



CINEC CAMPUS (PVT) LTD.

Faculty of Maritime Sciences

Department of Navigation

EDUCATION & TRAINING COURSE : NAVIGATION OFFICER CADET FOUNDATION COURSE

COURSE CODE : ND- 0199, B-024

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MID EXAMINATION – QUESTION PAPER  
**INTRODUCTION TO SHIPPING**

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- Answer all questions
- Total Marks – 100

Date: 28.02.2024

Pass mark 50%

Time allocated: 2.5 Hours

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1) Briefly explain the meaning of the following nautical terms:

- Forecastle
- Poop deck
- Hopper tanks
- Collision bulk head
- Bunkering
- Accommodation ladder
- Port side
- Midship
- Bridge
- Galley

(02 marks each)

2) Write short notes on the following short notes:

- International maritime organisation
- Recognized organizations
- International association of classification societies
- International chamber of shipping
- Flag of convenience

(06 marks each)

3) Describes the uses of the following auxiliary machineries used onboard ships:

- Capstan
- Windless
- Bilge pump
- Crude oil washing machines
- Derricks
- Gantries

(05 marks each)

- 4) Describe the duties of:
- a) Helmsman
  - b) Duty officer
  - c) Quartermaster
  - d) Watchman

(05 marks each)

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 MID EXAMINATION – QUESTION PAPER  
**APPLIED MECHANICS**

- Answer any 04 questions only
- Total Marks – 100
- $g = 9.8 \text{ ms}^{-2}$

Date: 26.02.2024

Pass mark 50%

Time allocated: 2.5 Hours

- 1)
- i. Define **velocity** and **Deceleration** (2 × 3 = 6 marks)
- ii. The engine of a model rocket accelerates the rocket vertically upward for 2.0 s as follows: At  $t = 0$ , the rocket's speed is zero; at  $t = 1.0 \text{ s}$ , its speed is  $5.0 \text{ m/s}$ ; and at  $t = 2.0 \text{ s}$ , its speed is  $16 \text{ m/s}$ . Plot a velocity vs. time graph for this motion, and use the graph to determine
- (a) the rocket's average acceleration during the 2.0 s interval and
- (b) the instantaneous acceleration of the rocket at  $t = 1.5$
- (10 marks)
- iii. A cyclist is travelling at a constant velocity of  $12 \text{ m s}^{-1}$  when he passes a stationary bus. The bus starts moving just as the cyclist passes, and accelerates at  $1.5 \text{ m s}^{-2}$ .
- (a) When does the bus reach the same speed as the cyclist?
- (b) How long does the bus take to catch the cyclist?
- (c) What distance has the cyclist travelled before the bus catches up?
- (9 marks)

2)

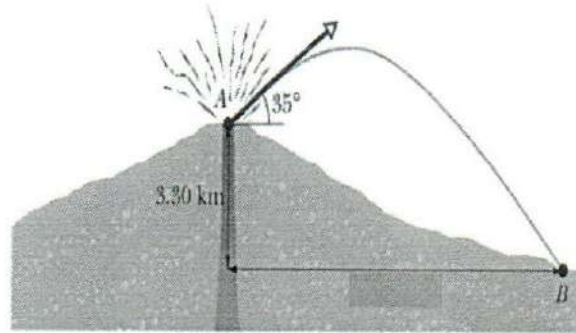
- i. Man through a ball at  $u \text{ ms}^{-1}$  at angle  $\theta$  to horizontal .(gravitational acceleration as  $g \text{ ms}^{-2}$  ).show that horizontal range of projectile (R ) is

$$R = \frac{u^2 \sin 2\theta}{g}$$

(Show your work out)

(5 marks)

- 00014
1. During volcanic eruptions, chunks of solid rock can be blasted out of the volcano; these projectiles are called volcanic bombs. The initial velocity of a volcanic bomb is  $82.0 \text{ m/s}$  at  $35.0$  degrees. Point A is  $3300.0 \text{ m}$  above point B.
- what is the horizontal distance traveled by the bomb?
  - Calculate the maximum height of the bomb above the ground.



(20 marks)

3)

- State Newton's laws of motion (3 × 4 = 12 marks)
- A light string passes over a smooth pulley, and carries particles of masses  $6 \text{ kg}$  and  $12 \text{ kg}$  at each end.
  - Mark all the force acting on the system (5 marks)  
If the system moves freely find;
  - find the acceleration of masses and tension of the string (8 marks)

4)

- Draw a graph to illustrate the variation of frictional force ( $F$ ) with applied force. Mention limiting frictional force, Static region and Kinetic region on the graph. (7 marks)
- Suppose a block with a mass of  $2.50 \text{ kg}$  is resting on a ramp. If the coefficient of static friction between the block and ramp is  $0.350$ , what maximum angle can the ramp make with the horizontal before the block starts to slip down? (9 marks)
- A cord running over a mass less pulley connects two objects ( $m_1 = 5.0 \text{ kg}$  and  $m_2 = 6.0 \text{ kg}$ ). The kinetic coefficient of friction ( $\mu_k$ ) between the object and the table is  $0.30$ . Find,

- The limiting frictional force.

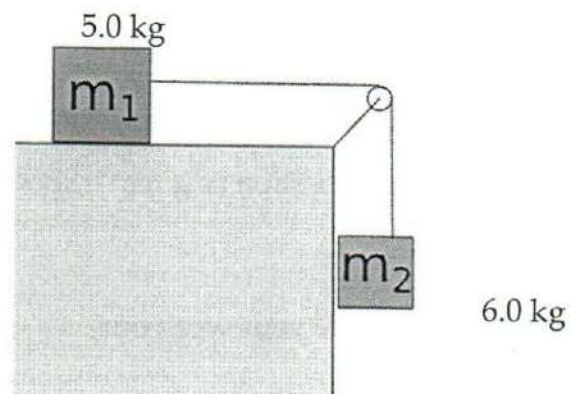
(The Static frictional coefficient  $\mu_s = 0.40$ )

- The acceleration of the system.

(The Kinetic frictional coefficient  $\mu_k = 0.30$ )

- The tension of the string ( $T$ ).

(9 marks)



(9 marks)

5)

- i) List four different forms or types of energy. Give one example of a conversion from each of these forms to another form. (8 marks)
- ii) What are the advantages and disadvantages of solar energy? (8 marks)
- iii) A hairdryer has a power-rating of 750W. If a unit of electricity costs Rs 71, how much does it cost to run the appliance for a year if it is switched on for 10 minutes each day? (5 marks)
- iv) A mass of 50kg is to be lifted vertically for 8m in 10s. Calculate the work done? (4 marks)



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MID EXAMINATION – QUESTION PAPER  
**ELECTRONICS**

- This question paper consists of four questions.
- Answer all Questions

Date:

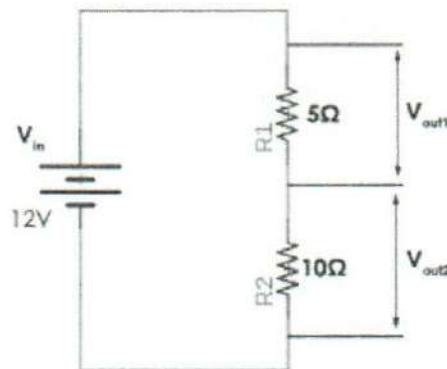
Pass mark 50%

Time allocated: 03 Hrs

➤ **Some helpful Data:**

\* Air permittivity  $\epsilon_0 = 8.854 \times 10^{-12} \text{ F} \cdot \text{m}^{-1}$

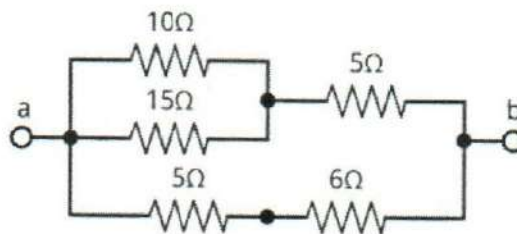
1. a) State Ohm's law (8 marks)
- b) The circuit consists of a 12 V battery with an insignificant internal resistance connected to two resistors.



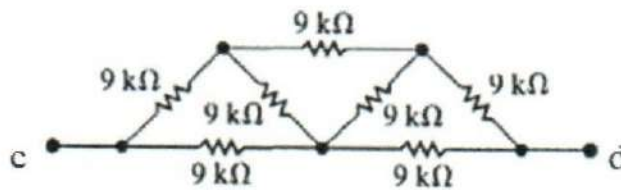
calculate

- The equivalent resistance of above circuit.
  - The current through the circuit.
  - The potential difference  $V_{out1}$  across  $5 \Omega$  resistor.
  - The potential difference  $V_{out2}$  across  $10 \Omega$  resistor. (12 marks)
- c) Calculate the power consumption of above resistor network. (5 marks)

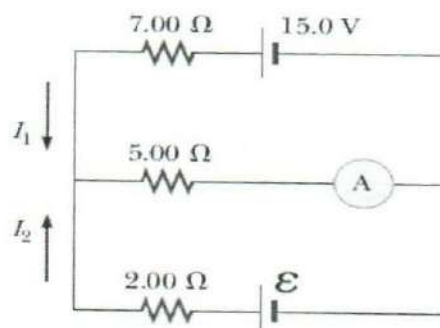
2. a) Define resistance and resistivity. (6 marks)
- b) A 7.0 m length of wire with a cross-sectional area of  $3.14 \times 10^{-6} \text{ m}^2$  at  $20^\circ \text{C}$  has a resistance of  $1 \text{ k}\Omega$ . Determine the resistivity of the wire at  $20^\circ \text{C}$  (5 marks)
- c) i. Find the equivalent resistance ( $R_{ab}$ ) of following resistor network. (7 marks)



- ii. Evaluate the equivalent resistance ( $R_{cd}$ ) of the following network of resistance using star delta transformation. (7 marks)

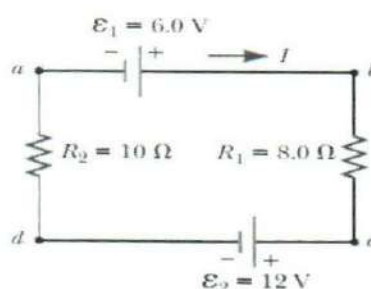


3. a) State Kirchhoff laws. (8 marks)
- b) The ammeter shown in the Figure reads 2.00 A. Find  $I_1$ ,  $I_2$  and  $E$  of the cell.



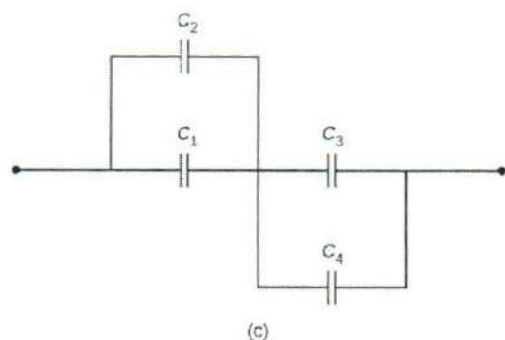
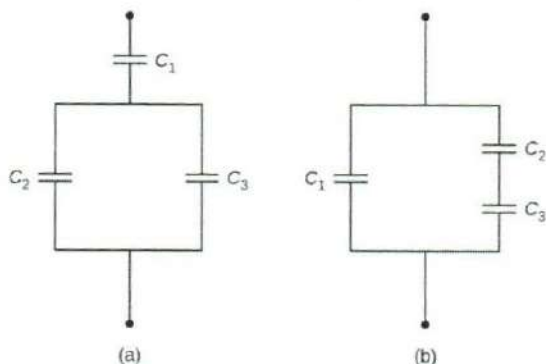
(10 marks)

- c) A single-loop circuit contains two resistors and two batteries as shown in Figure (Neglect the internal resistances of the batteries.) Find the current in the circuit.



(7 marks)

4. a) i. Define the term capacitance. (5 marks)
- ii. A capacitor of  $7 \text{ nF}$  is discharged through a resistor of resistance  $R$ . The time constant of the discharge is  $5.6 \times 10^{-3} \text{ s}$ . Calculate the value of  $R$ . (5 marks)
- iii. Determine the net capacitance  $C$  of each network of capacitors shown below. Assume that  $C_1 = 1.0 \text{ pF}$ ,  $C_2 = 2.0 \text{ pF}$ ,  $C_3 = 4.0 \text{ pF}$ , and  $C_4 = 5.0 \text{ pF}$ . Find the charge on each capacitor, assuming there is a potential difference of  $12.0 \text{ V}$  across each network.



(15 marks)





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MID EXAMINATION – QUESTION PAPER

**CHEMISTRY**

Answer any 4 questions

Avogadro Constant (N) –  $6.022 \times 10^{23} \text{ mol}^{-1}$

H – 1.0, He – 4.0, Li – 6.9, Be – 9.0, B – 10.8, C – 12.0, N – 14.0, O – 16.0, F – 18.9, Ne – 20.2, Na – 23.0, Mg – 24.3, Al – 27.0, Si – 28.1, P – 31.0, S – 32.1, Cl – 35.5, Ar – 40.0, K – 39.1, Ca – 40.1, Ag – 108.0, Cu – 63.5, Fe – 56.0, Co – 58.9, Zn – 65.4, Sn – 117.8

1)

a) Write down the correct chemical formula

- i) Aluminum oxide
- ii) methanol
- iii) Potassium permanganate
- iv) Iron (iii) oxide
- v) Carbon dioxide
- vi) Ammonia
- vii) Butane

(1×6= 6 marks)

b) Draw the electron structure for

- i) P
- ii) O<sub>2</sub>
- iii) Mg
- iv) NaCl

(2×4= 8 marks)

- c) Identify the Following Elements.
- An element having atomic number 12.
  - An element having 11 protons in its nucleus.
  - An element having mass number 27 and 14 neutrons.
  - An element denoted as  ${}_{19}^{39}X$
  - An element having 18 electrons and -2 charge (1×5= 5 marks)
- d) Give one example for followings
- Alloy
  - Metalloid
  - Heterogeneous Mixture
  - Metal
  - Covalent bonds
  - Ionic bond (1×6= 6 marks)
- 2)
- a) Define these terms,
- Acid base reaction
  - Metallic bond
  - Homogeneous Mixture
  - Atomic numbers
  - Ionic Bond
  - Monoprotic acid (3×6=18 marks)
- b) Balance Following equation
- $FeCl_3 + NH_4OH \rightarrow Fe(OH)_3 + NH_4Cl$
  - $CH_3CH_2CH_2OH + O_2 \longrightarrow CO_2 + H_2O$  (7 marks)
- 3)
- How many moles of Ca are there in 20.5 g of Ca? (4 marks)
  - How many atoms are present in 4.28 g of iron (Fe)? (5 marks)
  - Calculate the percent composition by mass of each of the elements in sulfuric acid ( $H_2SO_4$ ). (2×3= 6 marks)
  - What is the empirical formula of the compound with the following composition, 2.1 percent H, 65.3 percent O, 32.6 percent S (10 marks)

- 4)
- a) What is Atomic Mass Unit (amu) (5 marks)
- b) Styrene, a compound substance used to make Styrofoam cups and insulation, contains 92.3% C and 7.7% H by mass and has a molar mass of 104 g/mol. What is the empirical formula for this compound? (10 marks)
- c) The hydrate of magnesium sulfate has a mass of 13.52 g. This sample is heated until no water remains. The  $\text{MgSO}_4$  has a mass of 6.60 g. Find the formula of the hydrate. (10 marks)
- 5)
- a) Briefly explain the terms of Acid and Base (4 marks)
- b) Calculate the pH of
- i) 0.1 mol dm<sup>-3</sup>  $\text{HNO}_3$  solution (3 marks)
- ii) 0.015 mol dm<sup>-3</sup> NaOH solution at 25°C. (3 marks)
- c) Lactic acid ( $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$ ) has one acidic hydrogen. A 0.10 M solution of lactic acid has a pH of 2.44. Calculate  $K_a$ . (9 marks)
- Note: we assume, unless stated otherwise, that the temperature is 25 °C*
- d) Indicate whether solutions with each of the following ion concentrations are neutral, acidic, or basic: (show your work out)
- i.  $[\text{H}^+] = 5 \times 10^{-8} \text{ M}$
- ii.  $[\text{OH}^-] = 1 \times 10^{-7} \text{ M}$
- iii.  $[\text{OH}^-] = 4 \times 10^{-13} \text{ M}$
- (6 marks)