



D. MARINE
Study Material

MEO CLASS 4

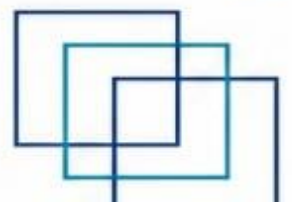
WRITTEN: MET

(MARINE ELECTRO TECHNOLOGY)

FOR INDIAN COMPETENCY EXAM

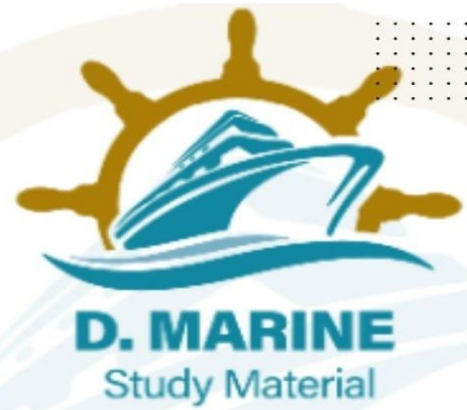


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JANUARY - 2026

Q1. (a) Draw a 4 pole DC generator construction diagram labelling its main parts (8)

(b) Describe briefly its

(i) Field system

(ii) Armature

(iii) Commutator

(iv) Brushes (8)

2025/JAN2/Q1 **2026/JAN/Q1**

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Q2. If the motor terminal markings are unknown, how would you identify the start run and common terminal connections (16)

2023/APR/Q3 **2024/FEB/Q2** **2024/JUL/Q2** **2025/JAN2/Q2**

2026/JAN/Q2

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Q3. (a) Sketch and describe the working of a lead acid battery (12)

(b) What routine maintenance is carried out on these batteries (4)

2023/FEB/Q1 **2023/JUN/Q3** **2024/FEB/Q3** **2024/JUL/Q3**

2025/JAN2/Q3 **2026/JAN/Q3**

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Q4. With the aid of a circuit diagram explain how a galvanometer can be used as an ammeter (16)

2023/FEB/Q2 **2023/NOV/Q2** **2024/FEB/Q4** **2024/JUL/Q4**

2025/JAN2/Q4 **2026/JAN/Q4**

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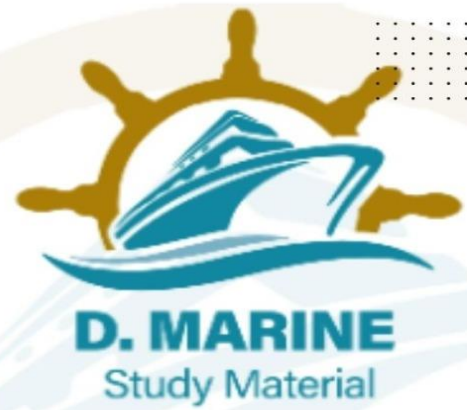
Q5. With the aid of a simple circuit diagram explain the electrical distribution system for essential loads onboard a cargo ship (16)

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2026/JAN/Q5



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Q6. (a) Explain Kirchhoff's current law (6)
(b) In the given circuit find the current value I_2 (10)

2023/FEB/Q6 2024/FEB/Q6 2024/JUL/Q6 2025/JAN2/Q6
2026/JAN/Q6

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Q7. (a) Compare constant current method and constant voltage method of charging batteries (6)
(b) The filament of a 230V lamp takes a current of 0.261 A when working at its normal temperature 2000°C The temperature coefficient of tungsten filament material can be taken as 0.005°C^{-1} at 0°C Find the appropriate current which flows at the instant of switching on the supply to the cold lamp which can be considered to be at a room temperature of 20°C (10)**

2026/JAN/Q7

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Q8. (a) Define work power and efficiency (6)
(b) A shunt motor has an armature resistance of 0.2 ohm and with an armature current of 120 A runs at 750 rpm off a 400 V supply Calculate the speed and armature current of the motor if the flux per pole is reduced to 75 percent of its initial value the total torque remaining unaltered (10)**

2024/FEB/Q8 2024/JUL/Q8 2025/JAN2/Q8 2026/JAN/Q8

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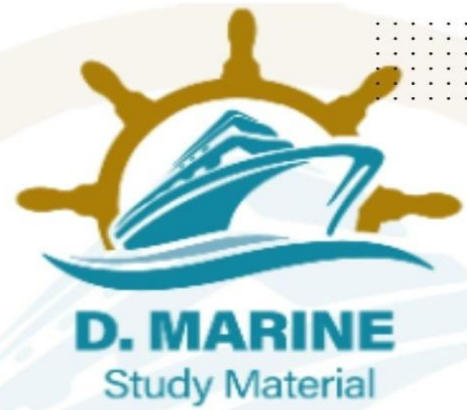
Q9. (a) Explain what is meant by phase difference between voltage and current values (6)
(b) An inductance coil has a resistance of 19.5 ohm and when connected to a 220 V 50 Hz supply the current passing is 10 A Find the inductance of the coil (10)

2023/APR/Q7 2024/FEB/Q9 2024/JUL/Q9 2025/JAN2/Q9
2026/JAN/Q9

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FEBRUARY - 2026

Q1. (a) Sketch a diesel electric propulsion arrangement for a ship (8) (b) Describe the operation of the propulsion arrangement sketched in (a), including in your description how reversal of the propulsion motor is achieved (8)

2024/MAY2/Q1 **2024/AUG/Q1** **2025/APR2/Q1** **2026/FEB/Q1**

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Q2. Differentiate between squirrel cage and wound rotor motors, of the three phase a.c. induction type, in respect of the following: (16)

- (a) Rotor construction
- (b) Torque characteristics
- (c) Speed variation

2024/MAY2/Q2 **2024/AUG/Q2** **2025/APR2/Q2** **2026/FEB/Q2**

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Q3. (a) Explain open loop control system and closed loop control system with suitable examples (8)

(b) What are the merits and demerits of the two systems? (8)

2024/MAY2/Q3 **2024/AUG/Q3** **2025/APR2/Q3** **2026/FEB/Q3**

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Q4. (a) Explain why it is necessary to have reverse power protection for alternators intended for parallel operation (6)

(b) (i) Sketch a reverse power trip (5) (ii) Explain briefly the principle on which the operation of this power trip is based and how tripping is activated (5)

2022/DEC/Q2 **2024/MAY2/Q4** **2024/AUG/Q4** **2025/APR2/Q4**

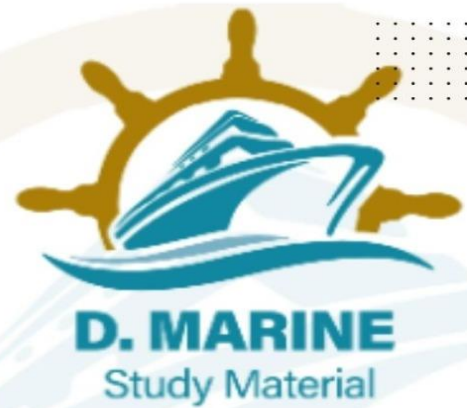
2026/FEB/Q4

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Q5. With reference to the condition monitoring of electrical machinery: (a) State TWO important parameters that may be recorded (8) (b) Explain how the parameters are measured and what defects may be revealed (8)



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2022/DEC/Q4 **2024/MAY2/Q5** **2024/AUG/Q5** **2025/APR2/Q5**
2026/FEB/Q5

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Q6. (a) Describe the basic principles a self-excited generator. (6) (b) The armature resistance of a 200 V, shunt motor is 0.4 ohms and the no-load armature current is 2A. When fully loaded and taking an armature current of 50 A, the speed is 1200 rev/min. Find the no-load speed and state the assumption made in the calculation. (10)

2026/FEB/Q6

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Q7. A 4 pole, lap wound shunt generator delivers 200 A at terminal voltage of 250 V. It has a field and armature resistance of 50 Ω and 0.05 Ω respectively. Determine: (16) (a) Armature current (b) Generated e.m.f (c) Current per armature parallel paths (d) Power developed 2024/MAY2/Q7

2024/AUG/Q7 **2025/APR2/Q7** **2026/FEB/Q7**

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Q8. (a) State the relationship between impedance, voltage and current. (6) (b) A 4-pole shunt generator with lap connected armature has field and armature resistances of 50 Ω and 0.1 Ω respectively. It supplies power to sixty 100V, 40 W lamps. Calculate the total armature current, the current per armature path, and the generated electromotive force. Allow a contact drop of 1V per brush. (10)

2026/FEB/Q8

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Q9. (a) Describe the effect of running an induction motor on reduced voltage (6)

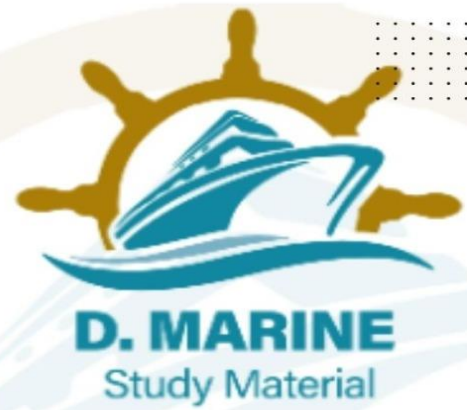
(b) A 90V D.C. generator is used to charge a battery of 40 cells in series, each cell having an average e.m.f. of 1.9 V and an internal resistance of 0.0025 Ω . If the total resistance of the connecting cells is 1 Ω , calculate the value of the charging current (10)

2026/FEB/Q9

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MARCH - 2026

Q1. Explain with a simple line sketch, a main engine jacket cooling automatic control system capable of maintaining the jacket water temperature within close limits during wide changes in engine load. (16)

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2025/JUL/Q1 2026/MAR/Q1

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Q2. a) What is the function of insulation in an electric conductor? (3) b) What are the various classes of insulation? (8)

c) What are the desired properties of insulating materials? (5)

2023/JAN/Q1 2024/JAN/Q2 2024/JUN/Q2 2024/NOV/Q2
2025/FEB/Q2 2025/JUL/Q2 2026/MAR/Q2

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Q3. a) How protection is provided for electrical short circuit. (4) b) Describe the construction and operation of HRC fuses. (8)

c) What are the advantages of HRC fuses. (4)

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2025/FEB/Q3 2025/JUL/Q3 2026/MAR/Q3

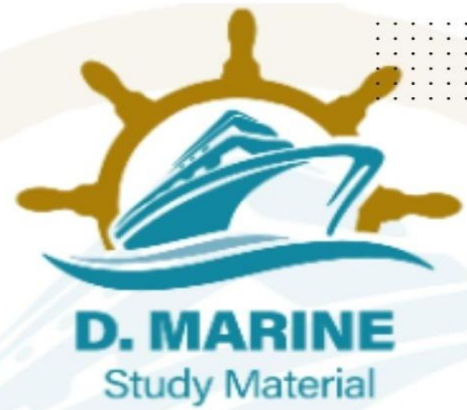
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Q4. a) Shunt generators having drooping characteristics are best suited for parallel operation. Discuss. (6)

b) Two 220 V D.C. generators each having linear external characteristics, operated in parallel. One machine has a terminal voltage of 270 V on no-load and 220V at a load current of 35 A, while the other has a voltage of 280 V at no-load and 220 V at 50 A. Calculate the output current of each machine and the bus bar voltage when the total load is 60 A. What is the kW output of each machine under this condition. (10)



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2023/APR/Q9 **2024/JAN/Q4** **2024/MAR/Q9** **2024/JUN/Q4**
2024/SEP1/Q9 **2024/NOV/Q4** **2025/FEB/Q4** **2025/JUL/Q4**
2026/MAR/Q4

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Q5.a) Briefly explain static induction and dynamic induction. (6) b) A coil of 250 turns is wound uniformly over a wooden ring of mean circumference 500mm and uniform cross-sectional area of 400mm². If the current passed through the coil is 4A find (a) the magnetizing force (b) the total flux. (10)

2023/JAN/Q9 **2024/JAN/Q5** **2024/JUN/Q5** **2024/NOV/Q5**
2025/FEB/Q5 **2025/JUL/Q5** **2026/MAR/Q5**

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Q6. (a) Explain how excitation of the rotor is produced and supplied. (6) (b) A 25 kVA, single phase transformer has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500 V, 50 Hz mains calculate: (10) (i) Secondary emf (ii) Primary and secondary current on full load (iii) Maximum flux in the core. 2025/FEB/Q6

2025/JUL/Q6 **2026/MAR/Q6**

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Q7. a) State the conditions which must be satisfied before an A.C generator can be paralleled with live bus-bars. (4)

b) Sketch a lamp-bright configuration for synchronizing lamps. (8)

c) Discuss the advantages and disadvantages of the lamps-bright system over the lamps-darks system. (4)

2024/JAN/Q7 **2024/JUN/Q7** **2024/SEP2/Q2** **2024/NOV/Q7**
2025/FEB/Q7 **2025/APR1/Q2** **2025/JUL/Q7** **2025/OCT/Q2**
2026/MAR/Q7

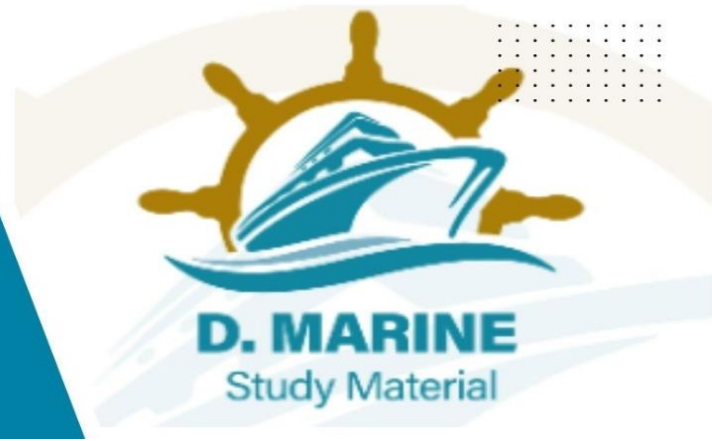
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Q8. With reference to a three-phase shipboard electrical distribution system.

a) Enumerate the advantages of an insulated neutral system (4)



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- b) Enumerate the disadvantages of an insulated neutral system (4)
c) Compare the use of an insulated neutral system as opposed to use of an Earthed neutral system with regards to the risk of electric shock from either system. (8)

2023/JUL/Q5 2024/JUN/Q8 2024/JAN/Q8 2024/NOV/Q8

2025/FEB/Q8 2025/JUL/Q8 2026/MAR/Q8

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Q9. a) Differentiate between resistance, induction and impedance in an A.C. circuit. (6)

b) A circuit is made up from four resistors of value 2Ω , 4Ω , 5Ω and 10Ω connected in parallel. If the current is 8.6A, find the voltage drop across the arrangement and the current in each resistor. (10)

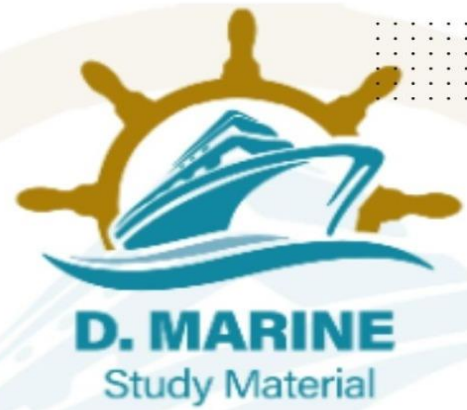
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APRIL - 2026

- Q1. a) What is the meaning of excitation in an alternator? (6)
b) Explain a brushless alternator with an insight on how the excitation is achieved in these alternators. (10)

2024/DEC2/Q1 **2025/AUG/Q1** **2026/APR/Q1**

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- Q2. a) What are the differences between synchronous and induction motor?
b) What do you understand by the term 'slip'? (4)
c) How do you check continuity of a circuit? Explain the process in brief.

2024/DEC2/Q2 **2025/AUG/Q2** **2026/APR/Q2**

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- Q3. a) Describe an alkaline battery cell, listing the materials used in its manufacture. (6)
b) With reference to alkaline batteries used on ships, state each of the following: (10)
i) Significance of the relative density reading of the electrolyte.
ii) When the electrolyte would normally be renewed.
iii) Reasons why the voltage reading of this type of battery is not necessarily indicative of its condition.
iv) The normal temperature range and safe temperature limit of battery.
v) Effects of high and low temperature.

2024/DEC2/Q3 **2025/AUG/Q3** **2026/APR/Q3**

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- Q4. Describe with the aid of a diagram the operation of the following components of electrical equipment and explain the purpose of each. (16)

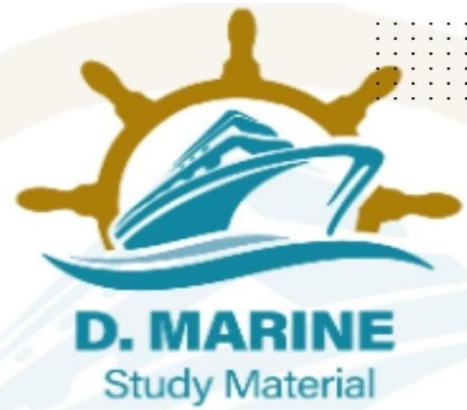
- a) Under voltage protection.
b) Miniature circuit breakers.
c) Reverse power tripping.

2024/DEC2/Q4 **2025/AUG/Q4** **2026/APR/Q4**

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Q5. With respect to personnel carrying out inspection and maintenance involving entry to boilers and other confined spaces.

- a) State the precautions needed for the operation of portable electrical tools and lighting, with respect to safety. (10)
- b) Outline the routine checks carried out on the equipments. (6)

2024/DEC2/Q5 **2025/AUG/Q5** **2026/APR/Q5**

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Q6. a) Discuss the open circuit and short circuit test performed for transformer. (6)

- b) The primary and secondary windings of a 30 KVA, 6000/230V, 1-phase transformer have resistance of 10Ω and 0.016Ω respectively. The reactance of the transformer referred to the primary is 34Ω . Calculate the primary voltage required to circulate full load current when the secondary is short circuited. What is the power factor on the short circuit? (10)

2023/AUG/Q6 **2024/DEC2/Q6** **2025/AUG/Q6** **2026/APR/Q6**

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Q7. a) Explain what do you understand by the term 'transducer'? (6)

- b) A coil of resistance 10Ω and inductance 100mH is connected in series with two parallel capacitors each of value $100 \mu\text{F}$ across a 250V , 50Hz supply. determine (10)

- i) The circuit current
- ii) The total power factor
- iii) The power taken from the supply.

2024/DEC2/Q7 **2025/AUG/Q7** **2026/APR/Q7**

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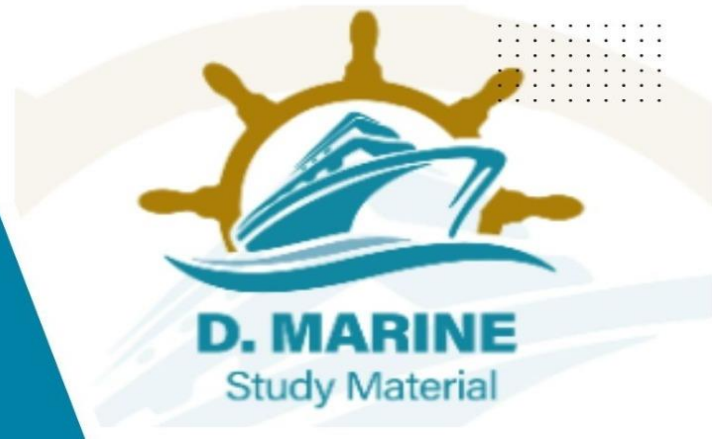
Q8. a) What is a Zener diode? (6)

- b) Find the generated e.m.f./conductor of a 6-pole d.c. generator having a magnetic flux/pole of 64m Wb and a speed of 1000 rev/min . If there are 468 conductors, connected in six parallel circuits, calculate the total generated e.m.f. of the machine. Find also the total power developed by the armature when the current in each conductor is 50 A . (10)

2024/DEC2/Q8 **2025/AUG/Q8** **2026/APR/Q8**



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- Q9. a) Sketch a schematic arrangement of a three-phase alternator with star connection. (6)
- b) A 500V, 3-phase, star-connected alternator supplies a star-connected induction motor which develops 45kW. The efficiency of the motor is 88 percent and the power factor is 0.9 (lagging). The efficiency of the alternator at this load is 80 percent. Determine a) The line current b) The power output of the alternator
- c) The output power of the prime-mover.

2023/AUG/Q9 2024/DEC2/Q9 2025/AUG/Q9 2026/APR/Q9

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