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CINEC CAMPUS(PVT)LTD

Faculty of Marine Engineering

Department of Marine Engineering

EDUCATION & TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I

COURSE CODE: ED 0350 PI (BATCH NO 45)

1<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER

MARITIME LAW

- This question paper consists of nine questions.
- Answer any SIX questions

Date: 25.11.2022

Pass mark 50%

Time allocated: 03 Hrs

1) Write full terms of the following abbreviations **(16 marks)**

- |              |                          |
|--------------|--------------------------|
| a. IMO       | i. VOC                   |
| b. ILO       | j. SSO                   |
| c. CMI       | k. CSO                   |
| d. ISPS Code | l. GMDSS                 |
| e. MLC       | m. DP (According to ISM) |
| f. SOLAS     | n. PPM                   |
| g. ORB       | o. ECA                   |
| h. EEBD      | p. ISPP                  |

2) According to IMO

- |  |                  |
|--|------------------|
| a. What is the IMO briefly Explain     | <b>(6 marks)</b> |
| b. Explain the Procedure Of making law | <b>(6 marks)</b> |
| c. What is the tacit Acceptance?       | <b>(4 marks)</b> |

- 3) Under UNCLOS describe following:
- a. Inland waters (4 marks)
  - b. Territorial waters (4 marks)
  - c. High seas (4 marks)
  - d. Archipelagic waters (4 marks)
- 4) With regards to MLC 2006,
- a. Name the 5 titles of the MLC 2006. (5 Marks)
  - b. Identify 5 areas that are covered in MLC 2006 (5 Marks)
  - c. Briefly explain the conditions for the minimum working and rest hours on board (6 Marks)
- 5) As per the SOLAS chapter 2 Part 1 & 2
- a. State the regulations pertaining to the ships' emergency generators (6 marks)
  - b. Define a noncombustible material? (4 marks)
  - c. What are "A" class divisions. (6 marks)
- 6) Write all chapters of SOLAS convention (16 marks)
- 7) With related to MARPOL,
- a. List 6 Annexes of MARPOL (06 marks)
  - b. According to annex IV, state the requirements/ conditions to discharge sewage into the sea (06 marks)
  - c. State 2 certificates/documents required to carry onboard according to Annex IV (04 marks)

- 8) With reference to ISM and ISPS codes, briefly explain
- a. Purpose/objective of ISM (04 marks)
  - b. Role of 'Designated Person' (04 marks)
  - c. Role of 'Company security officer' (04 marks)
  - d. Ship Security Alert System (04 marks)
- 9) With reference to International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM)
- a. How does the ballast water which is carried by ships can affect the marine pollution? (06 marks)
  - b. State the ballast water performance standard and 3 methods proposed for achieving this with examples (10 marks)



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I<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER  
Thermodynamics

- This question paper consists of Nine questions.
- Answer any SIX questions

Date: 2022.11.23

Pass mark 50%

Time allocated: 03 Hrs

For air  $c_p = 1.005 \text{ kJ/kg K}$ ,  $c_v = 0.717 \text{ kJ/kg K}$ ,  $\gamma = 1.4$

Composition of air (mass proportions): 77 % of Nitrogen and 23 % of Oxygen

Specific heat capacity of water 4.2 kJ/kg K, Latent heat of evaporation of water 2.256 MJ/kg

Specific heat capacity of ice 2.1 kJ/kg K, Latent heat of fusion of ice 336 kJ/kg

1.

a. Briefly explain the following terms

i. Boyle's law

ii. Charles' law

iii. Avogadro's law

(6 marks)

b. Write an expression for the gas constant by using the molecular mass and universal gas constant. (4 marks)

c. The analysis by mass of sample of air is 23.14 % Oxygen, 75.53% Nitrogen, 1.28% Argon and 0.05 % carbon dioxide. Estimate the gas constant for air.

Taking the molecular weights of  $O_2$ ,  $N_2$ ,  $Ar$ ,  $CO_2$  as 32, 28, 40 and 44 respectively, and the universal gas constant 8.314 kJ/ k-mol K. (10 marks)

2.

a. State the First Law in thermodynamics (3 marks)

b. 0.5 kg of air initially at 25 ° C and 2 bar is occupied in a volume of 0.02 m<sup>3</sup>. The air sample is heated under constant pressure to 100 °C. Then it is cooled under constant volume until its temperature is back to the initial value. Finally, it compressed isothermally to the initial conditions.

i. Draw the PV diagram (4 marks)

Determine the followings

ii. The final volume and pressure of air (4 marks)

iii. Work done during the heating process (3 marks)

- ii. Saturated water at  $263.9\text{ }^{\circ}\text{C}$ , wet steam at  $50\text{ bar}$  with  $0.65$  dry, dry steam at  $30\text{ bar}$  and steam at  $30\text{ bar}$  and  $400\text{ }^{\circ}\text{C}$  (5 marks)
- b. Steam enters to a condenser at a pressure of  $0.05\text{ bar}$  and dryness  $0.95$  and the condensate leaves the condenser at  $25\text{ }^{\circ}\text{C}$ .
- i. Draw the condensation process in a  $TH$  diagram (5 marks)
- ii. Using the steam tables, find the specific enthalpy of change of steam in the condenser (5 marks)
- 7.
- a. Describe Dalton's partial pressure law (4 marks)
- b. A closed vessel of  $1.5\text{ m}^3$  capacity contains air and dry steam at a total pressure of  $0.12\text{ bar}$  and temperature  $40\text{ }^{\circ}\text{C}$ . Due to air leakage into the vessel, the pressure raises to  $0.25\text{ bar}$  and the temperature falls to  $36\text{ }^{\circ}\text{C}$ . Taking  $R$  for air =  $0.287\text{ kJ/kgK}$ . Determine
- i. The initial partial pressure of steam and air in the vessel (4 marks)
- ii. The final partial pressure of steam and air in the vessel (6 marks)
- iii. The mass of air leaked into the vessel (6 marks)
8. The analysis of a sample of coal burned in the furnace of a boiler is  $85\%$  of *Carbon*,  $5\%$  *Hydrogen*,  $4\%$  *Oxygen*, and the remainder *ash*. Calorific values of C and H are  $33\text{ MJ/kg}$  and  $144\text{ MJ/kg}$  respectively. Determine
- i. The *calorific value* of the fuel (5 marks)
- ii. The *theoretical mass of air required per kg of coal* for perfect combustion taking the molecular mass of C, H and O 12, 1 and 16 respectively (5 marks)
- iii. The *actual mass of air* if it is supplied with 70% excess (5 marks)
- iv. The *percentage mass analysis of the products* of combustion (5 marks)
- 9.
- a. State the steady flow energy equation in full, defining the symbols and unit used (5 marks)
- b. Air passes through a gas turbine at the rate of  $10\text{ kg/s}$ . The gas enters the turbine with a velocity of  $100\text{ m/s}$  and specific volume of  $0.68\text{ m}^3/\text{kg}$ . The gas leaves the turbine with a specific volume of  $1.85\text{ m}^3/\text{kg}$ . The exit area of the turbine is  $0.045\text{ m}^2$ . In its passage through the turbine system, the specific enthalpy of air is reduced by  $300\text{ kJ/kg}$  and there is a heat transfer loss of  $48\text{ kJ/kg}$ . Determine
- i. The inlet area of the turbine in  $\text{m}^2$  (5 marks)
- ii. The exit velocity of the air  $\text{m/s}$  (5 marks)
- iii. The power developed by the turbine system in  $\text{kW}$  (5 marks)

- iv. Heat transfer under constant pressure (3 marks)
- v. Heat transfer under constant volume (3 marks)

3.

- a. Describe the specific heat capacity of a gas (4 marks)
- b. Write an expression for the specific heat capacity of gas under constant pressure,  $c_p$  and the specific heat capacity of gas under constant volume,  $c_v$  using the adiabatic index,  $\gamma$  and gas constant,  $R$  (4 marks)
- c. Taking characteristic gas constant,  $R$  and adiabatic index,  $\gamma$  for Oxygen as  $0.26 \text{ kJ/kg K}$  and  $1.393$  respectively, estimate the specific heat capacities  $c_p$  and  $c_v$  of Oxygen. (4 marks)
- d.  $0.30 \text{ m}^3/\text{kg}$  of Oxygen gas at  $27^\circ\text{C}$  is compressed adiabatically to a temperature of  $257^\circ\text{C}$ . Estimate the initial pressure, the final pressure, internal energy and enthalpy change (8 marks)

4.

- a. Describe the three type of heat transfer mechanisms (4 marks)
- b. State the Fourier law in heat transfer. (3 marks)
- c. A pond of water has been in cold weather, and a slab of ice  $5.0 \text{ cm}$  thick has formed on its surface. The air above the ice is  $-40^\circ\text{C}$ . Take the thermal conductivity of ice to be  $0.5023 \text{ W/m K}$  and its density to be  $0.92 \text{ g/cm}^3$ .
- What is the temperature of the ice and water interface? (3 marks)
  - Estimate the rate of heat transfer from water to ice (4 marks)
  - Calculate the rate of ice formation on the ice slab (6 marks)

5.

- a. Write expressions for the *entropy change* during process at constant volume and constant pressure. (4 marks)
- b. In a reversible process  $0.3 \text{ m}^3$  of Nitrogen at a pressure of  $1.2 \text{ bar}$  and temperature of  $25^\circ\text{C}$  is heated at constant volume to a pressure of  $4.8 \text{ bar}$ . It is then heated at constant pressure to the volume of  $0.45 \text{ m}^3$ . For Nitrogen  $C_v = 0.743 \text{ kJ/kg K}$ ,  $C_p = 1.04 \text{ kJ/kg K}$ .
- Sketch the process on *P-V* and *T-S diagram* (4 marks)

Calculate

- The *net flow of heat* during the process (6 marks)
- The *net entropy change* (6 marks)

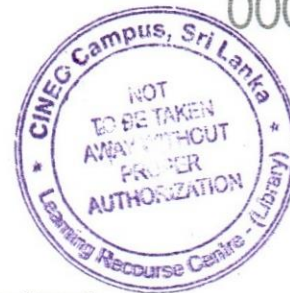
6.

- a. Draw the Temperature -enthalpy diagram for water and steam to represent the following states on it
- Saturated liquid line, Wet vapour region, Saturated dry vapour line, Superheated vapour region and Critical point (5 marks)



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I<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER  
Workshop Theory (Batch 45)

- This question paper consists of six questions.
- Answer All questions

Date: 2022.11.23

Pass mark 50%

Time allocated: 03 Hrs

- Explain following manufacturing process. You may use sketches where necessary.

Forging,  
Casting  
Welding. (6 marks)
  - Give one example for each of above categories. (3marks)
  - Write short notes on MIG welding, Brazing and Soldering (7 marks)
- Explain various type of welding joints using suitable sketches. (5marks)
    - Make a circuit diagram for electric arc welding procedure using DC current. (5marks)
  - List down common welding faults that are found in electric arc-welding. (6marks)
- Briefly explain following Heat treatment methods.

  - Annealing, Hardening, Tempering, Normalizing, Hot-rolling and cold-rolling. (12marks)
  - Write brief notes on following properties of materials Ductility, Brittleness, Toughness and elasticity (4 marks)

4. (a) Explain die penetration crack detection system and its limitation.  
Your answer should include purpose of using each type of spray for above job. (6marks)
- (b) What is meant by destructive and non destructive crack detection system and their application. (2marks)
- (c) Name three methods of non-destructive crack detection system other than die penetration method. (3marks)
- (d) Explain the correct method of removing a broken stud from a threaded hole and preparing same thread for re -using. (5marks)
5. With an aid of a suitable graph (strain against stress) explain following physical properties of a material. (16marks)
- (a) Yield strength and yield point
- (b) Ultimate strength
- (c) Strain hardening
- (d) Necking
- (e) Failing point (fracture point)
- (f) Area of elastic behavior and plastic behavior
- (g) Proportional limit
6. Briefly explain the following workshop tools and their uses with suitable sketches where necessary. (2 marks each)
- (a) Surface- plate
- (b) Depth gauge
- (c) Dial gauge
- (d) V block
- (e) Scriber
- (f) Filler gauge
- (g) Thread gauge
- (h) Out- side and inside calipers
- (i) Centre punch
- (j) Taps and Dies.



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EDUCATION & TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I  
COURSE CODE: ED 0350 PI (BATCH NO 45)

1<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER  
APPLIED MECHANICS

- This question paper consists of nine questions.
- Answer any SIX questions

Date: 2022.11.22

Pass mark 50%

Time allocated: 03 Hrs

1.

1.1 A motor car starting from rest travels the first two *minutes* with a uniform acceleration of  $\frac{1}{5} \text{ ms}^{-2}$ , the next five *minutes* with a uniform velocity and the last part with a deceleration and comes to rest. The total distance of the journey is 9 km. Draw a *velocity-time* curve and hence find;

- a. The distance travelled with acceleration (10 Marks)
- b. The deceleration (10 Marks)

2.

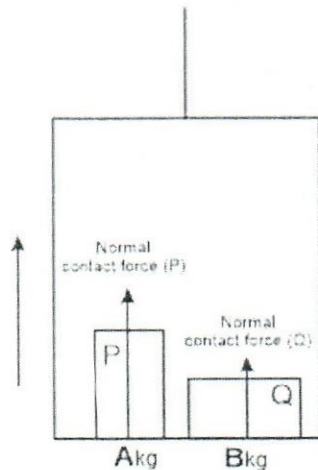
2.1 A body moves with simple harmonic motion and has a velocity of 12 m/s when the displacement is 50 mm from the origin and a velocity of 3 m/s when the displacement is 100 mm from the origin, calculate;

- a. The frequency of oscillations (7 marks)
- b. The amplitude of oscillations (7 marks)
- c. The acceleration when the displacement is 75 mm (6 marks)

3.

3.1 State Newton's second law, and hence derive the equation  $F = ma$  with standard notations. (5 Marks)

3.2 Two boxes **P** and **Q** of mass  $A$  kg and  $B$  kg are resting in a lift. When the lift is accelerating upward with  $1\text{m/s}^2$  the magnitude of the normal contact force (reaction force) exerted on **P** by the lift floor is  $880\text{N}$  (see figure). When the lift is moving with constant speed the combined magnitude of the normal contact forces exerted on **P** and **Q** by the lift floor is  $1000\text{N}$ . Find the values of  $A$  and  $B$ . (15 Marks)



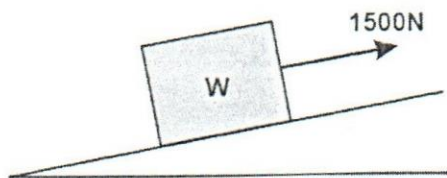
4

4.1 Describe advantages and disadvantages of having friction in engineering applications

(6 marks)

4.2 A force of  $1500\text{N}$  acting parallel to a rough plane with ' $\mu$ ' Coefficient of friction is required to just move an object with weight " $w$ " up an incline plane of angle  $12^\circ$ . If the angle of inclination is increased to  $15^\circ$ , then the force required is  $1728\text{N}$ . Find;

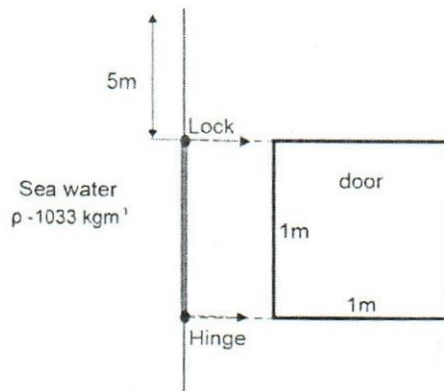
- The weight of the object ( $w$ ) (7 marks)
- Coefficient of friction ( $\mu$ ) (7 marks)



5.

5.1 A large tank of sea water has a square shaped door having a surface area of  $1\text{ m}^2$  on one of its sides. The top of the door is  $5\text{ m}$  below the free surface. The door is hinged at the bottom edge and lock from the top. If the density of the sea water is  $1033\text{ kgm}^{-3}$  calculate;

- The total force due to pressure acting on the door (6 marks)
- Location of the center of pressure (10 marks)
- The force required at the lock to keep it closed (4 marks)



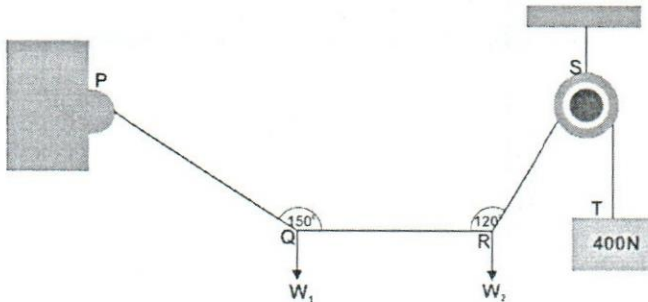
6.

6.1 State Lami's theorem using suitable figure and notations. (4 Marks)

6.2 A light string PQRS whose extremity P is fixed, has weights  $W_1$  and  $W_2$  attached to it at Q and R. It passes round a small smooth peg at S carrying a weight of 400N at the free end T as shown in the figure. If in the equilibrium position, QR is horizontal and PQ and RS make  $150^\circ$  and  $120^\circ$  with QR respectively, find;

a. Tensions in the portions PQ, QR, RS of the string (8 Marks)

b. Magnitudes of  $W_1$  and  $W_2$  (8 Marks)

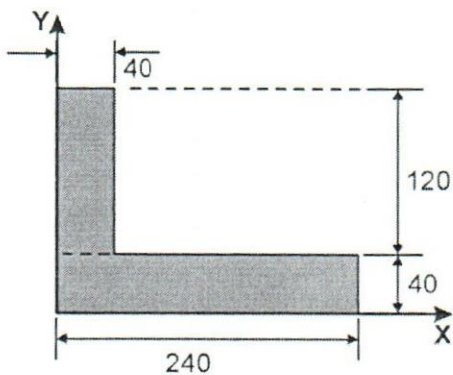


7.

7.1 Briefly describe the concepts of 'center of gravity', 'center of mass' and 'centroid'. (4 Marks)

7.2 Below figure shows a composite "L" section area. Compute the centroid of the section  $(\bar{X}, \bar{Y})$  using the axes defined in the diagram. (Consider all dimensions are in mm)

(16 Marks)



8.

8.1 A flywheel starts rotating from rest and is given an acceleration of  $1 \text{ rad/s}^2$  for 1.5 minutes. Then the flywheel is brought to rest with a uniform angular retardation of  $0.5 \text{ rad/s}^2$ . Find;

- a. The angular velocity (rad/s) and speed (rpm) after 1.5 minutes. (4 Marks)
- b. Determine the time taken by the flywheel to come to rest after reaching the maximum angular velocity. (4 Marks)
- c. What is the maximum linear velocity reached by the outer rim of the fly wheel (take radius of the wheel = 0.5 m) (4 Marks)
- d. Calculate the total angular displacement of the motion (4 Marks)
- e. Plot the motion on an angular velocity vs time curve (4 Marks)

9.

9.1 State Bernoulli equation and identify the variables (4 marks)

9.2 A Smooth pipe has two ends as A and B. The diameter at A is 20 cm and located at a height of 150 cm above the reference line. The pressure observed at the end A is 35 kPa. Pipe diameter at the end B is 30cm and it is at an elevation of 130 cm above the reference. Further the volume flow rate through the pipe is noted to be  $6 \text{ m}^3/\text{s}$ . If the total head loss between section A and B is equal to 4 m, find the value of pressure at B when the flow is from A to B. (16 marks)

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EDUCATION & TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I  
COURSE CODE: ED 0350 PI (BATCH 43)



02<sup>ND</sup> SEMESTER EXAMINATION QUESTION PAPER  
*Engineering Knowledge Motor*

Date: 2022.08.16

Pass mark 70%

Time allocated: 03Hrs

- Answer any *Six* questions

**Question 01**

- Sketch a smoke tube boiler and mark all the important mountings. (8 Marks)
- What are the dangers of oil entering a boiler with the feed water? (5 Marks)
- Explain what is meant by "blow back" of a boiler (3 Marks)

**Question 02**

- Sketch and describe a hydraulically operated exhaust valve suitable for a large bore 2-stroke diesel engine. (12 Marks)
- What are the changes made to operate the above exhaust valve in an electronically controlled engine? (4 Marks)

**Question 03**

- What is the function of the engine Governor? (4 Marks)
- Sketch and describe a simple Governor suitable for a medium speed engine. (12 Marks)

**Question 04**

- Briefly describe the conditions which creates a dangerous oil mists in engine crank case. (4 Marks)
- Sketch and describe the principle operation of oil- mist detector used to monitor crank case conditions. (12 Marks)

**Question 05**

- a) With the aid of sketches mention the difference between purifier & clarifier. (10 Marks)
- b) Mention the correct procedure of disposal of sludge onboard ships. (3 Marks)
- c) What are the fuel oil treatment methods employed on board ships (3 Marks)

**Question 06**

Briefly explain the working principle and the uses of

- a) Steam Turbine (8 Marks)
- b) Gas Turbine (8 Marks)

**Question 07**

- a) Sketch and describe the operation of 2-Stroke air compressor. (10 Marks)
- b) Why inter coolers and after coolers are fitted to this type of air compressors? (4 Marks)
- c) What is the importance of having "bumping clearance" at the recommended value? (2 Marks)

**Question 08**

- a) Sketch and describe an oil cooled piston suitable for a large bore 2-Stroke engine. (12 Marks)
- b) What is the function of piston rings in the engine? (4 Marks)

**Question 09**

Write brief notes on

- a) Swept volume    b) Mean effective pressure (MEP)    c) Indicated power
- d) Brake power    e) Mechanical efficiency    f) Viscosity
- g) Flash point    h) Supercharging (2 Marks Each)



CINEC CAMPUS (PVT) LTD  
Faculty of Maritime Sciences  
Department of Navigation

EDUCATION & TRAINING COURSE: NAVIGATION OFFICER CADET TRAINING COURSE - PHASE I  
COURSE CODE: ND-0100 P3A MI



FINAL EXAMINATION - QUESTION PAPER  
**METEOROLOGY**

- Answer any 05 questions
- Total Marks 100 - (each question carries 20 marks)
- Diagrams should be shown wherever possible

Date: 06.09.2022

Pass mark 50%

Time allocated: 3 Hours

1. Give a brief introduction to the following:

- Wind
- Monsoons
- Anabatic winds
- Katabatic winds
- Land breeze
- Sea breeze
- TRS
- Frontal depressions
- HP ridge
- LP trough

(2 × 10 = 20 marks)

2. (i) In the attached sample weather map of North Atlantic Ocean, identify the following information by jotting down the respective number at the applicable position.

- occlusion,
- frontal depression,
- secondary depression,
- family of depression,
- squall,
- non frontal depression,

- g) ridge of high pressure,
- h) coll,
- i) anti-cyclone,
- j) cold front,
- k) warm front,
- l) occluded front,
- m) embryo wave,
- n) quasi stationary front
- o) geostrophic wind speed at position marked "X"

(1 × 15 = 15 marks)

(ii) what sort weather conditions you can expect in a "Coll" (05 marks)

3. i. What are the methods of air lifting for formation of clouds?

ii. Describe the types of clouds expected when the atmosphere is stable.

(5 × 2 = 10 marks)

iii. Write short notes on the following:

a. Unstable Atmosphere

b. Cumulonimbus cloud

(5 × 2 = 10 marks)

4. i. List down eight (8) signs of presence of ice ahead of your maritime passage.

ii. Describe the origin of ice bergs found near Newfoundland in north Atlantic.

iii. What are the conditions required for the formation of a TRS (tropical revolving storm).

iv. Show in a basic sketch the expected movement &amp; path of a TRS in North and South hemispheres

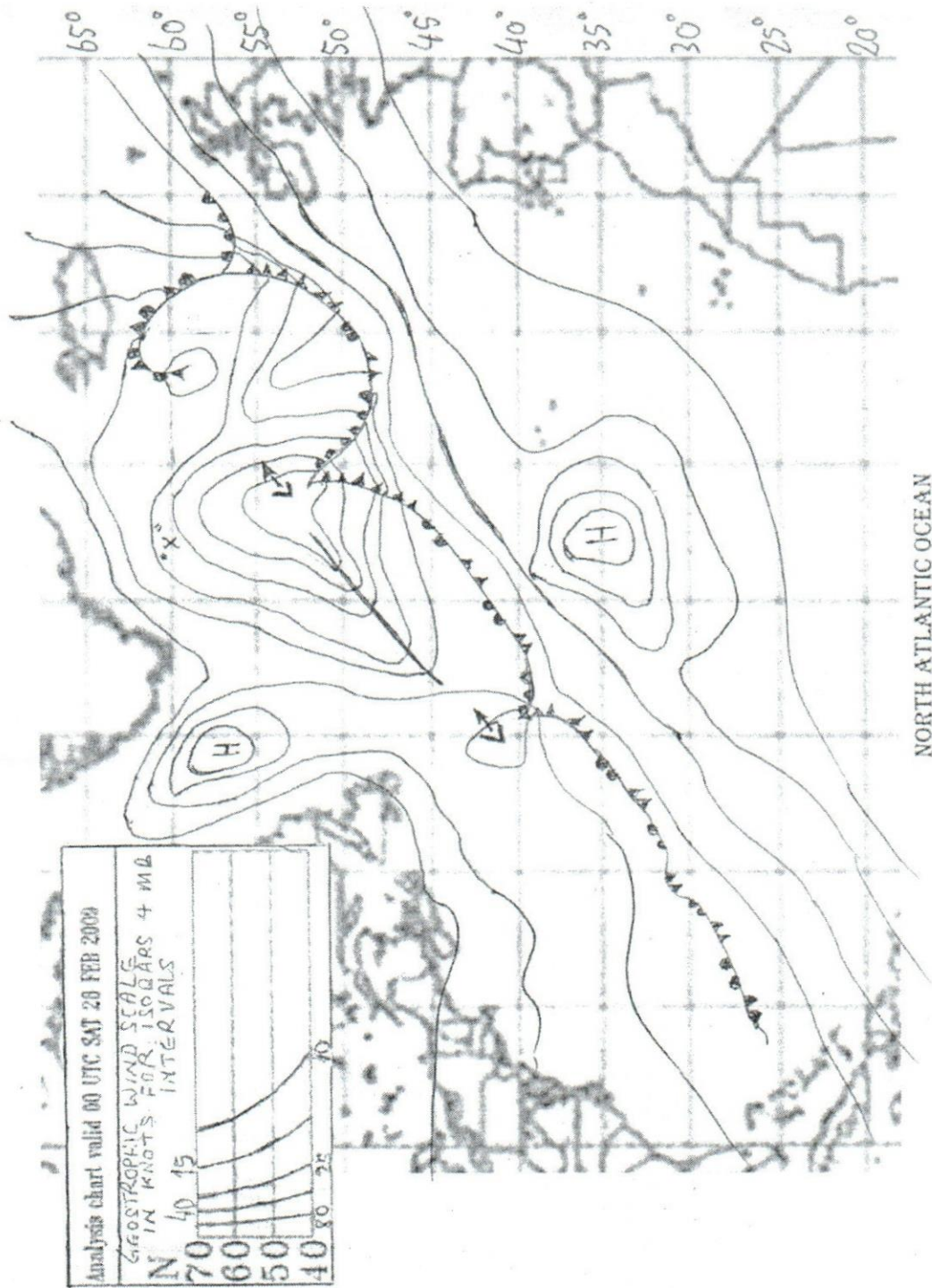
(5 × 4 = 20 marks)

5. With the aid of simple sketches, write sort descriptive notes on the following:

- i) Radiation fog
- ii) Advection fog
- iii) Arctic sea smoke
- iv) Precipitation
- v) Haze
- vi) Smog
- vii) Mist
- viii) Saturated vapor pressure
- ix) Dew point
- x) Isobars and isallobars

(2 × 10 = 20 marks)





==END==