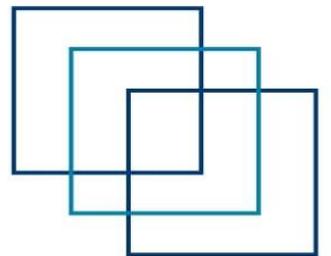




# ELECTRO TECHNICAL OFFICER : WRITTEN

FOR INDIAN COMPETENCY EXAM



[www.dmarinestudy.com](http://www.dmarinestudy.com)



www.dmarinestudy.com



## JAN-2023 SECTION - I

Q1. A) Discuss the criteria of the classification of marine high voltage for A.C. and D.C. Systems. Sketch a Ships high voltage distribution system and explain its features. (8)

b) Discuss the various methods of testing the insulation of HV system, Mention the significance of PI test, why 3 terminals insulation testers are used in HV insulation measurements (8).

**2021/SEP/Q1** **2023/JAN /Q1**

[Click Here to See the Answer](#)

Q2. Under what conditions can you produce sustained oscillations? Classify oscillations with respect to frequency range, principle involved, etc. It is possible to produce oscillations with RC networks in phase shift oscillator. Discuss in detail. (16)

**2023/JAN/Q2**

[Click Here to See the Answer](#)

Q3. (a) Which of the following devices will prevent a DC generator from becoming motorized?

(i) Over current relay (4)

(ii) Motorization trip (4)

(iii) Reverse power relay (4)

(iv) Reverse current relay. (4)

(b) Give a detailed explanations as to why the remaining options were not considered. (8)

**2023/JAN/Q3**

[Click Here to See the Answer](#)

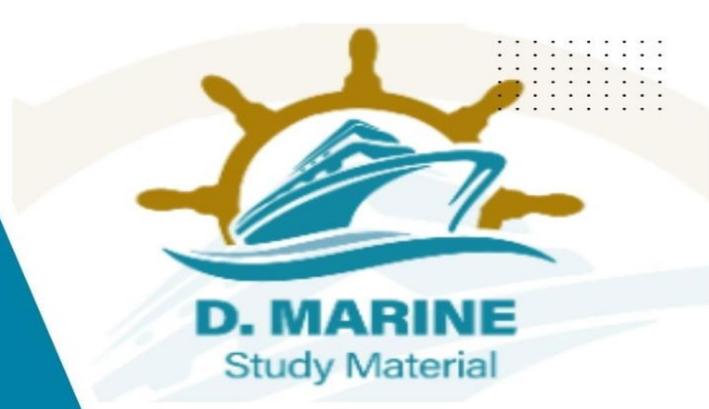
Q4. a) What design factor limits the maximum torque of a d.c. motor? (6)

(b) A shunt motor runs on no load at 700 r/min off a 440 V supply. The resistance of the shunt circuit is 240Ω. The following table gives the relationship between the flux and the shunt current:

Shunt current (A): 0.5 0.75 1.0 1.25 1.5 1.75 2.0



www.dmarinestudy.com



Flux per pole (mWb): 6.0 8.0 9.4 10.2 10.8 11.2 11.5

Calculate the additional resistance required in the shunt circuit to raise the no-load speed to 1000r/min

**2023/JAN /Q4**

[Click Here to See the Answer](#)

Q5. (a) On what factors does the capacitance of a parallel -plate capacitor depend? (6)

(b) A tuned circuit consisting of a coil having an inductance of  $200\mu\text{H}$  and a resistance of  $20\ \Omega$  in parallel with a variable capacitor is connected in series with a resistor of  $8000\ \Omega$  across a 60 V supply having a frequency of 1 MHz. Calculate: (10)

(a) The value of C to give resonance.

(b) The dynamic impedance and the Q factor of the tuned circuit.

(c) The current in each branch

**2023/JAN /Q5**

[Click Here to See the Answer](#)

Q6. (a) The capacitor-start induction run motor has a much higher starting torque than the resistance split-phase motor. Explain (6)

(b) An eight-pole armature is wound with 480 conductors. The magnetic flux and the speed are such that the average e.m.f. generated in each conductor is 2.2 V, and each conductor is capable of carrying a full load current of 100 A. Calculate the terminal voltage on no load, the output current on full load and the total power generated on full load when the armature is:

(i) Lap connected

(ii) Wave connected (10)

**2023/JAN/Q6**

[Click Here to See the Answer](#)

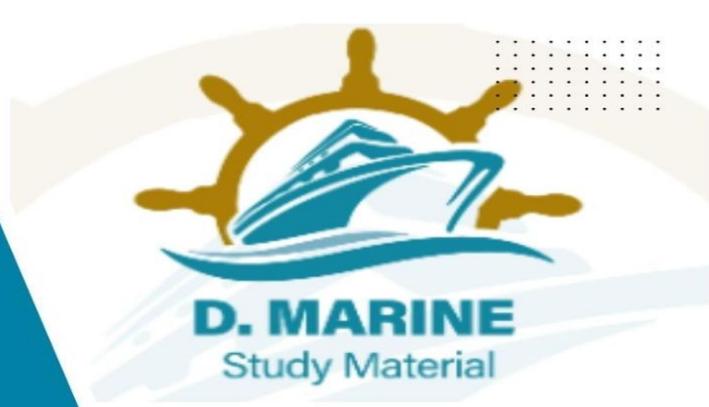
Q7. If a small amount of oil is spilled during bunkering and causes a sheen upon the water, state what should be the procedure adopted for pollution control, information to authorities and subsequent bunkering practice (16)

**2023/JAN /Q7**

[Click Here to See the Answer](#)



www.dmarinestudy.com



- Q8. (a) Make a detailed sketch of a non-portable 136-liter foam fire extinguisher. (4)  
(b) Briefly explain how to operate the foam extinguisher. (3)  
(c) State the two constituents used, which enable stable foam to be produced.  
(d) State for what approximate length of time, the extinguisher should generate foam. (3)  
(e) Where on board ship would you expect such an extinguisher to be located? (3)

**2023/JAN /Q8**

[Click Here to See the Answer](#)

Q9. with reference to the 1978 SOLAS protocol which outlines mandatory requirements for steering gear tests and drills:

- (a) Describe the test procedure to be carried out within the 12 hours before departure on a sea voyage.  
(b) Describe the emergency steering drills that must take place at least every 3 months. (5)  
(c) State how often the tests in (a) and the drill in (b) should be carried out for ships which regularly engaged on voyages of short duration (5)

**2023/JAN /Q9**

[Click Here to See the Answer](#)

**FEB-2023  
SECTION - I**

Q1. With reference to the provision of a shore electrical supply to a ship:

- a) Sketch an arrangement for taking A.C. Shore supply and checks to be carried out prior taking shore connection? (8)  
b) Describe the methods of safely connecting the arrangement sketched in (A) to the shore supply? (8)

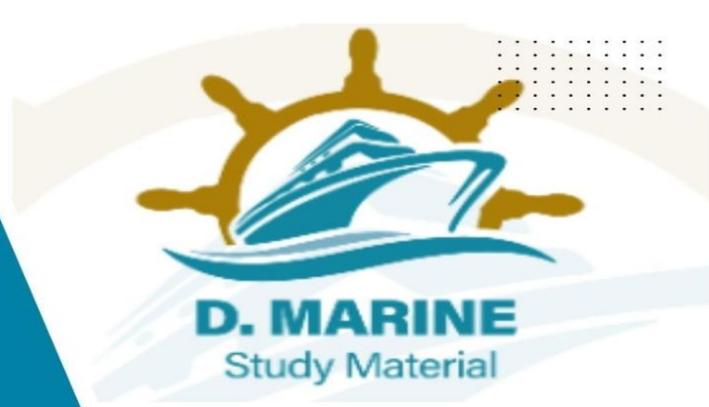
**2023/FEB/Q1**

[Click Here to See the Answer](#)

Q2. a) Sketch a circuit diagram of a push button direct on line contactor starter for a three phase Incorporating overload and short circuit protection.



www.dmarinestudy.com



b) Indicate, on a sketch of the typical characteristic curves of current and torque against Speed, disadvantages of a direct online start squirrel cage induction motor. (8)

**2023/FEB/Q2**

[Click Here to See the Answer](#)

Q3. a) Sketch a main engine shaft driven generator arrangement with an electronic system for frequency correction. (8)

b) Describe the operation of the generator arrangement sketched in (a). (8)

**2022/OCT/Q3** **2022/DEC/Q1** **2023/FEB/Q3**

[Click Here to See the Answer](#)

Q4. A) Explain the potential hazards if liquid-cooled transformers are used.

b) In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 w. Calculate the efficiency at half-full load 0.8 power factor. (10)

**2023/FEB/Q4**

[Click Here to See the Answer](#)

Q5. A) List the factors that determine the starting torque of the three-phase induction motor. How does this torque generally compare with the value of the rated torque? (6)

b) The low-voltage release of an a.c. motor-starter consists of a solenoid into which an iron plunger is drawn against a spring. The resistance of the solenoid is 35 ohm. When connected to a 220 V, 50 Hz, a.c. supply the current taken is at first 2 A, and when the plunger is drawn into the "full-in" position the current falls to 0.7 A. Calculate the inductance of the solenoid for both positions of the plunger, and the maximum value of flux-linkages in weber-turns for the "full-in" position of the plunger. (10)

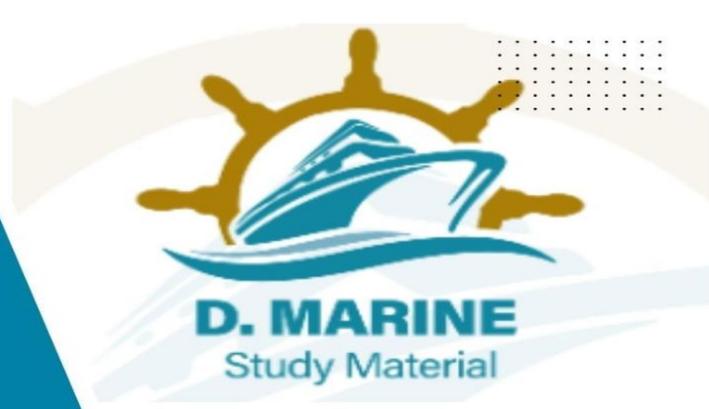
**2023/FEB/Q5**

[Click Here to See the Answer](#)

Q6. A) With the aid of delta and star connection diagrams, state the basic equation from which the delta-star and star-delta conversion equation can be derived. (6)



www.dmarinestudy.com



b) Three batteries A, B, and C have their negative terminals connected together. Between the positive terminals of A and B there is a resistor of 0.5 ohm and between B and C there is a resistor of 0.3 ohm Specifications of the three batteries are given below.

Battery A 105 V, Internal resistance 0.25 ohm

Battery B 100 V, Internal resistance 0.2 ohm

Battery C 95 V, Internal resistance 0.25 ohm

Determine the current values in the two resistors and the power dissipated by them. (10)

**2023/FEB/Q6** **2023/JUL/Q6** **2024/FEB/Q6**

[Click Here to See the Answer](#)

Q7. a) As per annex II of MARPOL. Describe categories in which substances are divided. (8)

b) Give conditions under which they can be discharged outside special areas?

**2023/FEB/Q7**

[Click Here to See the Answer](#)

Q8. With reference to "ISM code" write short notes on. (16)

a) Management Review

b) Advantage of drills and procedure

c) Master overriding authority.

d) Advantage of internal audit.

**2023/FEB/Q8**

[Click Here to See the Answer](#)

Q9. a) Sketch and describe a total flooding CO<sub>2</sub> gas system suitable for the protection of machinery spaces. (6)

b) State, with reasons, which valve should be operated first in the system shown in (a) (4)

c) State the periodic maintenance required on the system. (6)

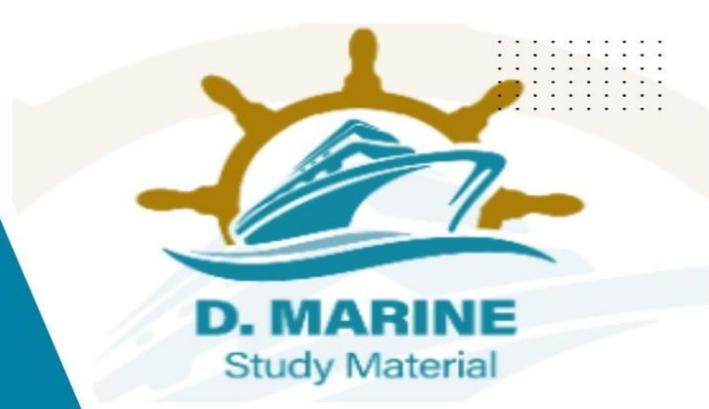
**2023/FEB/Q9**

[Click Here to See the Answer](#)

**MARCH-2023**



www.dmarinestudy.com



- Q1. a) Describe the circuit breaker for an A.C. generator using a sketch to show how arcing is controlled.  
b) Explain the sequence of events that might occur if the breaker opens on a short circuit and state the check you would require following such event. (4)  
c) Give a safe procedure to follow should a main circuit breaker fail to open under fault Condition. (4)

**2023/MAR/Q1**

[Click Here to See the Answer](#)

- Q2. In a ship's power system, the neutral on the low voltage side is not grounded, but it is mandatory to ground the neutral in high voltage systems. Discuss in detail for the above difference and with suitable sketches, explain the different earthing arrangements for HV system (16)

**2023/MAR/Q2**

[Click Here to See the Answer](#)

- Q3. a) In A.C. generators, voltage dip occurs in two stages.  
i) Sketch a voltages-time graph showing the pattern of voltage dip. (4)  
ii) Referring to this graph, state the reasons the effect on the electrical system of a small power installation when a large load is suddenly switched on. (4)  
b) Explain EACH of the following categories of voltage control:  
i) Error operated (4)  
ii) Functional (4)

**2023/MAR/Q3**

[Click Here to See the Answer](#)

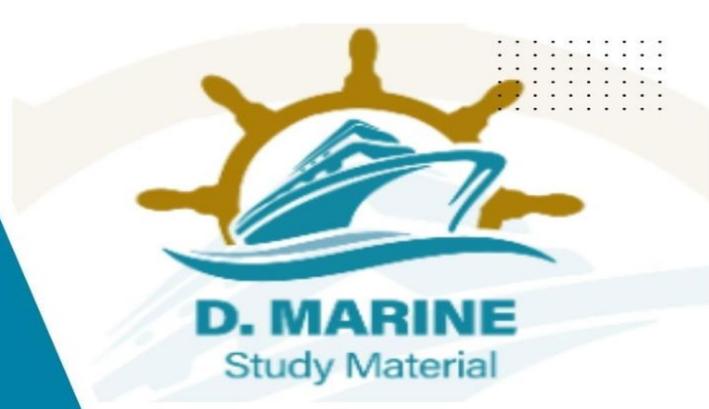
- Q4. (a) Why is a synchronous motor not self-starting? What are the various ways in which it can be started?  
(b) Differentiate Ge and Si diode characteristics. The reverse bias saturation current for a P -N junction diode is  $1.0 \mu\text{A}$  at 300 K. Determine its AC resistance at 150 mV Forward bias. (10)

**2023/MAR/Q4**

[Click Here to See the Answer](#)



www.dmarinestudy.com



Q5. (a) Describe the no-load saturation characteristic of a d.c. generator. (6)  
 (b) A 400V shunt motor has an armature resistance of 0.3 ohm and a shunt-field circuit resistance of 300 ohm. Calculate the speed attained by the motor when the current taken from the supply is (i) 30A and (ii) 50A. The open-circuit characteristic of the machine, when driven as a generator at 1500 rev/min, is given by the following figures:

Field current (A)	0.25	0.5	0.75	1.0	1.25	1.5
Open-circuit voltage (V)	220	398	515	598	638	662

Neglect the effects of armature reaction (10)

**2023/MAR/Q5**

[Click Here to See the Answer](#)

Q6. a) What is back emf? Derive the relation for the back emf and the supplied voltage in terms of armature reactance. (6)  
 b) Two earth lamps at 120 V, 15 W are used on a 110 V distribution circuit. Due to damage to a motor, the resistance of the positive line is reduced to 10 ohm and that of the negative line to 5 ohm. Find the voltage across each lamp and the extra load on the generator due to the fault. (10)

**2023/MAR/Q6**

[Click Here to See the Answer](#)

Q7. With reference to Annex V of MARPOL 73/78 that deals with the prevention of pollution of the sea by garbage from ships -

a) Define the following terms.

- i) Garbage
- ii) Nearest land
- iii) Special areas (8)

b) State the regulations governing the disposal of garbage outside special areas. (8)

**2023/MAR/Q7**

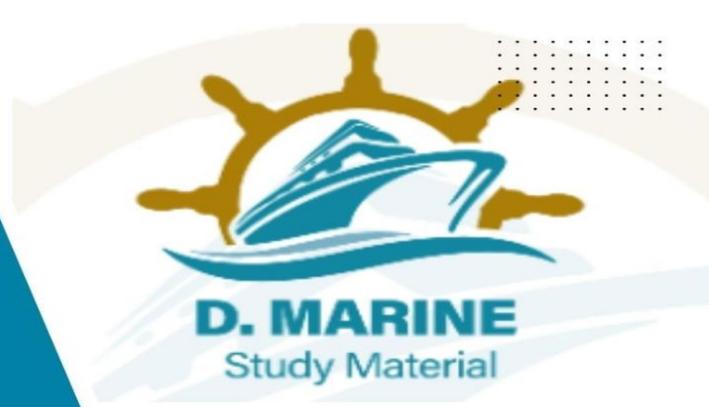
[Click Here to See the Answer](#)

Q8. With reference to oil monitoring of bilge and tanker ballast discharges:

a) Describe with the aid of a sketch, the general arrangement of an oil monitoring system. (8)



www.dmarinestudy.com



- b) State the inputs that are recorded. (4)  
c) Explain the difficulties encountered with the efficient operation of the oil monitoring system. (4)

**2022/SEP/Q7** **2023/MAR/Q8**

[Click Here to See the Answer](#)

Q9. Explain the principle of port State control and give in detail the verification , the Port State Control

Officer may carry out with reference to the following:

- a) Emergency generator (4)  
b) Auxiliary steering gear (3)  
c) Lifeboat engine (3)  
d) Bilge pump (3)  
e) SOPEP (3)

**2023/MAR/Q9**

[Click Here to See the Answer](#)

**APRIL-2023**

Q1. Under what conditions can you produce sustained oscillations? Classify oscillations with respect to frequency range, principle involved, etc. It is possible to produce oscillations with RC networks in phase shift oscillator. Discuss in detail. (16)

**2023/JAN/Q2** **2023/APR/Q1**

[Click Here to See the Answer](#)

Q2. List at least two factors that cause deterioration of the frequency response of a transistor amplifier. Explain how each factor affects the performance of the amplifier and the portion of the frequency range where it is effective. (16)

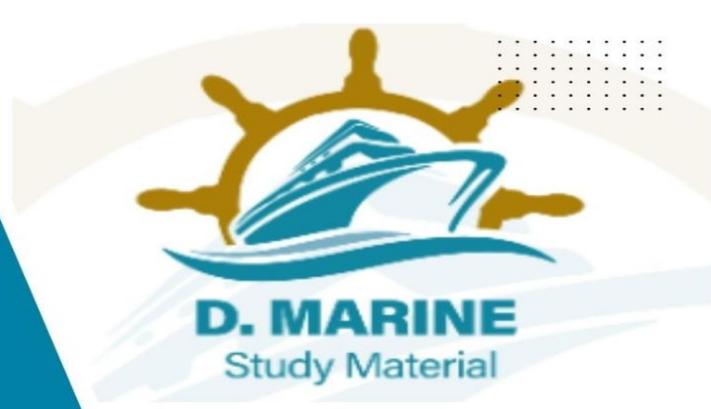
**2022/NOV/Q2** **2023/APR/Q2** **2024/APR/Q2**

[Click Here to See the Answer](#)

Q3. With reference to the provision of a shore electrical supply to a ship:



www.dmarinestudy.com



- a) Sketch an arrangement for taking A.C. Shore supply and checks to be carried out prior taking shore connection? (8)
- b) Describe the methods of safely connecting the arrangement sketched in (A) to the shore supply? (8)

**2023/FEB/Q1** **2023/APR/Q3**

[Click Here to See the Answer](#)

Q4. A) Explain the significance of the root-mean-square value of an alternating current or voltage waveform. Define the form factor of such a waveform. (6)

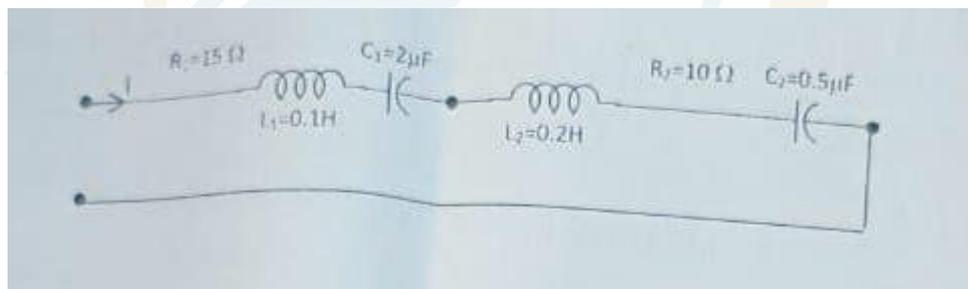
b) A total load of 8000 kW at 0.8 power factor is supplied by two alternators in parallel. One alternator supplies 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.

**2021/MAR/Q6** **2021/SEP/Q6** **2023/APR/Q4**

[Click Here to See the Answer](#)

Q5. (a) Sketch an arrangement showing the principal of a proportional plus Integral (P + I) control loop.

(b) Compare the series and parallel resonance circuits. Find the frequency at which the following circuit resonates. (10)



**2023/APR/Q5**

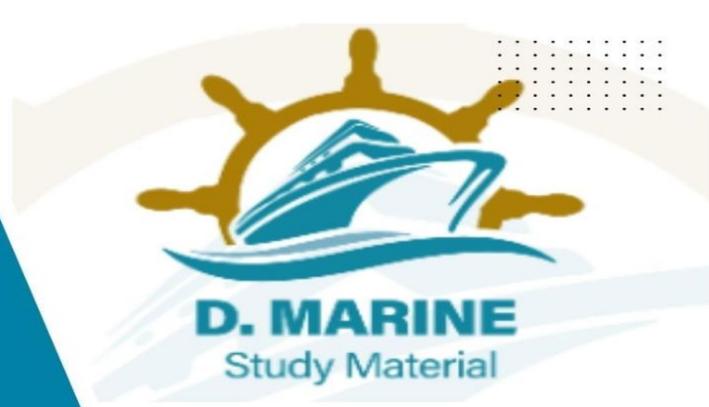
[Click Here to See the Answer](#)

Q6. A) Explain the potential hazards if liquid-cooled transformers are used.

b) In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 w. Calculate the efficiency at half-full load 0.8 power factor. (10)



www.dmarinestudy.com



**2023/FEB/Q4** **2023/APR/Q6**

[Click Here to See the Answer](#)

Q7. a) The UMS monitoring, and control system of your ship has recently started to give false alarms and incorrect data printouts. State, with reasons, possible causes if the false alarms and reading are:

i) Localized to a particular area of engine operation.

ii) General to the engine room (6)

b) State, with reasons, the action you, as Electrical Engineer, would take to ensure continued safe operation of the vessel if the defects were general to the engine room. (6)

c) Explain the procedure you, as Electrical Engineer, would adopt in order to locate and rectify a general fault in the UMS system. (4)

**2023/APR/Q7**

[Click Here to See the Answer](#)

Q8. a) Describe information which is available in the record which is attached as a supplement to the IOPP Certificate, for bulk carriers and oil tanker. (6)

b) What are the provisions for engine room under MARPOL 73/78 Annex -1, for large ocean-going vessel? (6)

c) What is IBC Code and what Certificates are issued under the Code and to which ship? (4)

**2023/APR/Q8**

[Click Here to See the Answer](#)

Q9. With reference to an automatic water sprinkler, fire detecting alarm and extinguishing system for accommodation spaces:

a) Sketch a typical system. (4)

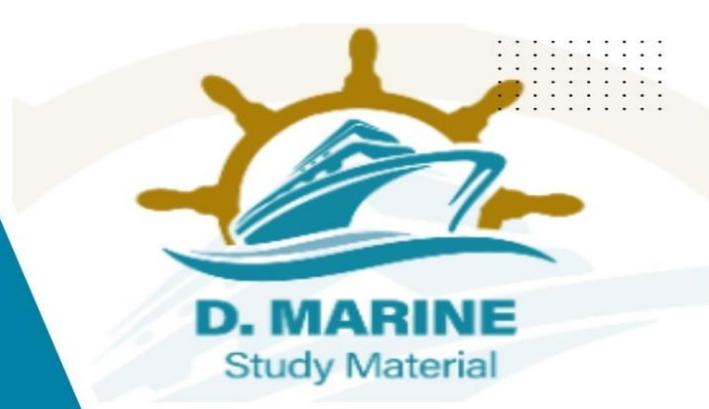
b) Describe the operation of this system. (4)

[Click Here to See the Answer](#)

**JUNE-2023**  
**SECTION - I**



www.dmarinestudy.com



Q1. Explain the effect of reduced voltage on standard squirrel cage motors with respect to EACH of the following:

- a) Burn outs (4)
- b) Starting current (4)
- c) Starting torque (4)
- d) Speed (4)

**2023/JUN/Q1**

[Click Here to See the Answer](#)

Q2. a) In A.C. generators, voltage dip occurs in two stages.

- i) Sketch a voltages-time graph showing the pattern of voltage dip. (4)
- ii) Referring to this graph, state the reasons the effect on the electrical system of a small power installation when a large load is suddenly switched on. (4)

b) Explain EACH of the following categories of voltage control:

- i) Error operated (4)
- ii) Functional (4)

**2023/MAR/Q3** **2023/JUN/Q2**

[Click Here to See the Answer](#)

Q3. With reference to the provision of a shore electrical supply to a ship:

- a) Sketch an arrangement for taking A.C. Shore supply and checks to be carried out prior taking shore connection? (8)
- b) Describe the methods of safely connecting the arrangement sketched in (A) to the shore supply? (8)

**2023/FEB/Q1** **2023/APR/Q3** **2023/JUN/Q3**

[Click Here to See the Answer](#)

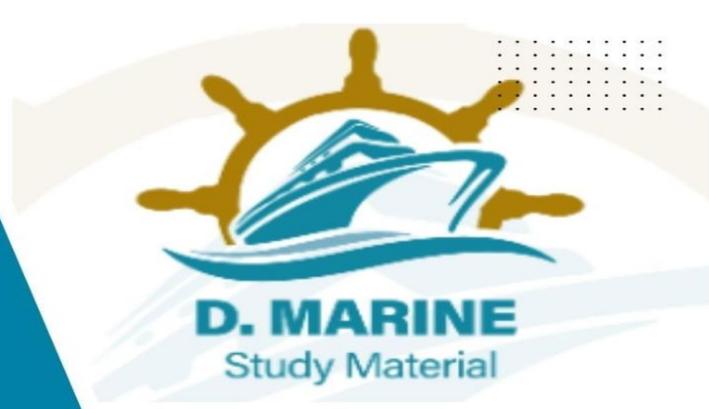
## SECTION - II

Q4. a) What are the characteristics of PN junction diode? Point out its specifications. Also point out the significance of dynamic and static resistances. (6)

b) Draw the circuit of half-wave rectifier and its output waveform. A diode whose internal resistance is  $20\ \Omega$  is to supply power of  $1000\ \Omega$  load from  $110\ \text{V}$  (RMS) source. Calculate



www.dmarinestudy.com



- (a) Peak load current
- (b) DC load current
- (c) AC load current. (10)

**2023/JUN/Q4**

[Click Here to See the Answer](#)

- Q5. a) Describe the no-load saturation characteristics of a D.C. generator. (6)
- b) A D.C. motor takes an armature current of 110 A at 480 V. The resistance of the armature circuit is  $0.2 \Omega$ . The machine has six poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate
- i) The speed
  - ii) The gross torque developed by the armature.

**2023/JUN/Q5**

[Click Here to See the Answer](#)

- Q6. A) What is back emf? Derive the relation for the back emf and the supplied voltage in terms of armature resistance. (6)
- b) A three-phase induction motor is wound for four poles and is supplied from a 50 HZ system. Calculate:
- (i) The synchronous speed
  - (ii) The speed of the rotor when the slip is 4 percent
  - (iii) The rotor frequency when the speed of the rotor is 600 r/min. (10)

**2023/JUN/Q6**

[Click Here to See the Answer](#)

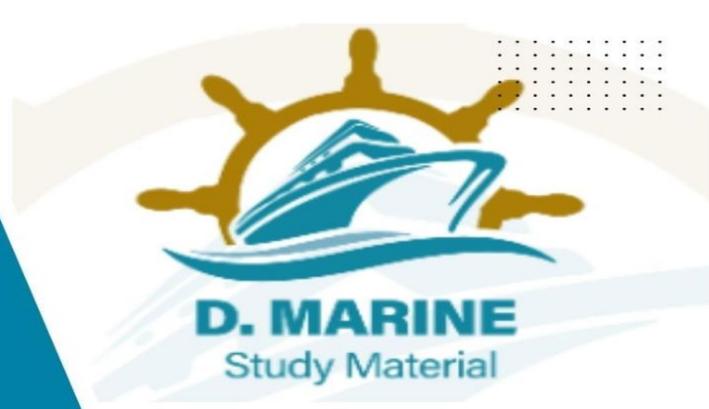
- Q7. a) With reference to SOLAS 74 amendments 2000, maintenance plan is to be kept on -board ship for firefighting system,
- a) Enumerate the list of fire protection system and fire-fighting systems and appliances which will be required to be included in the maintenance plan. (8)
- b) Training manual as required by SOLAS 74 amendments 2000, chapter II -2 contains instructions and information with respect to fire fighting. List the same and their significance.

**2023/JUN/Q7**

[Click Here to See the Answer](#)



www.dmarinestudy.com



Q8. a) Sketch and describe a total flooding CO<sub>2</sub> gas system suitable for the protection of machinery spaces. (8)

b) State, with reasons, which valve should be operated first in the system shown in (a). (8)

**2023/JUN/Q8**

[Click Here to See the Answer](#)

Q9. a) Describe a vacuum sewage system. (8)

b) With reference to the system described in (a)

i) State advantages of the system. (2)

ii) State why a holding tank may be required to be fitted to the system. (2)

iii) State the problems resulting from the retention of untreated sewage in a holding tank. (2)

iv) State the periodic maintenance required on the system. (2)

**2023/JUN/Q9**

[Click Here to See the Answer](#)

### JULY-2023 SECTION - I

Q1. Direct online starting for large induction motors such as those for bow thrust units, may not be viable.

a) State the reasons for this. (5)

b) Sketch a starting system that may be used for such motors. (6)

c) Describe the starting method sketched in (a, b). (6)

**2023/JUL/Q1**

[Click Here to See the Answer](#)

Q2. What is a Marine High Voltage System? Sketch and describe a Shipboard high voltage switch board and its protective devices. (16)

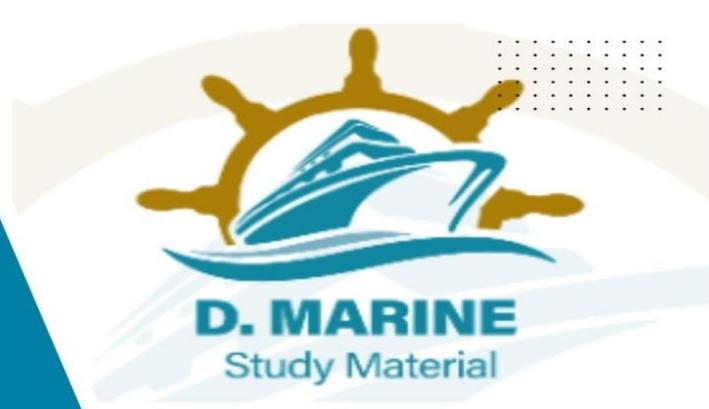
**2023/JUL/Q2**

[Click Here to See the Answer](#)

Q3. What is soft starting of an Induction Motor? Describe with a circuit using thyristors used for soft starting. Discuss its advantages and disadvantages.



www.dmarinestudy.com



**2023/JUL/Q3**

[Click Here to See the Answer](#)

## SECTION - II

Q4. A) Explain the potential hazards if liquid-cooled transformers are used.  
b) In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 w. Calculate the efficiency at half-full load 0.8 power factor. (10)

**2023/FEB/Q4** **2023/APR/Q6** **2023/JUL/Q4**

[Click Here to See the Answer](#)

Q5. A) List the factors that determine the starting torque of the three-phase induction motor. How does this torque generally compare with the value of the rated torque? (6)  
b) The low-voltage release of an a.c. motor-starter consists of a solenoid into which an iron plunger is drawn against a spring. The resistance of the solenoid is 35 ohm. When connected to a 220 V, 50 Hz, a.c. supply the current taken is at first 2 A, and when the plunger is drawn into the "full-in" position the current falls to 0.7 A. Calculate the inductance of the solenoid for both positions of the plunger, and the maximum value of flux-linkages in weber-turns for the "full-in" position of the plunger. (10)

**2023/FEB/Q5** **2023/JUL/Q5**

[Click Here to See the Answer](#)

Q6. A) With the aid of delta and star connection diagrams, state the basic equation from which the delta-star and star- delta conversion equation can be derived. (6)

b) Three batteries A, B, and C have their negative terminals connected together. Between the positive terminals of A and B there is a resistor of 0.5 ohm and between B and C there is a resistor of 0.3 ohm Specifications of the three batteries are given below.

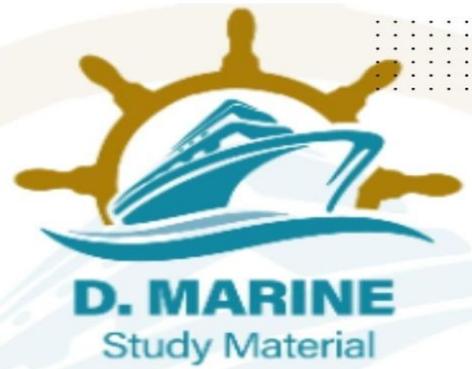
Battery A 105 V, Internal resistance 0.25 ohm

Battery B 100 V, Internal resistance 0.2 ohm

Battery C 95 V, Internal resistance 0.25 ohm



www.dmarinestudy.com



Determine the current values in the two resistors and the power dissipated by them. (10)

**2023/FEB/Q6** **2023/JUL/Q6** **2024/FEB/Q6** **2024/JUL/Q6**

[Click Here to See the Answer](#)

### SECTION - III

Q7. With reference to oil monitoring of bilge and tanker ballast discharges:

- Describe with the aid of a sketch, the general arrangement of an oil monitoring system. (8)
- State the inputs that are recorded. (4)
- Explain the difficulties encountered with the efficient operation of the oil monitoring system. (4)

**2022/SEP/Q7** **2023/MAR/Q8** **2023/JUL/Q7**

[Click Here to See the Answer](#)

Q8. With respect to the hazardous areas of tankers.

- Explain the term flameproof (Ex d) for electrical equipment. (6)
- State the type of electrical equipment that would be protected in this way.
- List likely defects of flameproof equipment. (5)

**2020/MAR/Q9** **2020/OCT/Q9** **2021/FEB/Q8** **2021/APR1/Q7**

**2021/JUL2/Q9** **2021/OCT/Q9** **2022/APR/Q8** **2022/JUL/Q9**

**2023/JUL/Q8**

[Click Here to See the Answer](#)

Q9. With reference to an emergency fire pump state

- The regulations that influence its location, capacity, and power. (4)
- How the power supply to emergency pump is ensured? (4)
- Why a relief valve is necessary on the deck main? (4)
- Requirement of isolation valve in fire main line (4)

**2023/JUL/Q9**

[Click Here to See the Answer](#)

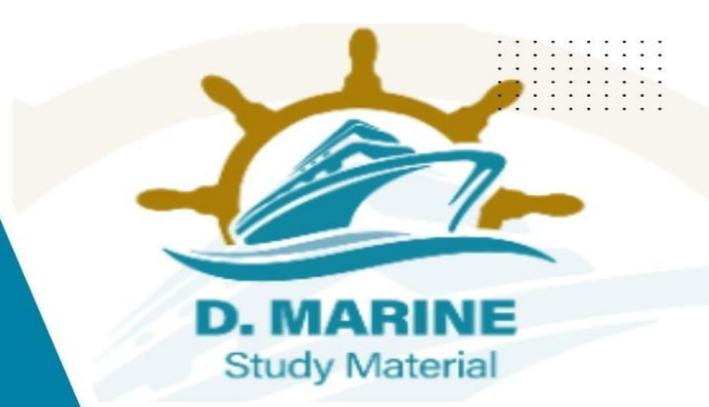
### AUG-2023

Q1. With reference to alkaline batteries used on board ship.

- Describe the operation of a battery cell and state the material used. (8)



www.dmarinestudy.com



- b) Describe how the cells are mounted to form a battery. (4)  
c) State the advantages and disadvantages compared with lead-acid batteries.

**2023/AUG/Q1**

[Click Here to See the Answer](#)

Q2. With reference to a 3 speed a.c. cage motor driven cargo winch:

- a) Sketch a circuit diagram for a pole change motor. (8)  
b) Describe how speed change and braking are achieved. (8)

**2023/AUG/Q2**

[Click Here to See the Answer](#)

Q3. With reference to electronic control systems:

- a) Draw a simple block diagram for temperature control (8)  
b) Describe each component shown in the diagram in (a). (8)

**2023/AUG/Q3**

[Click Here to See the Answer](#)

Q4. a) Explain the preference for a 60 Hz system. Describe the dangers of running a 50 Hz system from a 60 Hz supply. (6)

b) A transistor amplifier stage comprises a transistor of parameters  $h_{ie} = 800 \Omega$ ,  $h_{fe} = 50$  and  $h_{oe} = 20 \mu S$ , and bias components and coupling capacitors of negligible effect. The input signal consists of an e.m.f. of 60 mV from a source of internal resistance  $2.2 k\Omega$ , and the total load on the stage output is  $4 k\Omega$ . Determine the current, voltage and power gains of the amplifier stage.

**2023/AUG/Q4**

[Click Here to See the Answer](#)

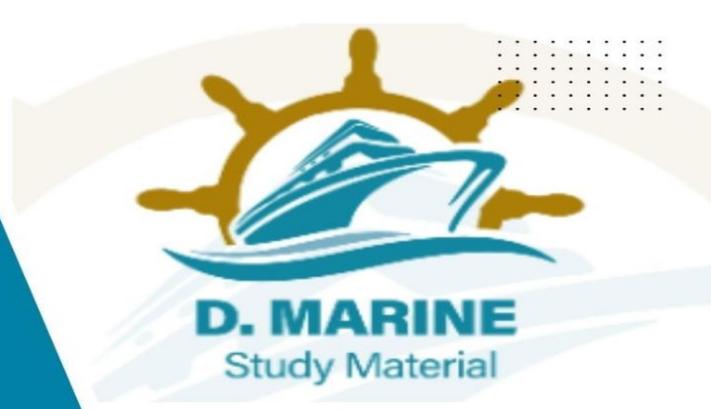
Q5. A) Explain how the efficiency and regulation of a transformer can be assessed by open circuit and short circuit tests? (6)

b) A tuned circuit consisting of a coil having an inductance of  $200 \mu H$  and a resistance of  $20 \Omega$  in parallel with a variable capacitor is connected in series with a resistor of  $8000 \Omega$  across a 60V supply having a frequency of 1 MHz  
Calculate:

- a) The value of C to give resonance.  
b) The dynamic impedance and the Q factor of the tuned circuit.



www.dmarinestudy.com



c) The current in each branch. (10)

2023/AUG/Q5

[Click Here to See the Answer](#)

Q6. a) Explain distribution factor and pitch factor for alternator windings. (6)

b) An eight-pole armature is wound with 480 conductors. The magnetic flux and the speed are such that the average e.m.f. generated in each conductor is 2.2 V, and each conductor is capable of carrying a full load current of 100 A. Calculate the terminal voltage on no load, the output current on full load and the total power generated on full load when the armature is

a) lap-connected

b) wave-connected (10)

2023/AUG/Q6

[Click Here to See the Answer](#)

### SECTION -III

Q7. 'Fire Control Plan' is one of the requirements to be carried on board ship. State the International Convention under which the plan is made mandatory.

With reference to this plan explain the following:

a) What all information are available in the plan. (8)

b) Which all locations it is stowed/exhibited and the reasons. (8)

2023/AUG/Q7

[Click Here to See the Answer](#)

Q8. With reference to "ISM Code" write short notes on

a) Management Review (5)

b) Advantage of drills and procedures (5)

c) Internal Audit (6)

2023/AUG/Q8

[Click Here to See the Answer](#)

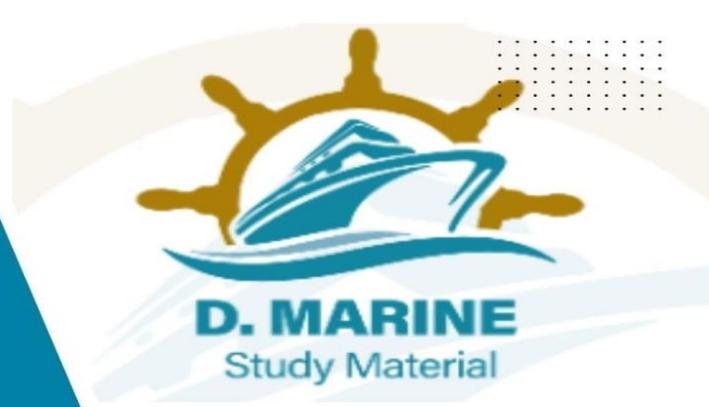
Q9. With reference to the Maritime Labour Convention (MLC) 2006. Discuss the requirements for

seafarers regarding: -

a) Minimum age to work onboard vessels (5)



www.dmarinestudy.com



b) Seafarers Employment agreements (5)

c) Hours of work and hours of rest. (6)

**2022/AUG/Q8** **2023/AUG/Q9**

[Click Here to See the Answer](#)

### SEP-2023 SECTION - I

Q1. (a) Compare methods of obtaining speed regulation of three-phase induction motor generally used in tankers by means of: (16)

- i. Rotor resistance.
- ii. Cascade system.
- iii. Pole-changing.

Give examples where each system may be employed with advantage.

**2023/SEP/Q1**

[Click Here to See the Answer](#)

Q2. a) State the necessary conditions required prior to the synchronizing of electrical alternators. (4)

b) Describe the type of cumulative damage that may be caused when alternators are incorrectly synchronized. (4)

c) Explain how the damage referred to in (b) can be avoided / reduced. (4)

d) For two alternators operating in parallel state the consequences of: (4)

(i) Reduced torque from the prime mover of one machine.

(ii) Reduced excitation on one machine.

**2023/SEP/Q2**

[Click Here to See the Answer](#)

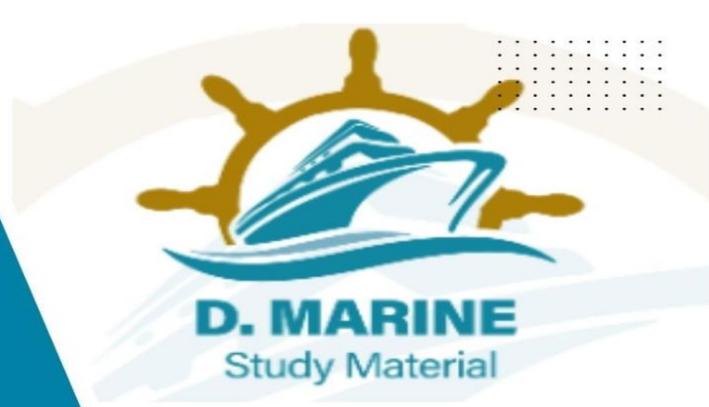
Q3. With respect to the High Voltage power systems installation, explain the different types of circuit breaker that are used, comparing them on merits and de-merits. Describe the theory of arc phenomenon and the mechanism fitted to mitigate the arc. (16)

**2023/SEP/Q3**

[Click Here to See the Answer](#)



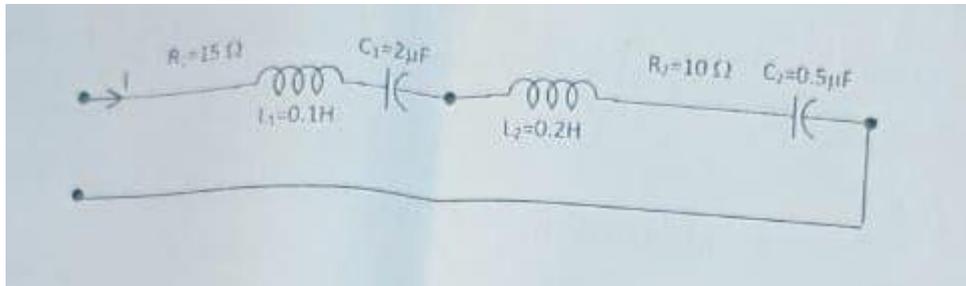
www.dmarinestudy.com



## SECTION - II

Q4. (a) Sketch an arrangement showing the principal of a proportional plus Integral (P + I) control loop.

(b) Compare the series and parallel resonance circuits. Find the frequency at which the following circuit resonates. (10)



**2023/APR/Q5** **2023/SEP/Q4**

[Click Here to See the Answer](#)

Q5. A) Explain the potential hazards if liquid-cooled transformers are used.

b) In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 w. Calculate the efficiency at half-full load 0.8 power factor. (10)

**2023/FEB/Q4** **2023/APR/Q6** **2023/JUL/Q4** **2023/SEP/Q5**

[Click Here to See the Answer](#)

Q6. a) Compare the effectiveness of a current limiting circuit breaker with that of a HRC fuse.

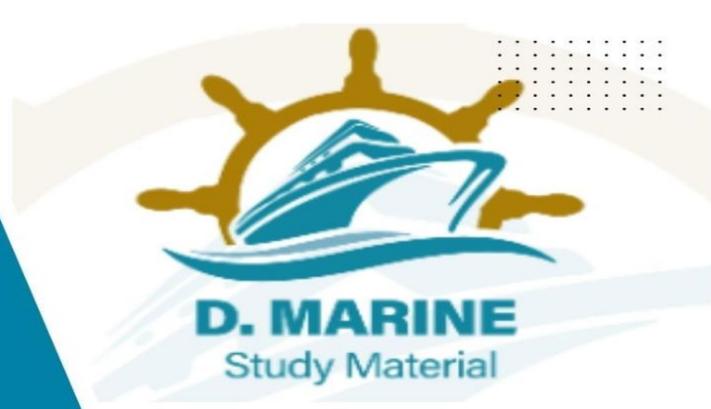
b) A 440 V shunt motor takes an armature current of 30 A at 700 rev/min. The armature resistance is 0.7 ohm. If the flux is suddenly reduced 20 per cent, to what value will the armature current rise momentarily? Assuming unchanged torque to motion, what will be the new steady values of speed and armature current? Sketch graphs showing armature current and speed as functions of time during the transition from initial to final, steady-state conditions. (10)

**2023/SEP/Q6**

[Click Here to See the Answer](#)



www.dmarinestudy.com



### SECTION - III

Q7. With respect to MARPOL 73/78, Annex-II, Noxious liquid chemicals are divided into categories.

- State the number of categories, and what does each category signify. (8)
- State the requirement of procedures and Arrangements Manual, and what information is available.

**2023/SEP/Q7**

[Click Here to See the Answer](#)

Q8. With reference to free fall lifeboat of an ocean-going ships:

- Periodical maintenance, tests and checks on lifeboat and releasing gear. (6)
- Secondary means of lowering. (5)
- Lifeboat Drills. (5)

**2023/SEP/Q8**

[Click Here to See the Answer](#)

Q9. Briefly discuss the following with respect to safety of navigation:

- Bridge Navigation Watchkeeping Alarm System (BNWAS) (6)
- Long Range Identification and Tracking of ships (LRIT). (5)
- Voyage Simplified Voyage Recorder (VDR/S-VDR) (5)

**2021/MAR/Q8** **2021/NOV/Q3** **2022/APR/Q9** **2022JUN/Q9**

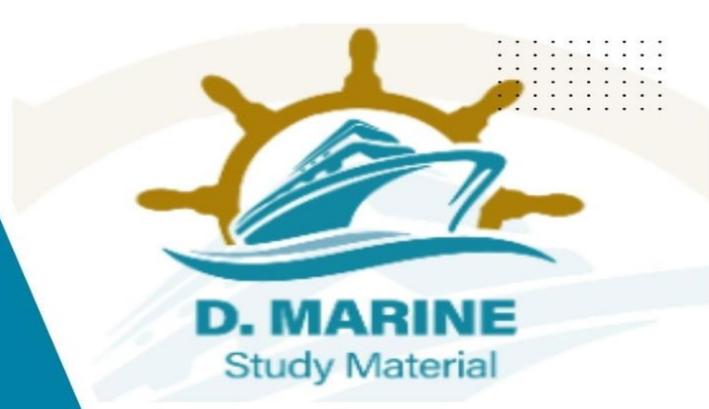
**2023/SEP/Q9**

[Click Here to See the Answer](#)

**OCT-2023**  
**SECTION - I**



www.dmarinestudy.com



Q1. What are semiconductor devices? What are its advantages over thermionic devices? With respect to semiconductor devices describe working principle and application of the following: (16)

- (a) Zener Diode
- (b) Transistor
- (c) Photocell
- (d) Thyristor

**2022/APR/Q3** **2022/JUN/Q3** **2023/OCT/Q1**

[Click Here to See the Answer](#)

Q2. Tank liquid level sensors are an integral part of ships. Describe with the aid of suitable sketches the working principle of:

- (a) Capacitive type level sensor (6)
- (b) Ultrasonic level sensor (5)
- (c) Float (5)

**2021/DEC/Q1** **2023/OCT/Q2**

[Click Here to See the Answer](#)

Q3. The direct online start of squirrel cage motor is used for most electrical driven on a.c. powered ships. Describe with sketches as necessary one method of overcoming each of the following problems:

- (a) High starting current
- (b) Low starting torque

**2023/OCT/Q3**

[Click Here to See the Answer](#)

## SECTION - II

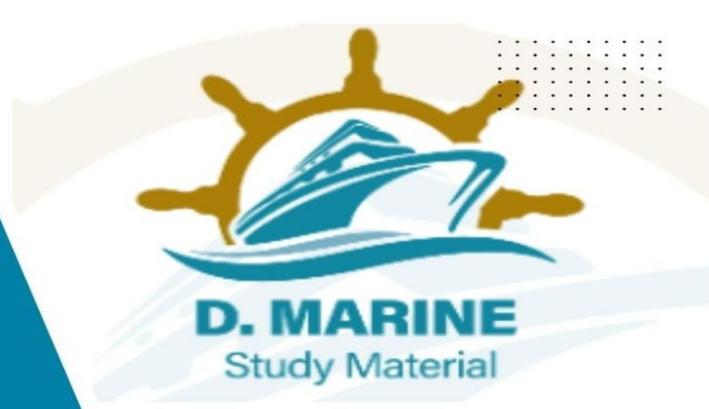
Q4. A) Explain the significance of the root-mean-square value of an alternating current or voltage waveform. Define the form factor of such a waveform. (6)

b) A total load of 8000 kW at 0.8 power factor is supplied by two alternators in parallel. One alternator supplies 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.

**2021/MAR/Q6** **2021/SEP/Q6** **2023/APR/Q4** **2023/OCT/Q4**



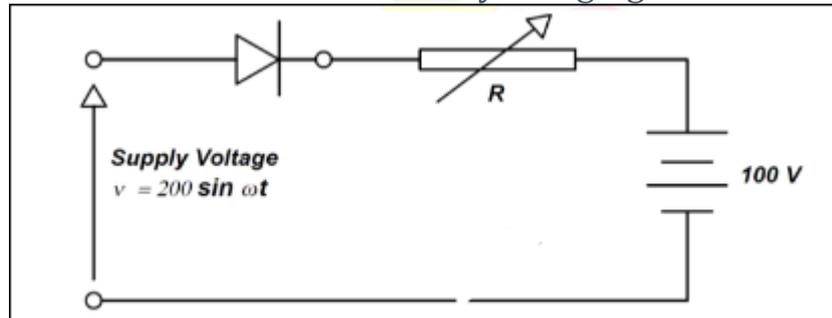
www.dmarinestudy.com



[Click Here to See the Answer](#)

Q5. A) By means of a schematic circuit diagram illustrate the peak rectifier. If the supply voltage is  $v(t) = V_m \sin \omega t$ , what is the voltage across the load resistor? (6)

b) A battery-charging circuit is shown below in fig. The forward resistance of the diode can be considered negligible and the reverse resistance infinite. The internal resistance of the battery is negligible. Calculate the necessary value of the variable resistance  $R$  so that the battery charging current is 1.0 A. (10)



2021/SEP/Q5 2023/OCT/Q5

[Click Here to See the Answer](#)

Q6. A) What is back emf? Derive the relation for the back emf and the supplied voltage in terms of armature resistance. (6)

b) A three-phase induction motor is wound for four poles and is supplied from a 50 HZ system. Calculate:

(i) The synchronous speed

(ii) The speed of the rotor when the slip is 4 percent

(iii) The rotor frequency when the speed of the rotor is 600 r/min. (10)

2023/JUN/Q6 2023/OCT/Q6

[Click Here to See the Answer](#)

### SECTION - III

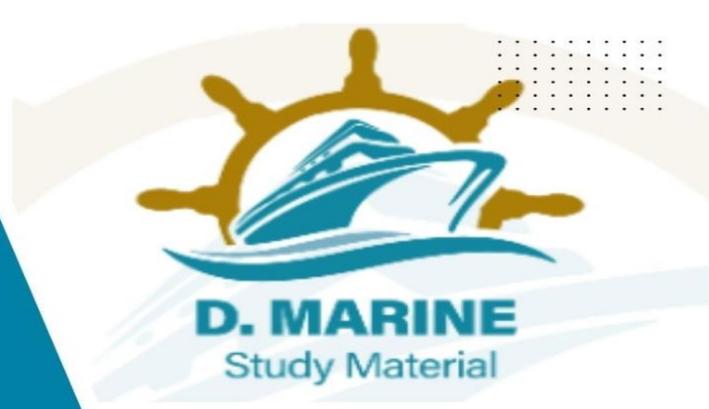
Q7. Name various statutory Certificates and Documents to be carried on board Gas Tankers giving a reference to the conventions and justify for their requirement. (16)

2023/OCT/Q7

[Click Here to See the Answer](#)



www.dmarinestudy.com



Q8. With Reference to the Maritime Labor Convention (MLC) 2006, discuss the requirements for seafarers regarding:

- a) Young Seafarers onboard ships (6)
- b) Repatriation (5)
- c) Seafarers Wages (5)

**2023/OCT/Q8**

[Click Here to See the Answer](#)

Q9. With reference to an oil/ water separator:

- a) (i) Sketch such a device (4)
- (ii) Describe the passage of oil/water mixture from the delivery of pump to the outlets of the separator.
- b) State how oil density and temperature affect the case of separation of oil from water. (4)
- c) State how the movement of oil on board ship or its discharge and the discharge of oily-bilge or ballast water overboard is recorded. (4)

**2023/OCT/Q9**

[Click Here to See the Answer](#)

### NOV-2023 SECTION - I

Q1. Diesel electric propulsion is now being chosen as the power plant for an increasingly wide variety of vessels. (16)

- a) Sketch a simple layout of such an installation.
- b) Explain the advantages of selecting such a plant.

**2019/DEC/Q2** **2022/APR/Q2** **2023/NOV/Q1**

[Click Here to See the Answer](#)

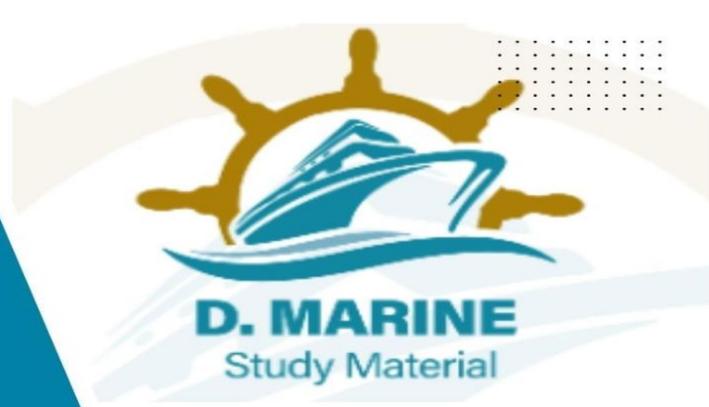
Q2. With reference to an emergency source of electrical power in cargo ships:

- a) Describe a typical power source. (8)
- b) Give a typical list of essential services, which must be supplied simultaneously. Explain how the emergency installation can be periodically tested. (8)

**2019/DEC/Q3** **2021/MAR/Q1** **2023/NOV/Q2**



www.dmarinestudy.com



[Click Here to See the Answer](#)

Q3. With reference to electronic control systems:

- a) Draw a simple block diagram for temperature control (8)
- b) Describe each component shown in the diagram in (a). (8)

**2023/AUG/Q3** **2023/NOV/Q3**

[Click Here to See the Answer](#)

## SECTION - II

- Q4. (a) Describe how protection against short circuit is provided. (6)
- (b) Explain how rotating magnetic field is produced in three phase winding with three phase supply. A 4-pole, 3 phase induction motor operates from a supply whose frequency is 50 Hz. Calculate (i) Speed at which the magnetic field of the stator is rotating, (ii) Speed of the rotor when the slip is 0.04, (iii) The frequency of the rotor current when the slip is 0.03. (10)

**2023/NOV/Q4**

[Click Here to See the Answer](#)

- Q5. A) Explain the potential hazards if liquid-cooled transformers are used.
- b) In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 w. Calculate the efficiency at half-full load 0.8 power factor. (10)

**2023/FEB/Q4** **2023/APR/Q6** **2023/JUL/Q4** **2023/SEP/Q5**

**2023/NOV/Q5**

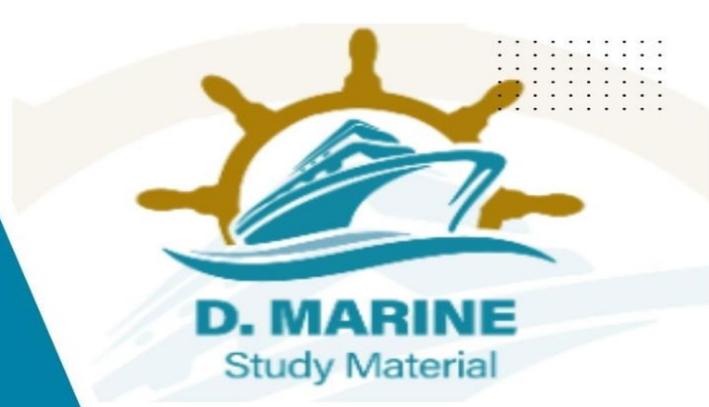
[Click Here to See the Answer](#)

- Q6. A) Explain the effect of making incorrect phase and starter connections.
- b) A 440V shunt motor takes an armature current of 30A at 700 rev/min. The armature resistance is 0.7 Ohm. If the flux is suddenly reduced 20 percent, to what value will the armature current rise momentarily? Assuming unchanged resisting torque to motion, What will be the new steady values of speed and armature current? Sketch graphs showing armature current and speed as functions of time during the transition from initial to final, steady-state conditions. (10)

**2023/NOV/Q6**



www.dmarinestudy.com



[Click Here to See the Answer](#)

### SECTION - III

Q7. With reference to MARPOL Annex IV

a) Draw a biological sewage treatment plant and explain the principle of operation. (8)

b) Periodical maintenance and checks and tests required to be done to verify the effectiveness of the above system. (8)

2020/OCT/Q7 2021/JAN/Q7 2021/MAR/Q9 2021/JUL2/Q9

2021/DEC/Q7 2022/JUL/Q8 2023/NOV/Q7

[Click Here to See the Answer](#)

Q8. A) (i) Discuss the various hazards and problems which are associated with electric cable insulation in the event of fire (4)

ii) Suggest remedies for these problems. (4)

B) State how the spread of fire may be reduced by the method used for installing electric cables. (8)

2023/NOV/Q8

[Click Here to See the Answer](#)

Q9. With reference to "ISM Code" write short notes on:

a) Masters Review (4)

b) Requirement and Advantages of Familiarization of seafarer onboard (4)

c) Designated Person Ashore (DPA) (4)

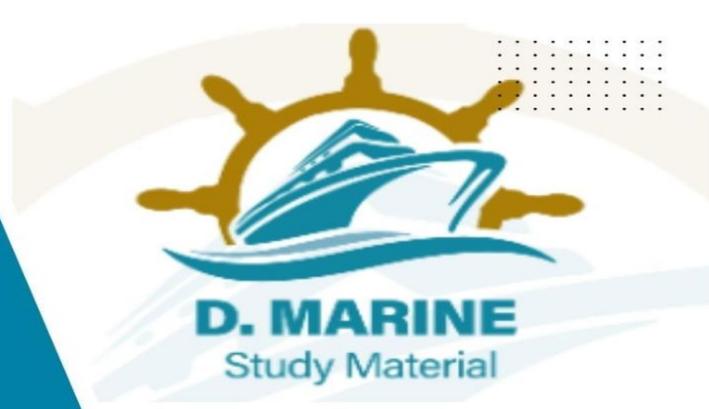
d) Functional requirements for a Safety Management System. (4)

2022/AUG/Q9 2023/NOV/Q9

[Click Here to See the Answer](#)



www.dmarinestudy.com



## DEC-2023 SECTION - I

Q1. (a) Compare methods of obtaining speed regulation of three-phase induction motor generally used in tankers by means of: (16)

- i. Rotor resistance.
- ii. Cascade system.
- iii. Pole-changing.

Give examples where each system may be employed with advantage.

**2023/SEP/Q1** **2023/DEC/Q1**

[Click Here to See the Answer](#)

Q2. Tank liquid level sensors are an integral part of ships. Describe with the aid of suitable sketches the working principle of:

- (a) Capacitive type level sensor (6)
- (b) Ultrasonic level sensor (5)
- (c) Float (5)

**2021/DEC/Q1** **2023/OCT/Q2** **2023/DEC/Q2**

[Click Here to See the Answer](#)

Q3. With reference to squirrel cage, induction, electric motors:

- A. Describe the construction of such a motor. (6)
- B. Sketch the torque against speed curve of such a motor. (5)
- C. Describe a method employed by a retrofitted device used to improve the part load performance of an induction motor. (5)

**2023/DEC/Q3**

[Click Here to See the Answer](#)

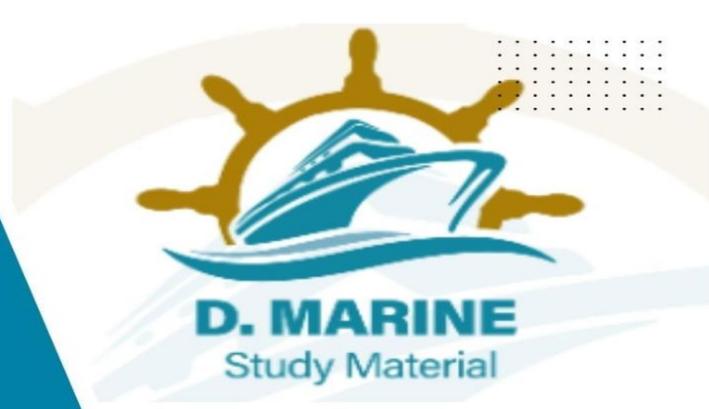
## SECTION - II

Q4. a) Explain the significance of the root mean square value of an alternating current or voltage wave form; Define the form factor of such a wave form. (6)

b) A 72 KVA transformer supplies a heating and lighting load of 12 kW at unity power factor and a motor load of 70 KVA at 0.766 (lagging) power factor. Calculate the minimum rating of the power-factor improvement capacitors which must be connected in the circuit to ensure that the transformer does not become overloaded (10)



www.dmarinestudy.com



**2023/DEC/Q4**

[Click Here to See the Answer](#)

Q5. a) Show how the power that is transferred across the air gap of the three-phase induction motor is represented. Explain the terms. What portion of this is useful power? (6)

b) A 440V shunt motor takes an armature current of 30A at 700 rev/min. The armature resistance is 0.7 Ohm. If the flux is suddenly reduced 20 percent, to what value will the armature current rise momentarily? Assuming unchanged resisting torque to motion, what will be the new steady values of speed and armature current? Sketch graphs showing armature current and speed as functions of time during the transition from initial to final, steady-state conditions. (10)

**2023/DEC/Q5**

[Click Here to See the Answer](#)

Q6. (a) What are the factors which determine the synchronous speed of a motor? (6)

(b) A three-phase induction motor is wound for four poles and is supplied from a 50 Hz System, Calculate:

(i) The synchronous speed

(ii) The speed of the rotor when the slip is 4 percent

(iii) The rotor frequency when the speed of the rotor is 600 r/min. (10)

**2023/DEC/Q6**

[Click Here to See the Answer](#)

### SECTION - III

Q7. With reference to the Maritime Labour Convention (MLC) 2006. Discuss the requirements for seafarers regarding: -

a) Minimum age to work onboard vessels (5)

b) Seafarers Employment agreements (5)

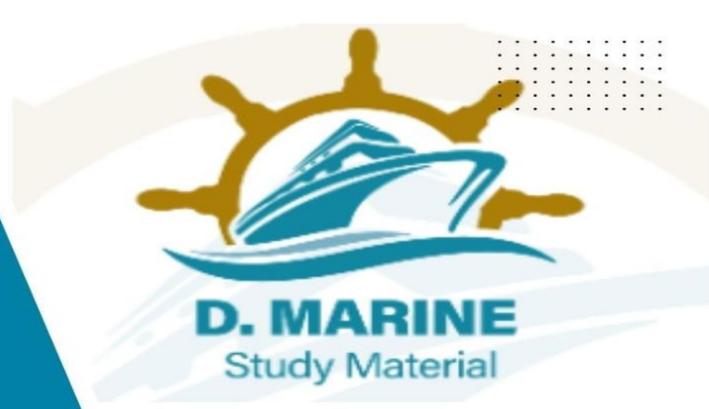
c) Hours of work and hours of rest. (6)

**2022/AUG/Q8** **2023/AUG/Q9** **2023/DEC/Q7**

[Click Here to See the Answer](#)



www.dmarinestudy.com



Q8. With reference to entry into enclosed spaces onboard:

- a) Define “Enclosed space” and give example of enclosed spaces onboard (6)
- b) Describe the checks done for testing the atmosphere inside such enclosed spaces. (5)
- c) Explain safety precautions taken prior to entry into enclosed spaces onboard vessel. (5)

2019/APR/Q7	2019/JUN/Q8	2019/JUL/Q8	2019/SEP/Q8
2019/OCT1/Q7	2020/MAR/Q7	2021/JAN/Q8	2021/MAR/Q7
2021/APR2/Q8	2021/OCT/Q7	2021/NOV/Q7	2021/DEC/Q9
2022/JAN/Q9	2022/FEB/Q9	2022/APR/Q7	2022/JUN/Q7
2023/DEC/Q8			

[Click Here to See the Answer](#)

Q9. With reference to free fall lifeboat of an ocean-going ships:

- a) Periodical maintenance, tests and checks on lifeboat and releasing gear. (6)
- b) Secondary means of lowering. (5)
- c) Lifeboat Drills. (5)

2023/SEP/Q8	2023/DEC/Q9
-------------	-------------

[Click Here to See the Answer](#)