



MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN ARCHITECTURE

APS 2103: PHYSICS

SUPPLEMENTARY/SPECIAL EXAMINATIONS

SERIES: OCTOBER, 2011

TIME: 2 HOURS

Instruction to Candidates

1. You should have the following for this examination:
 - Answer Booklet
 - Mathematical Tables/Calculator

2. This paper consists of **FIVE** Questions in **TWO** Sections.
3. Answer Question **ONE** and any other **TWO** Questions.
4. Maximum marks for each part of a question are as shown.

Section A (Compulsory)

Question ONE

- (a) Define the following terms:

- (i) Stress
- (ii) Strain
- (iii) Elastic modulus
- (iv) Density

(8 Marks)

- (b) A length of steel material has a square cross-section $1.5\text{m} \times 1.5\text{m}$. The material is stretched by a tension of 50N . Find the tensile stress developed in Pa. **(5 Marks)**

- (c) A circuit is as shown in figure 1.

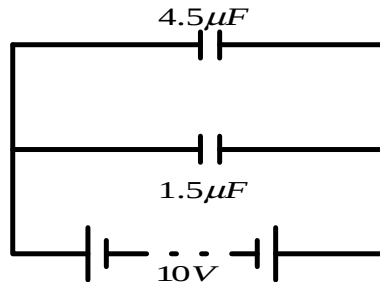


Fig. 1

- (i) Find the p.d across each capacity.
- (ii) Determine the total charge.
- (iii) Find the capacitance of a single capacitor that would store same charge for both capacitors.

(7 Marks)

- (d) With the aid of a labelled stress-strain graph explain the following terms:

- (i) Elastic deformation
- (ii) Plastic deformation

(10 Marks)

SECTION B (Answer any **TWO** Questions)

Question TWO

- (a) A wire 5m long is strained 0.2% . Find the stretched length.

(2 Marks)

- b) A balloon rises to a hill at which upruth is 4550g newtons where g is acceleration due to gravity. The balloon weighs 4550kg and has a volume of 4000m^3 . Find density of air at this height.

(5 Marks)

- (c) A motorist starts from rest accelerates at 2ms^{-2} for 30 seconds. He then travels at a constant speed for 5 minutes. Finally the man decelerates at 3m/s^2 until he stops moving. Find the following:
- Maximum speed in km/h.
 - Total distance covered. **(4 Marks)**
- (d) Derive the typical equations that are used in projection motion considering determination of;
- Maximum height
 - Range **(10 Marks)**

Question THREE

- (a)
 - Define the term capillarity.
 - State **THREE** factors that affect capillarity **(5 Marks)**
- (b) A ball is thrown straight upwards with initial velocity of 30m/s. Find of a time of 5 seconds;
- Velocity
 - Height attained (Take $g=9.8\text{m/s}$) **(5 Marks)**
- (c) Water is fills a clean glass tube radius $0.2 \times 10^{-3}\text{m}$. Density of the water is 1.0gcm^{-3} and surface tension is $7.3 \times 10^{-2}\text{Nm}^{-1}$. Find height of water in the tube. **(5 Marks)**
- (d) The tube of a mercury barometer has an internal diameter of 4mm. Surface tension of the mercury is $4.5 \times 10^{-1}\text{Nm}^{-1}$. Its angle of contact with glass is 130° . Density of the mercury is $13.6 \times 10^3\text{kgm}^{-3}$. Find a corrected reading from an observed reading of 75.25cm. **(5 Marks)**

Question FOUR

- (a) Define the following terms:
- Linear expansivity
 - Area expansivity
 - Volume expansivity **(3 Marks)**
- (b) Calculate the change in length of a copper rod 2m long after raising its temperature from 15°C to 25°C . Take $\alpha = 1.7 \times 10^{-5}^\circ\text{C}^{-1}$. **(3 Marks)**
- (c) If the temperature of 100cm^3 of mercury in a glass vessel is raised from

10°C to 100°C and γ real; for mercury is $1.82 \times 10^{-4} \text{ }^{\circ}\text{C}^{-1}$ and α glass is $8.00 \times 10^{-4} \text{ }^{\circ}\text{C}^{-1}$, calculate γ app. **(6 Marks)**

(d) Define the following terms:

- (i) Centripetal force
- (ii) Angular Velocity

(e) The turntable of a record player makes 45 revolutions per minute. Calculate: **(6 Marks)**

- (i) Its angular velocity in rad/s.
- (ii) The linear velocity of a point 0.12m from the centre.

Question FIVE

(a) Define the following terms as used in electricity. **(3 Marks)**

- (i) Potential difference
- (ii) Resistance
- (iii) Capacitor

(b) Derive the equations used to determine the combined capacitance of capacitors in: **(8 Marks)**

- (i) Parallel
- (ii) Series

(c) In the circuit shown in fig. 2, what is the p.d across each capacitor? What is the total charge stored? What is the capacitance of the single capacitor which would store the same charge as the two capacitors together. **(4 Marks)**

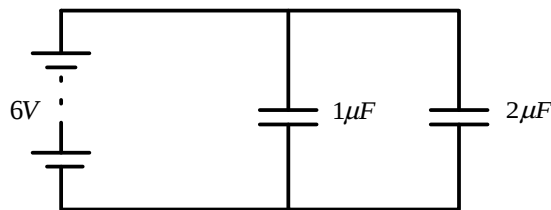


Fig. 2

(d) Calculate the combined resistance of the network of resistors shown in fig.3. **(3 Marks)**

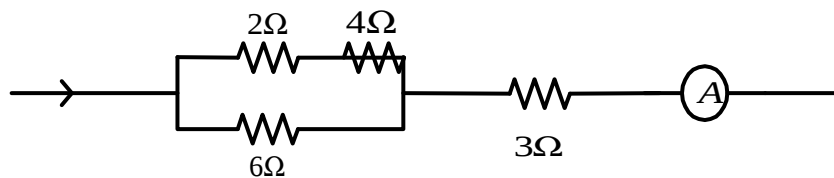


Fig. 3