D. MARINE
Study Material

ELECTRO TECHNICAL OFFICER : WRITTEN

FOR INDIAN COMPETENCY EXAM

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D. MARINE
Study Material

JAN 2025

1. Sketch and describe a main engine shaft driven generator arrangement with an electronic system for frequency correction. (16)
Click Here to See the Answer

2. State the applications of the synchronous motors. Discuss how a synchronous motor can function as a synchronous capacitor. Compare synchronous motors with induction motor drives.
Click Here to See the Answer

3.a) Explain three methods of overcurrent protection for electrical circuit.
b) Explain with aid of diagram, the meaning of the term inverse current time characteristic.
Click Here to See the Answer

SECTION II

4. With respect to Alternators onboard:
a) Briefly explain True Power, Apparent Power and Power Factor?
b) The alternator is rated for 750 KVA at 0.85 PF. What is the maximum load (Kilo Watt) that can be put on it? Would you be overloading the alternator if the Kilowatt reading were now 620 KW and the power factor 0.80?
Click Here to See the Answer

5. Explain with the help of a neat diagram the operation of a Brushless alternator. What would likely happen if one of the rotating Diodes fails and becomes:
(a) An open circuit?
(b) A Short Circuit?
Click Here to See the Answer

6. With Reference to 3-phase Transformers:
a) Discuss the essential and desirable conditions to be fulfil for operating two three-phase transformers in parallel.

b) What are the advantages of transformer bank of three 1-phase transformers over a unit three phase transformer of the same kVA rating? (5)
c)In a 25kW, 3300/233V, 1-phase transformer the iron and full load copper losses are 350 watts and 400 watts respectively. Calculate the efficiency at half load, 0.8 p. With Refererice to Maritime Labour Convention (MLC) answer the following. -
Click Here to See the Answer

7a) Explain the structure of the convention with titles.
b) Briefly, discuss DMLC Part I and Part II covering welfare measures for seafarers.
Click Here to See the Answer

8. Explain how PSC is different from FSC? Discuss Clear Grounds under SOLAS, MARPOL and the STCW with examples.
Click Here to See the Answer

9. Discuss the following with respect to International Safety Management (ISM) Code:
a) Emergency preparedness, drills & training.
b) Reporting of near miss, non-conformities, accidents/incidents, and hazardous occurrences.
c)Risk assessment Identification of critical equipment, tests, and minimum spares requirement.
Click Here to See the Answer

FEB – 2025

1. a) State essential electrical services on board that are able to be operable under fire conditions.
b) Explain how electric cables for the essential services in part (a) pass through bulkheads whilst maintaining gas tight and watertight integrity.
c) State the requirements for the cables which supply electrically driven emergency fire pumps
Click Here to See the Answer

2.a) Sketch a circuit diagram of a push button direct online contactor starter for a three phase Incorporating overload and short circuit protection
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.
Click Here to See the Answer

3. Differentiate between half and full wave rectification. State where half wave rectification may be used and the purpose for which it is not weli adapted. Sketch a bridge connection by which full wave rectification may be obtained..
Click Here to See the Answer

SECTION II

4.a) Explain the potential hazards if liquid-cooled transformers are used.
b) What are the losses in transformers? Mention the various factors which affect these losses. C) in a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. losses are respectively 350 and 400 watts. Calculate the efficiency at half-full load, 0.8 power factor.
Click Here to See the Answer

5.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?
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.
Click Here to See the Answer

6.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.
b) Three batteries A, B, and C have their negetive 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, ,, ,, ,, 0.2 ohm
Battery C 95 V, ,, ,, ,, 0.25 ohm
Determine the current values in the two resistors and the power dissipated by them.
Click Here to See the Answer

7. With respect to MARPOL 73/78, Annex II, Noxious liquid chemicals are divided into categories;
a). State the number of categories, and what does each category signify.
b) State the requirement of Procedures and Arrangements Manual, and what information is available.
Click Here to See the Answer

8. With reference to free fall lifeboat of an ocean-going ships:
a) Periodical maintenance, tests and checks on lifeboat and releasing gear.
b) Secondary means of lowering.
c) Lifeboat Drills.
Click Here to See the Answer

9. Briefly discuss the following with respect to safety of navigation:
a) Bridge Navigation Watchkeeping Alarm System (BNWAS)
b) Long Range Identification and Tracking of ships (LRIT)
c) Voyage Simplified Voyage Recorder (VDR/S-VDR)
Click Here to See the Answer

MARCH – 2025

SECTION-I

1. a) What precautions must be taken when testing the insulation of

generator cables and wiring connected to an AVR unit?
b) How could you monitor the correct instant for synchronising, if synchroscope and synchronising lamps are not working?
c) How is the air gap of an alternator measured and why the air gap of an alternator to be checked periodically?
Click Here to See the Answer

2. a) Explain with the aid of a diagram, a controller utilizing proportional plus integral action.
b) List out the Advantages and Disadvantages of electric propulsion system
c) Explain briefly what you know about "Pulse Width Modulation" and how it can be applied for propulsion control.
Click Here to See the Answer

3. With Respect to PLC's used onboard ships:
a) Draw and explain the block diagram of a PLC.
b) Name the onboard ship equipment where PLC's are used.
c) What are the advantages of PLC controllers over other type of controllers?
Click Here to See the Answer

SECTION II

4.a) What design factor limits the maximum torque of a d-c motor?
b) A shunt motor runs on no load at 700 r/min off a 440 V supply. The resistance of the shunt circuit is 24012. 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
Flux per pole (mWb) 6.0 8.0 9.4 10.2 10.5 11.2 11.5
Calculate the additional resistance required in the shunt circuit to raise the no-load speed to 1000 r/min
2024/NOV/04 2023/JAN/04 2025/MAR/04
Click Here to See the Answer

5. a) On what factors does the capacitance of a parallel - plate capacitor depend?
b) A tuned circuit consisting of a coil having an inductance of 200μ H and a resistance of 20Ω in parallel with a variable capacitor is connected in series

with a resistor of 8000Ω across a 60 V 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.
c) The current in each branch.
Click Here to See the Answer

6.a) The capacitor - start induction run motor has a much higher starting torque than the resistance split-phase motor. Explain.
b) An 8-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
Click Here to See the Answer

SECTION-III

7. With reference to port State control
a) List the certificates and documents which a Port State Control Officer (PSCO) may like to see during inspection.
b) List the Life Saving Appliances and Fire Fighting Equipment which are likely to be inspected by PSCO.
Click Here to See the Answer

8. Explain the following with respect to MARPOL Annex-l
a) Pump room bottom protection.
b) Intact stability of oil tankers.
c) Subdivision and damage stability of oil tankers.
Click Here to See the Answer

9. With reference to MLC answer the following
a) Briefly discuss DMLC Part I and Part II covering the welfare points for seafarers.

b) Briefly discuss the grievance redressal mechanism for seafarers of Indian flagged vessel.
Click Here to See the Answer

APRIL – 2025

1. Explain the matching of an induction electric motor to a pump required for main circulating duty, with the aid of pump characteristic and torque/ship diagrams.
Click Here to See the Answer

2. a) Explain the term power factor correction
b) State advantages of PF correction
c) Explain, with the aid of a circuit diagram, how power factor correction can be affected using capacitors in a 3-phase circuit
d)state one method, other than the use of capacitors, by which power factor correction can be affected
Click Here to See the Answer

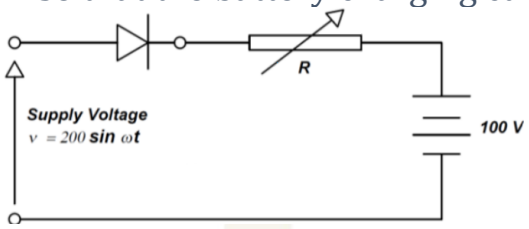
3. What is soft starting of an Induction Motor? Describe with a circuit using thyristors used for soft starting Discuss its advantages and disadvantages.
Click Here to See the Answer

SECTION II

4.a) Explain the significance of the root-mean-square value of an alternating current or voltage waveform. Define the form factor of such a wave form.
b) A total load of 8000 kW at 0.8 power factor is supplied by two alternators in parallel. One alternator supplies 6000kW at 0.9 power factor. Find the kVA rating of the other alternator and the power factor
Click Here to See the Answer

5.a) By means of a schematic circuit diagram illustrate the peak rectifier. If the supply voltage is v(t) = V Sin wt, what is the voltage across the load resistor?

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



6.a) What is back emf? Derive the relation for the back emf and the supplied voltage in terms of armature resistance.
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 %
(iii) The rotor frequency when the speed of the rotor is 600 r/min.
Click Here to See the Answer

SECTION-III

7. Explain the cargo hold fire detection system used on ships. Discuss the maintenance procedures for this system and outline the steps taken when a fire is detected in the cargo hold.
Click Here to See the Answer

8. Discuss the following with respect to international safety Management (ISM) Code
a) Management Review and its agenda
b) Functional requirement and objectives of code.
c) Master responsibility and Authority.
d) Certification and periodical verification.
Click Here to See the Answer

9. With reference to free fall lifeboat of an ocean-going ship:
a) Periodical maintenance, tests and checks on lifeboat and releasing gear

b) Secondary means of lowering
c) Lifeboat Drills.
Click Here to See the Answer

JUNE-2025

1. What are semiconductor devices? What are its advantages over Thermionic devices? With respect to semiconductor devices describe working principle and application of the following:
(a) Zener Diode,
(b) Transistor,
(c) Photocell, (d) Thyristor.
JUNE/2024 / Q1
Click Here to See the Answer

2.Diesel electric propulsion is now being chosen as the power plant for an increasingly wide variety of vessels.
a. Sketch a simple layout of such an installation.
b. Explain the advantages of selecting such a plant.
JUNE/2024 /02
Click Here to See the Answer
3. With reference to an emergency source of electrical power in cargo ships:
a) Describe a typical Emergency power source.
b) Give a typical list of essential services, which must be supplied simultaneously.
Explain how the emergency installation can be periodically tested.
JUNE/2024 /Q3
Click Here to See the Answer

SECTION II

4. With Respect to circuit breakers:
a) Compare the effectiveness of a current limiting circuit breaker with that of a HRC fuse.
b) A coil having a resistance of 10 ohm and an inductance of 0.15 H

is connected in series with a capacitor across a 100 V, 50 Hz supply. If the current and the voltage are in phase what will be the value of the current in the circuit and the voltage drop across the coil?
June/2024 /4
Click Here to See the Answer

5. With reference to three phase induction motors:
a) Explain the phenomenon of crawling and cogging in these motors.
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 per cent
iii. The rotor frequency when the speed of the rotor is 600 r/min.
JUNE/2024 / Q5
Click Here to See the Answer

6.a) Describe the working of a single phase full-wave rectifier with A resistive load. Draw the load voltage and current waveforms
b) Diode half-wave rectifier supplies a resistive load of 1000 from a 100V acr.m.s voltage source. The diode is a resistance of 5Ω during Conduction state. Calculate
i) The DC output voltage
ii) DC average load current.
Click Here to See the Answer

SECTION-III

7. With Reference to entry into enclosed spaces onboard:
a. Define "Enclosed Space" and give examples of enclosed spaces onboard.
b. Describe the checks done for testing the atmosphere inside enclosed spaces.
c. Explain safety precautions taken prior to entry into enclosed spaces onboard vessel.

Click Here to See the Answer

8. Briefly discuss the following with respect to safety of navigation:
a. Bridge Navigational watchkeeping Alarm System (BNWAS).
b. long range identification and tracking of ships (LRIT).
c. Voyage simplified voyage recorder (VDR/S VDR)
Click Here to See the Answer

9. With reference to MARPOL Annex IV:
a. Draw a biological sewage treatment plant and explain the principle of operation.
b. Periodical maintenance and checks tests required to be done to verify the effectiveness of the above system.
Nov – 2024 – Q7 Mar – 2024 - Q9
Click Here to See the Answer

JULY – 2025

1.a) State essential electrical services on board that are able to be operable under fire conditions.
b) Explain how electric cables for the essential services in part (a) pass through bulkheads whilst maintaining gas tight and watertight integrity.
c) State the requirements for the cables which supply electrically driven emergency fire pumps
FEB /2025/01
Click Here to See the Answer

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

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.

FEB /2023

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3) Differentiate between half and full wave rectification. State where half wave rectification may be used and the purpose for which it is not well adapted. Sketch a bridge connection by which full wave rectification may be obtained.

FEB/2025/03

Click Here to See the Answer

SECTION II

4.a) What design factor limits the maximum torque of a d-c motor?

b) A shunt motor runs on no load at 700 r/min off a 440 V supply. The resistance of the shunt circuit is 2402. 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
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 1000 r/min

2025/MAR/Q4 2025/JUL/Q4

Click Here to See the Answer

5.a) On what factors does the capacitance of a parallel plate capacitor depend?

b) A tuned circuit consisting of a coil having an inductance of 200μ H and a resistance of 202 in parallel with a variable capacitor is connected in series with a resistor of 8000Ω across a 60 V 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.

c)The current in each branch

Click Here to See the Answer

6. a) The capacitor start induction run motor has a much higher starting torque than the resistance split- phase motor. Explain.
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
2024/NOV/Q6 2025/MAR/Q6
Click Here to See the Answer

SECTION – III

7) Explain the cargo hold fire detection system used on ships. Discuss the maintenance procedures for this system and outline the steps taken when a fire is detected in the cargo hold.
2025/APR/Q7
Click Here to See the Answer

8) Discuss the following with respect to international safety Management (ISM) Code:
a) Management Review and its agenda.
b) Functional requirement and objectives of code.
c) Master responsibility and Authority.
d) Certification and periodical verification.
Click Here to See the Answer

9) Briefly discuss the following with respect to safety of navigation:
a) Bridge Navigation Watchkeeping Alarm System (BNWAS)
b) Long Range Identification and Tracking of ships (1.RIT)
c) Voyage Simplified Voyage Recorder (VDR/S-VDR)
2025/FEB/Q9 2025/JUN/Q8
Click Here to See the Answer

AUG-2025

Q1. Discuss the fundamental principles and advantages of electrical propulsion systems in merchant
vessels compared to conventional mechanical propulsion. What are some of the components that make
up an electrical propulsion system? (16)
2025/AUG/01
Click Here to See the Answer

Q2. What are the primary objectives of regular marine electrical surveys, and which specific electrical
components or systems are typically scrutinized during such inspections to ensure compliance and
operational safety? (16)
2025/AUG/02
Click Here to See the Answer

Q3.a) Explain three methods of overcurrent protection for electrical circuit. (8)
b) Explain with aid of diagram, the meaning of the term inverse current time characteristic (8)
Click Here to See the Answer

Q4. With respect to Alternators onboard:
a) Briefly explain true power, Apparent power and power factor? (8)
b) The alternator is rated for 750 KVA at 0.85 PF, what is the maximum load (Kilo Watt) that can be put on it? Would you be overloading the alternator if the Kilowatt reading were now 620 kW and the power factor 0.80? (8)
2021/APR/04 **2021/JUL/05** **2022/JAN/06** **2022/APR/06**
2022/JUN/06 **2025/JAN/04** **2019/AUG/04** **2025/AUG/04**
Click Here to See the Answer

Q5. Explain with the help of a neat diagram the operation of a Brushless alternator. What would likely happen if one of the rotating Diode fails and becomes: (16)
a) An open circuit?
b) A short circuit?
2020/DEC/04 **2021/NOV/02** **2025/JAN/05** **2025/AUG/05**
Click Here to See the Answer

Q6. With Reference to 3-phase Transformers:
a) Discuss the essential and desirable conditions to be fulfil for operating two three-phase transformers in parallel. (5)
b) What are the advantages of transformer bank of three single-phase transformers over a unit three phase transformer of the same kVA rating? (5)
c) In a 25 kW, 3300/233V, 1-phase transformer the iron and full load copper losses are 350 watts and 400 watts respectively. Calculate the efficiency at half load 0.8 P. F (6)
Click Here to See the Answer

Q7. With Reference to Maritime Labor Convention (MLC) answer the following:
a) Explain the structure of the convention with titles. (10)
b) Briefly, discuss DMLC Part I and Part II covering welfare measures for seafarers. (8)
2025/JAN/07 **2025/AUG/07**
Click Here to See the Answer

Q8. With reference to free fall lifeboat of an ocean-going ship:
a) Periodical maintenance, tests and checks on lifeboat and releasing gear. (6)
b) Secondary means of lowering. (5)
c) Lifeboat Drills. (5)
2022/FEB/02 **2022/APR/02** **2023/AUG/06** **2024/APR/07** **2025/AUG/06**
Click Here to See the Answer

Q9. Discuss the following with respect to International Safety Management (ISM) code:
A. Emergency preparedness, drills and training. (6)
B. Reporting of near miss, non-conformities, accidents/incidents and hazardous occurrences. (5)
C. Risk assessment, Identification of critical equipment, tests and minimum spares requirement. (5)
Click Here to See the Answer

SEP-2025

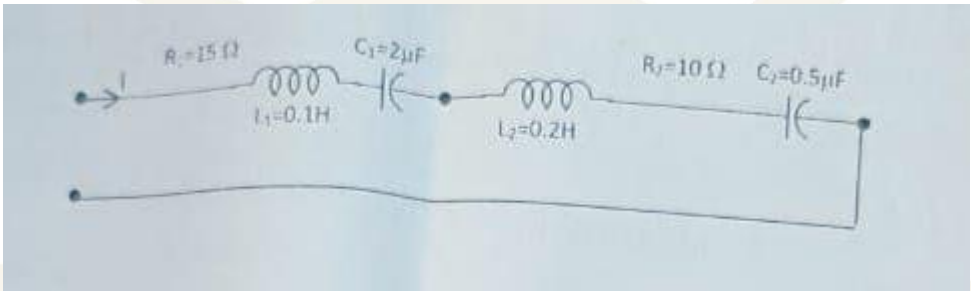
Q1. Under what conditions can you produce sustained oscillations? Classify oscillations with respect to frequency range, principle involved, etc. It is possible to produce oscillations with RC networks in phase shift oscillator. Discuss in detail. (16) - - - PREVIOUSLY ASKED - - - What are the condition for producing 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 2024/JAN/Q2 2024/NOV/Q2 2025/SEP/Q1
Click Here to See the Answer

Q2. List the 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)
2024/APR/Q1 2025/SEP/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 2025/SEP/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. (10)
2021/MAR/Q6 2021/SEP/Q6 2023/APR/Q4 2023/OCT/Q4 2025/SEP/Q4
Click Here to See the Answer

Q5. (a) Sketch an arrangement showing the principal of a proportional plus Integral (P + I) control loop. (6) (b) Compare the series and parallel resonance circuits. Find the frequency at which the following circuit resonates. (10)



2023/APR/Q5 2023/SEP/Q4 2024/APR/Q6 2025/SEP/Q5
Click Here to See the Answer

Q6. a) Explain the potential hazards if liquid-cooled transformers are used. (6) b) What are the losses in transformers? Mention the various factors which affect these losses. In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 Watts. 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 2024/JUL/Q4 2024/OCT/Q4 2025/FEB/Q4 2025/SEP/Q6
Click Here to See the Answer

SECTION – II

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 readings are: i) Localised to a particular area of engine operation ii) General to the engine room (7) 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 (7) c) Explain the procedure you, as Second Engineer, would adopt in order to locate and rectify a general fault in the UMS system. (6)
2023/APR/Q7 2025/SEP/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. (7) b) What are the provisions for engine room under MARPOL 73/78 Annex -1, for large ocean-going vessel? (7) c) What is IBC Code and what Certificates are issued under the Code and to which ship? (6)
2023/APR/Q8 2025/SEP/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) c) State the sources of water available. (2) d) Describe the sprinkler head and its operation. (3) e) State how the temperature rating of the sprinkler head is determined. (3)
2022/SEP/Q8 2023/APR/Q9 2025/SEP/Q9
Click Here to See the Answer

OCT-2025

1.Briefly explain the Principle of Operation of Induction Motors. (4)
a. What is Slip for an induction motor? (4)
b. Draw a simple ladder logic diagram of star delta starting of an Induction motor (8)
2025/MAR/01 **2025/JUN/05**
Click Here to See the Answer

2. Explain three methods of overcurrent protection for electrical circuit. Explain with aid of diagram, the meaning of the term inverse current time characteristic.
Click Here to See the Answer

3. What are semiconductor devices? What are its advantages over thermionic devices? With respect to semiconductor devices describe working principle and application of the following:
(a) Zener Diode,
(b) Transistor,
(c) Photocell,
(d) Thyristor. (16)
2022/APR/03 **2022/JUN/03** **2023/OCT/01** **2024/JUN/01** **2025/JUN/01**
Click Here to See the Answer

SECTION II

4. With Respect to circuit breakers:
a) Compare the effectiveness of a current limiting circuit breaker with that of a HRC fuse (6)
b) A coil having a resistance of 10 ohm and an inductance of 0.15 H is connected in series with a capacitor across a 100 V, 50 Hz supply. If the current and the voltage are in phase what will be the value of the current in the circuit and the voltage drop across the coil? (10
Click Here to See the Answer

5. With reference to three phase induction motors:
a) Explain the phenomenon of crawling and cogging in these motors. (6)
b) A three-phase induction motor is wound for four poles and is supplied from a 50 Hz system. Calculate: (10)
i. The synchronous speed
ii. The speed of the rotor when the slip is 4 per cent
iii. The rotor frequency when the speed of the rotor is 600 r/min.
2024/JUN/05 **2025/JUN/05**

Click Here to See the Answer

6.a) Describe the working of a single phase full-wave rectifier with a resistive load. Draw the load voltage and current waveforms. (8)
b) Diode half-wave rectifier supplies a resistive load of 100Ω from a 100V acr.m.s voltage source. The diode is a resistance of 5Ω during conduction state. Calculate i) The DC output voltage ii) DC average load current. (8)
Click Here to See the Answer

SECTION-III

7.a) Discuss the rights and expectations of seafarers in relation to occupational safety as per Maritime Labor Convention. (8)
b) What are the steps taken to reduce discrimination among seafarers due to differences in age, gender, language, nationality, and culture. (8)
Click Here to See the Answer

8. With reference to a lifeboat gravity davit arrangement:
a) Sketch the arrangement showing the lifeboat both in the housed position and at its maximum point of outboard travel. (8)
b). Describe the lowering and hoisting of lifeboat stating the safety features and the requirements as per SOLAS
2024/SEP/08
Click Here to See the Answer

9. 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 tests required to be done to verify the effectiveness of the above system.
2021/JAN/07 **2021/MAR/09** **2021/JUL/16** **2021/DEC/07**
2022/JUL/08 **2023/NOV/07** **2024/MAR/09** **2025/JUN/09**
Click Here to See the Answer

NOV-2025

1. a) Describe any two methods of determining the voltage regulation of 3-phase alternator (8)
b) Two alternators are connected in paralel, what happens when we increase the excitation of one machine (8)
Click Here to See the Answer

2. a) Draw circuit diagram and explain wording of star/delta starter (8)
b) Explain with diagram how direction of single-phase induction motor is reversed
(8)
Click Here to See the Answer

3. With reference to the provision of a shore electrical supply to a ship
a) Sketch an arrangement for taking AC. there supply and checks to be carried out prior Taking shore connection? (3)
b) Describe the method of safely connecting the arrangement sketched in (A) to the shore Supply? (8)
2023/APR/03 **2023/JUN/03** **2025/SEP/03** **2025/NOV/03**
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SECTION II

4.a) Explain the significance of the root-mean-square value of an alternating current or voltage waveform. Define the form factor of such a wave form. (6)
b) A total load of 8000 kW at 0.8 power factor is supplied by two alternators in parallel, one alternator supplies 6000kW at 0.9 power factor Find the kVA rating of the other alternator and the power factor.
2025/APR/04
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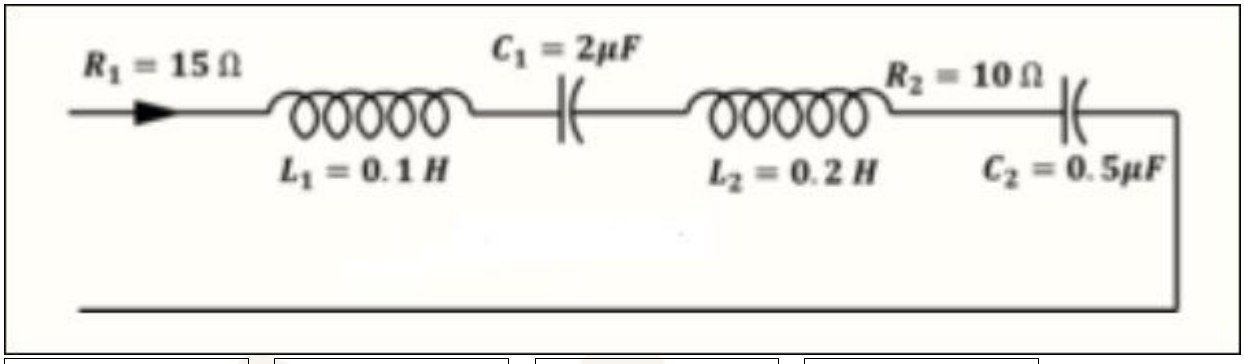
Q5. (a) Sketch an arrangement showing the principal of a proportional plus Integral (P + I) control loop. (6)

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



2023/APR/05 **2023/SEP/04** **2024/APR/06** **2025/SEP/05** **2025/NOV/05**

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Q6. a) Explain the potential hazards if liquid-cooled transformers are used. (6)
b) What are the losses in transformers? Mention the various factors which affect these losses. In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 Watts. Calculate the efficiency at half-full load 0.8 power factor. (10)

2023/FEB/04 **2023/APR/06** **2023/JUL/04** **2023/SEP/05** **2023/NOV/05** **2024/JUL/04** **2024/OCT/04** **2025/FEB/04** **2025/SEP/06** **2025/NOV/06**

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SECTION-III

7. a) Define "Enclosed Space and give examples of med spaces orboard (4)
b) Describe hazards relating to entry into enclose spices onboard
c) Explain salfety precautions taken prior to entry enclosed spaces orboard vessel.

Click Here to See the Answer

8.(a) How will you fighe a fire in a galley you at least restrict the fire if you are the first person to sight the fire in the galles (B)
(b) Describe the procedure to be adopted personnel in a smoke-filled accommodation area
Click Here to See the Answer

9. With reference to an automatic water sprinkler acting alam and extinguishing system for accommodation spaces
all Sketch a typical system
b Describe the operation of this system (4)
c) State the sources of water available (2)
d) Describe the sprinkler head and its speration
e) State how the temperature rating of the some had determined.
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DEC-2025

1. Diesel electric propulsion is now being chosen as the power plant for an increasingly wide variety of vessels.Sketch a simple layout of such an installation.
Explain the advantages of selecting such a plant.
2022/APR/02 **2023/NOV/01** **2024/JUN/02** **2025/JUN/02**
Click Here to See the Answer

2. With reference to an emergency source of electrical power in cargo ships: Describe a typical power source. by Give a typical list of essential services, which must be supplied simultaneously
Explain how the emergency installation can be periodically tested (8)
2021/MAR/01 **2023/NOV/02** **2024/JUN/03** **2025/JUN/03**
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3. What are semiconductor devices? What are its advantages over thermionic devices? With respect to semiconductor devices describe working principle and application of the following
(a) Zener Diode,

(b) Transistor,
(c) Photocell, (16)
(d) Thyristor
2022/APR/03 **2022/JUN/03** **2023/OCT/01** **2024/JUN/01** – **2025/JUN/01** **2025/OCT/03**
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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/04
Click Here to See the Answer

5) Explain the potential hazards if liquid-cooled transformers are used.
by What are the losses in transformers? Mention the various factors which affect these losses, 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)
Click Here to See the Answer

6. a) Explain the effect of making incorrect phase and starter connections (6)
b) A 440V shunt motor takes an armature current of 30A at 700 rev/min. The armature resistance is 0. 7ohm 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/06

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SECTION-III

7. With reference to MARPOL Annex IV
a) Draw a biological sewage treatment plant and explain the principal of operation (8)
b) by Periodical maintenance and checks and tests required to be done to verify the effectiveness of the above system.
2021/JAN/07 **2021/MAR/09** **2021/JUL/16** **2021/DEC/07** **2022/JUL/08** **2023/NOV/07** **2024/MAR/09** **2025/JUN/09** **2025/OCT/09**
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8.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
b) State how the spread of fire may be reduced by the method used for installing electric cables.
2023/NOV/08
Click Here to See the Answer

9.With reference to "ISM Code write short notes on
a) Masters Review
b) Requirement and Advantages of Familiarization of seafarer on-board
c). Designated Person Ashore (DPA)
d) Functional requirements for a Safety Management System.
2023/NOV/09 **2022/AUG/09**
Click Here to See the Answer