of V?

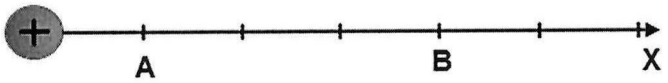


Figure Q49

A. 2 V

B. 4 V

C. ½ V

D. ¼ V

Q50 A sheet of mica is inserted between the plates of an isolated charged parallel plate capacitor. Which of the following statements is true?

A. The capacitance decreases

B. The potential difference across the capacitor decreases

C. The energy of the capacitor does not change

D. The charge on the capacitor plates decreases

Q51 Find the total capacitance of the circuits in **Figure Q51**.

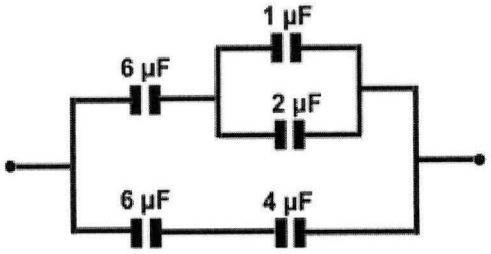


Figure Q51

A. 4 μF
B. 8 μF
C. 4.4 μF
D. 4.6 μF

Q52 An uncharged capacitor of capacitance 8.0 μF is connected to a batteri of e.m.f V and negligible internal resistance. If the charge on each plate of the capacitor is 24 μC, what is the value of V?

A. 3.0 V
B. 6.0 V
C. 10 V
D. 14 V

Q53 Two capacitors are connected in series with the battery as shown in **Figure Q53**. If V_1 and V_2 are the potential difference across the capacitors of 3 μF and 2 μF respectively, what is the ratio of $^{V_1}/_{V_2}$?

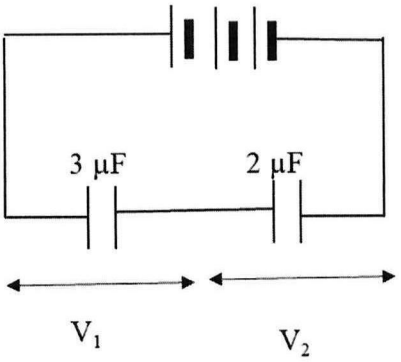


Figure Q53

A. 3 : 2
B. 3 : 1
C. 2 : 1
D. 2 : 3

Q54 All of these are the types of insulators **except**;

A. Glass
B. Mercury
C. Sulfur
D. Quartz

Q55 A wire of length L and cross-sectional area A has a resistivity ρ. Which of the following formulas can be used to calculate the resistance of the wire?

A. $R = \frac{\rho L}{A}$

B. $R = \frac{\rho A}{L}$

C. $R = \frac{L}{\rho A}$

D. $R = \frac{A}{\rho L}$

Q56 An electrical fan rotates when the equipment is switched ON. What are the charge carriers that convey the current in the fan?

A. Electrons only
B. Negative ions only
C. Holes and electrons
D. Lattice atoms and free electrons

Q57 When a conductor carries a current, the number of conduction electrons that flow in the conductor for 10 s is 3.75×10^{20}. What is the current that flows in the conductor?

A. 3.8 A
B. 4.2 A
C. 6.0 A
D. 10 A

Q58 Which of the following statement is correct regarding to the semi-conductor?

A. A semi-conductor is a material whose conductivity is same as between that of a conductor and an insulator
B. A semi-conductor is one which conducts only half of the applied voltage
C. A semi-conductor is a material which has conductivity having average value of conductivity of metal and insulator
D. A semi-conductor is a material made of alternate layers of conducting material and insulator

Q59 Which of the following statement is true both for a series and a parallel D.C. circuit?

A. Elements have individual currents
B. Currents are additive
C. Voltages are additive
D. Power are additive

Q60 Two resistors $R_1 = 6\ \Omega$ and $R_2 = 12\ \Omega$ are connected in parallel to each other and in series to $R_3 = 2\ \Omega$ as shown in **Figure Q60**. An ammeter measures an electric current of 3 A flowing though resistor R_3. What is the net voltage applied to the circuit?

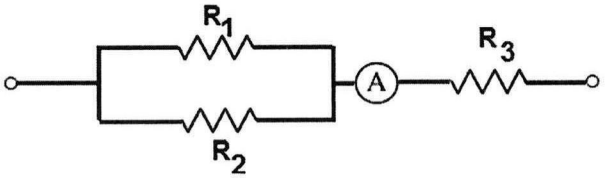


Figure Q60

A. 6 V
B. 12 V
C. 24 V
D. 18 V

PART B: ANSWER ALL QUESTIONS IN THE QUESTION BOOKLET

Q1 (a) State one difference between derived quantity and base quantity. Give one example for each of the quantity.

(4 marks)

ANSWER:

(b) Two resistors 15 Ω and 30 Ω are connected in parallel. The current through the 15 Ω resistor is 3 A. Calculate as below:

(i) The current in the 30 Ω resistor.

(2 marks)

ANSWER:

(ii) The power dissipated by each resistor.

(4 marks)

ANSWER:

Q2 (a) Identify the differences between Velocity and Speed.

(2 marks)

ANSWER:

(b) Find the flux through a spherical Gaussian surface of radius a = 1 m surrounding a charge of 8.85 pC. (Vacuum permittivity, $\varepsilon_0 = 8.85\times10^{-12}$ F·m^{-1})

(3 marks)

ANSWER:

(c) The force between two identical charges separated by 1 cm is equal to 90 N. What is the magnitude of the two charges? ($k = 9.0 \times 10^9$ Nm^{2}C^{-1})

(5 marks)

ANSWER:

Q3 (a) Explain the terminologies of Heat and Temperature.

(4 marks)

ANSWER:

(b) A bicycle has a kinetic energy 124 J. Determine kinetic energy for the below conditions;

(i) Twice the mass and the moving the same speed

(2 marks)

ANSWER:

(ii) Same mass and moving with twice speed

(2 marks)

ANSWER:

(iii) Twice the mass and moving with twice speed

(2 marks)

ANSWER:

Q4 (a) The diagram on **Figure Q4(a)** shows three coplanar forces acting on an object. Calculate the resultant force acting on the object.

(6 marks)

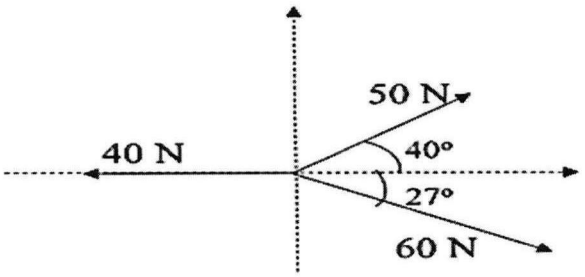


Figure Q4(a)

ANSWER:

(b) Two point charges, $Q_1 = +12\ \mu C$ and $Q_2 = +9\ \mu C$ are separated by 65 cm as shown in **Figure Q4(b)**. What is the electric potential at a point midway between the charges?

(4 marks)

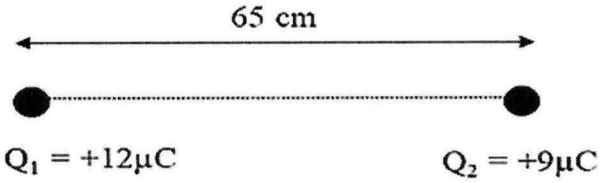


Figure Q4(b)

ANSWER:

- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER/SESSION: SEM I /2019/2020 PROGRAMME : DAE
COURSE NAME : PHYSICS FOR ELECTRICAL ENGINEERING COURSE CODE: DAE 13103

LIST OF FORMULA: Scalar and Vectors

$$A_x = A\cos\theta$$

$$A_y = A\sin\theta$$

$$A = \sqrt{{A_x}^2 + {A_y}^2} \qquad \theta = \tan^{-1}\frac{A_y}{A_x}$$

LIST OF FORMULA: Constant acceleration in linear motion

$$s_{ave} = \frac{Distance}{Time\ taken} \qquad v_{ave} = \frac{Displacement}{Time\ taken} \qquad v = \lim_{\Delta t \to 0}\frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

Final velocity	$v = v_o + at$
Final velocity	$v^2 = {v_o}^2 + 2as$
Displacement	$s = \frac{1}{2}(v_o + v)t$
Displacement	$s = v_o t + \frac{1}{2}at^2$
Displacement	$s = vt - \frac{1}{2}at^2$

LIST OF FORMULA: Work, Energy and Power

$$W = F \times s \qquad W = Fs\cos\theta \qquad P = \frac{Work}{Time} = \frac{W}{\Delta t}$$

Kinetic energy	$K = \frac{1}{2}mv^2$
Gravitational potential energy	$U_g = mgh$
Power	$P = Fv$
Work done by non-conservative forces	$W_{nc} = \Delta K + \Delta U$

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LIST OF FORMULA: Specific heat and latent heat

Rate of conduction heat transfer	$\frac{Q}{t} = \frac{\kappa A(T_{hot} - T_{cold})}{d}$
Specific heat	$Q = mc(\Delta T)$
Latent heat	$Q = mL$

LIST OF FORMULA: Force and electric field caused by electric charges

Force	$F = k\frac{q_1 q_2}{r^2}$
Electric field	$E = k\frac{q}{r^2}$
Electric flux	$\Phi = \frac{q}{\varepsilon 0}$
Electric potential	$V = k\frac{Q}{r}$

LIST OF FORMULA: Resistance

Resistance	$R = \rho\frac{L}{A}$

LIST OF FORMULA: Resistivities of conductor metal

Type	Resistivity, ρ (Ω m)
Silver	1.47×10^{-8}
Copper	1.72×10^{-8}
Gold	2.44×10^{-8}
Aluminium	2.75×10^{-8}
Tungsten	5.25×10^{-8}