D. MARINE
Study Material

MEO CLASS 4 WRITTEN: MET

(MARINE ELECTRO TECNOLOGY)

FOR INDIAN COMPETENCY EXAM

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Study Material

JANUARY – 2024

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)
2024/JAN/Q1
Click Here to See the Answer

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)
2024/JAN/Q2
Click Here to See the Answer

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)
2024/JAN/Q3
Click Here to See the Answer

Q4. a) Shunt generators having drooping characteristics are best suited for parallel operation. Discuss.
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 on-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)
2024/JAN/Q4
Click Here to See the Answer

Q5. a) Briefly explain static induction and dynamic induction.
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)
2024/JAN/Q5
Click Here to See the Answer

Q6. a) Explain how excitation of the rotor is produced and supplied. (6)
b) A shunt motor has an armature resistance of 0.2 ohms and with an armature current of 120 amperes runs at 750 r.p.m. off a 400-volts supply. Calculate the speed and armature current of the motor if the
flux per pole is reduced to 75 per cent of its initial value, the total torque remaining unaltered. (10)
2024/JAN/Q6
Click Here to See the Answer

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) State the advantages and disadvantages of the lamps-bright system over lamps-darks system. (4)
2024/JAN/Q7
Click Here to See the Answer

Q8. With reference to a three-phase shipboard electrical distribution system.
a) Enumerate the advantages of an insulated neutral system (4)
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. (4)
2023/JUL/Q5 **2024/JAN/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 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)
2024/JAN/Q9
Click Here to See the Answer

FEBRUARY – 2024

Q1. (a) With reference to single phasing applied to a.c. motors: (8)
(i) Explain the meaning of single phasing
(ii) Describe its effect
(iii) State the most common cause of single phasing.
(b) Sketch a simple diagram of a direct on line starter, showing in detail the overload and single phase protection trip. (8)
2024/FEB/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)
2024/FEB/Q2
Click Here to See the Answer

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/JUN/Q3 **2024/FEB/Q3**
Click Here to See the Answer

Q4. With the aid of a circuit diagram, explain how a Galvanometer can be used as an Ammeter. (16)
2023/NOV/Q2 **2024/FEB/Q4**
Click Here to See the Answer

Q5. With the aid of a simple circuit diagram, explain the electrical distribution system for essential loads
on board a cargo ship. (16)
2024/FEB/Q5
Click Here to See the Answer

Q6. (a) Explain Kirchoff's current law (6)
(b) In the given circuit, find the current value 12 (10)
2024/FEB/Q6
Click Here to See the Answer

Q7. (a) Compare constant current method and constant voltage method of charging batteries. (6)
(b) A 24V emergency battery is to be charged from the 110V ship's mains when the e.m.f. per cell has fallen to a minimum value of 1.8V. The battery consists of 12 cells in series, has a capacity of 100 Ahr at a 10-hr rate and the internal resistance is 0.03Ω/cell. If charging continues until the voltage per cell rises to 2.2V, find the value of the variable resistor needed to control the charging. The charging current can be assumed to be equal to the maximum allowable discharge current
2024/FEB/Q7
Click Here to See the Answer

Q8. (a) Define work, Power and Efficiency (6)
(b) A shunt motor has an armature resistance of 0.2 ohms and with an armature current of 120 amperes runs at 750 r.p.m. off a 400-volt supply. Calculate the speed and armature current of the motor if the flux per pole is reduced to 75 per cent of its initial value, the total torque remaining unaltered. (10)
2024/FEB/Q8
Click Here to See the Answer

Q9. (a) Explain what is meant by phase difference between voltage and current values. (6)
(b) An inductance coil has a resistance of 19.5Ω and when connected to a 220V, 50Hz supply, the current passing is 10A. Find the inductance of the coil. (10)
2024/FEB/Q9
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MARCH – 2024

Q1. (a) With the aid of a circuit diagram explain the working of Bridge rectifier. (8)
(b) Compare the performance of Bridge rectifier with Full wave and Half wave rectifier. (8)
2023/MAY2/Q1 **2024/MAR/Q1**
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Q2. (a) Explain, with the aid of a sketch, the principle of operation of an earth leakage detection system.
(b) Explain why an insulated neutral system is used extensively on-board ships. (4)
(c) State, with reasons, why a single earth fault on an insulated neutral system should always be cleared as soon as possible (4)
2024/MAR/Q2
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Q3. (a) State FIVE essential electrical services that should be operable under fire conditions. (8)
(b) Explain how electric cables for the essential services in part (a) pass through bulkheads whilst maintaining gas tight and watertight integrity. (4)
(c) State the requirements for the cables which supply electrically driven emergency fire pumps. (4)
2024/MAR/Q3
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Q4. (a) Name at least three types of temperature sensing devices for remote indication. (4)
(b) Explain the working of a Thermocouple type temperature sensor. (8)
(c) What are various materials used in a thermocouple? (4)
2023/MAY2/Q4 **2024/MAR/Q4**
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Q5. (a) What are the hazards associated with batteries? (4)
(b) What safety precautions are to be taken while operating and maintaining the batteries including in battery room. (6)
(c) What are the safety arrangements seen in the Battery room of a ship?
2024/MAR/Q5
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Q6. (a) How does a moving coil ammeter measure large current (6)
(b) A moving coil instrument with a coil resistance of 1.98Ω, produces full scale deflection from a current
of 10mA. Determine the value of shunt required to extend the range up to 10A. (10)
2023/MAY2/Q6 **2024/MAR/Q6**
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Q7. (a) Explain power factor with a.c. Sine wave and phasor diagram. (6)
(b) A circuit has a resistance value of 25Ω and an inductance value of 0.3H. If it is connected to a 230V,
50Hz supply, find the circuit current, the power factor and the power dissipation. (10)
2023/MAY2/Q8 **2024/MAR/Q7**
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Q8. (a) Compare Direct current with Alternating current. (6)
(b) A four-pole generator has a flux of 12 mWb/pole. Calculate the value of e.m.f. generated in one of the armature conductors, if the armature is driven at 900 rev/min. (10)
2023/MAY2/Q9 **2024/MAR/Q8**
Click Here to See the Answer

Q9. (a) Shunt generators having drooping characteristics are best suited for parallel operation. Discuss
(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 220 V 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)

2024/JAN/Q4 **2024/MAR/Q9**

Click Here to See the Answer

APRIL – 2024

Q1. (a) Explain the term single phasing as applied to poly phase induction motors. (4)
(b) State the likely causes of single phasing and the consequences if motors are not adequately
protected. (4)
(c) Describe with the aid of sketches THREE methods for motor protection should single phasing occur.
2023/JUL/Q1 **2024/APR1/Q1**
Click Here to See the Answer

Q2. With reference to a three-phase shipboard electrical distribution system:
(a) Enumerate the advantages of an insulated neutral system (4)
(b) Enumerate the disadvantages of an insulated neutral system (4)
(c) State why an Earthed neutral system may be earthed through a resistor
(d) Compare the use of an insulated neutral system as opposed to the use of an Earthed neutral system
with regard to the risk of electric shock from either system (4)
2024/APR1/Q2
Click Here to See the Answer

Q3. (a) Describe the principle of operation of EACH of the following detecting elements: (8)
(i) Bi-metal strips
(ii) Thermistors
(b) Explain, with the aid of sketches, typical applications where the devices described in (a) may be
employed in high voltage electrical systems. (8)
2024/APR1/Q3
Click Here to See the Answer

Q4. (a) Sketch the following types of electric motor connections: (8)

(i) A star connection
(ii) A delta connection
(b) Explain how and why star and delta connections are combined to produce a Star / Delta starter for an electric motor. (8)
2024/APR1/Q4
Click Here to See the Answer

Q5. (a) State the necessary conditions required prior to the synchronizing of electrical alternators. (6)
(b) Describe the type of cumulative damage that may be caused when alternators are incorrectly Synchronized. (6)
(c) Explain how the damage referred to in (b) can be avoided/reduced. (4)
2024/APR1/Q5
Click Here to See the Answer

Q6. (a) Explain the principle of conservation of charge and its relationship to Kirchoff's current law. (6)
(b) The open-circuit voltage of a cell as measured by a voltmeter of 100 ohm resistance, was 1.5 V, and the p.d. when supplying current to a 10 ohm resistance was 1.25 V, measured by the same voltmeter. Determine the e.m.f. and internal resistance of the cell. (10)
2024/APR1/Q6
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Q7. The loads of a 4-wire, 3-phase systems are: Red line to neutral current = 50 A, power factor of 0.707 (lagging) Yellow line to neutral current = 40 A, power factor of 0.866 (lagging) Blue line to neutral current = 40 A, power factor 0.707 (leading) Determine the value of the current in the neutral wire. (16)
2024/APR1/Q7
Click Here to See the Answer

Q8. (a) Describe the effect of running an induction motor on reduced voltage.

(b) A motor takes a current of 60 amperes at 230 volts, the power input being 12 kW. Calculate the
power component and the reactive component of the input current. (10)
2024/APR1/Q8
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Q9. (a) Describe the basic principles of self-excited generators (6)
(b) The armature resistance of a 200 V-shunt motor is 0.4 Ohms. The no load (this is the term used when the motor is running light, i.e. not loaded) armature current is 2A. When loaded and taking an armature current of 50A, the motor speed is 1200 rev/min. Find the approximate no load speed
2024/APR1/Q9
Click Here to See the Answer

MAY - 2024

Q1. (a) Sketch a circuit diagram for an automatic voltage regulator illustrating how the A.V.R. utilizes a
silicon-controlled rectifier to control the excitation system for an alternator.
(b) Describe how the A.V.R. monitors output and controls the excitation system. (6)
2024/MAY1/Q1
Click Here to See the Answer

Q2. Overcurrent protection relays are built into main alternator breakers to safeguard the individual
alternators and the distribution system against certain faults.
(a) Sketch a typical relay. (8)
(b) Describe the operation of the relay sketched in (a) (8)
2024/MAY1/Q2
Click Here to See the Answer

Q3. (a) Sketch and describe a power (watt) meter for an a.c. switchboard.
(b) State why type of load governs power factor and give examples of power factor for a resistance load and for normal marine operation. (8)
2024/MAY1/Q3
Click Here to See the Answer

Q4. Explain clearly why, in D.C. installation, a compound-wound electric generator is usually adopted for ship lighting purposes. Compare its performance with that of shunt and series wound machines. What attention does such a machine require when working and what care is necessary for its maintenance in a satisfactory condition? (16)
2023/JUL/Q2 **2024/MAY1/Q4**
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Q5. With reference to an emergency source of electrical power in cargo ships:
(a) Describe a typical power source. (6)
(b) Give a typical list of essential services, which must be supplied simultaneously. (5)
(c) Explain how the emergency installation can be periodically tested. (5)
2023/DEC/Q1 **2024/MAY1/Q5**
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Q6. (a) What are the different types of DC motors? (6)
(b) A 10 H.P. 230 V shunt motor takes an armature current of 6A from 230 V mains at no load runs at 1200 r.p.m. The armature resistance is 0.25Ω. Determine speed and electromagnetic torque when the armature takes 36 amps. with the same flux. (10)
2024/MAY1/Q6
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Q7. An amplifier has an open-circuit voltage gain of 1000, an input resistance of 2000 Ω and an output resistance of 1.0 Ω. Determine the input signal voltage required to produce an output signal current of 0.5A in a 4.0Ω resistor connected across the output terminals. If the amplifier is then used with negative series voltage feedback so that one tenth of the output signal is fed back to the input, determine the input signal voltage to supply the same output signal current. (16)
2024/MAY1/Q7
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Q8. (a) Explain how fluorescent tubes power factor is improved. (6)
(b) A fluorescent lamp taking 80W at 0.7 power factor lagging from a 230V, 50-Hz supply is to be connected to unity power factor. Determine the value of the correcting approach required. (10)
2024/MAY1/Q8
Click Here to See the Answer

Q9. (a) Explain about non-linear resistors with some examples and illustration on how they differ from linear resistor. (6)
(b) A half-wave rectifier is used to supply 50V d.c. to a resistive load of 800Ω. The diode has a resistance of 25 Ω. Calculate a.c. voltage required.
2024/MAY1/Q9
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JUNE – 2024

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)
2024/JAN/Q1 **2024/JUN/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 material? (5)
2024/JAN/Q2 **2024/JUN/Q2**
Click Here to See the Answer

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)
2024/JAN/Q3 **2024/JUN/Q3**
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Q4. (a) Shunt generators having drooping characteristics are best suited for parallel operation. Discuss.
(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 220 V 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)
2024/JAN/Q4 **2024/MAR/Q9** **2024/JUN/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 crosssectional area of 400mm2. If the current passed through the coil is 4A find: (10)
(i) The magnetising force
(ii) The total flux.
2024/JAN/Q5 **2024/JUN/Q5**
Click Here to See the Answer

Q6. (a) Explain how excitation of the rotor is produced and supplied. (6)
(b) A shunt motor has an armature resistance of 0.2 ohms and with an armature current of 120 amperes runs at 750 r.p.m. off a 400-volt supply. Calculate the speed and armature current of the motor if the flux per pole is reduced to 75 per cent of its initial value, the total torque remaining unaltered (10)
2024/JAN/Q6 **2024/JUN/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 & disadvantages of the lamps-bright system over the lamps-dark system. (4)
2024/JAN/Q7 **2024/JUL/Q7**
Click Here to See the Answer

Q8. With reference to a three-phase shipboard electrical distribution system:
(a) Enumerate the advantages of an insulated neutral system. (4)
(b) Enumerate the disadvantages of an insulated neutral system. (4)
(c) Compare the use of an insulated neutral system as opposed to the use of an Earthed neutral system with regard to the risk of electric shock from either system. (8)
2023/JUL/Q5 **2024/JAN/Q8** **2024/JUN/Q8**

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Q9. (a) Differentiate between resistance, inductance 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)
2024/JAN/Q9 **2024/JUN/Q9**
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JULY – 2024

Q1. (a) With reference to single phasing applied to a.c. motors: (8)
(i) Explain the meaning of single phasing;
(ii) Describe its effect;
(iii) State the most common cause of single phasing.
(b) Sketch a simple diagram of a direct on line starter, showing in detail the overload and single phase protection trip. (8)
2024/FEB/Q1 **2024/JUL/Q2**
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Q2. If the motor terminal markings are unknown how would you identify the start, run and common
terminal connections. (16)
2024/FEB/Q2 **2024/JUL/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/JUN/Q3 **2024/FEB/Q3** **2024/JUL/Q3**
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Q4. With the aid of a circuit diagram, explain how a Galvanometer can be used as an Ammeter. (16)
2024/FEB/Q4 **2024/JUL/Q4**
Click Here to See the Answer

Q5. With the aid of a simple circuit diagram, explain the electrical distribution system for essential loads on board a cargo ship. (16)
2024/FEB/Q5 **2024/JUL/Q5**
Click Here to See the Answer

Q6. (a) Explain Kirchoff's current law. (6)

(b) In the given circuit. find the current value I2. (10)
2024/FEB/Q6 **2024/JUL/Q6**
Click Here to See the Answer

Q7. (a) Compare constant current method and constant voltage method of charging batteries. (6)
(b) A 24V emergency battery is to be charged from the 110V ship's mains when the e.m.f. per cell has fallen to a minimum value of 1.8V. The battery consists of 12 cells in series, has a capacity of 100 Ahr at a 10 hr rate and the internal resistance is 0.03Ω/cell. If charging continues until the voltage per cell rises to 2.2V, find the value of the variable resistor needed to control the charging. The charging current can be assumed to be equal to the maximum allowable discharge current.
2024/FEB/Q7 **2024/JUL/Q7**
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Q8. (a) Define work, Power and Efficiency (6)
(b) A shunt motor has an armature resistance of 0.2 ohms and with an armature current of 120 amperes runs at 750 r.p.m. off a 400-volt supply. Calculate the speed and armature current of the motor if the flux per pole is reduced to 75 per cent of its initial value, the total torque remaining unaltered. (10)
2024/FEB/Q8 **2024/JUL/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 19.5Ω and when connected to a 220V, 50Hz supply, the current passing is 10A. Find the inductance of the coil. (10)
2024/FEB/Q9 **2024/JUL/Q9**
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AUGUST – 2024

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**
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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**
Click Here to See the Answer

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**
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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)
2024/MAY2/Q4 **2024/AUG/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)
2024/MAY2/Q5 **2024/AUG/Q5**
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Q6. (a) Describe the basic principles of 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)
2024/MAY2/Q6 **2024/AUG/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**
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Q8. (a) State the relationship between impedance, voltage and current (6)
(b) The filament of a 230V lamp takes a current of 0.261A when working at its normal temperature of
2000° C. The temperature coefficient of the tungsten filament material can be taken as 0.005 ohms/ohms at 0ºC/ºC. Find the approximate 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)
2024/MAY2/Q8 **2024/AUG/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 1Ω, calculate the value of the charging current (10)
2024/MAY2/Q9 **2024/AUG/Q9**
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SEPTEMBER – 2024

Q1. (a) With the aid of a circuit diagram explain the working of Bridge rectifier. (8)
(b) Compare the performance of Bridge rectifier with Full wave and Half wave rectifier. (8)
2023/MAY2/Q1 **2024/MAR/Q1** **2024/SEP1/Q1**
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2023/MAY2/Q8 **2024/MAR/Q7** **2024/SEP1/Q7**
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Q8. (a) Compare Direct current with Alternating current. (6) (b) A four-pole generator has a flux of 12 mWb/pole. Calculate the value of e.m.f. generated in one of the armature conductors, if the armature is driven at 900 rev/min. (10)
2023/MAY2/Q9 **2024/MAR/Q8** **2024/SEP1/Q8**
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Q9. (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 220 V 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)

2024/JAN/Q4 **2024/MAR/Q9** **2024/SEP1/Q9**

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Study Material

OCTOBER – 2024

Q1. (a) Sketch a circuit diagram for an automatic voltage regulator illustrating how the A.V.R. utilizes a silicon-controlled rectifier to control the excitation system for an alternator. (10)
(b) Describe how the A.V.R. monitors output and controls the excitation system. (6)
2024/MAY1/Q1 **2024/OCT/Q1**
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Q2. Overcurrent protection relays are built into main alternator breakers to safeguard the individual alternators and the distribution system against certain faults. (a) Sketch a typical relay. (8)
(b) Describe the operation of the relay sketched in (a) (8)
2024/MAY1/Q2 **2024/OCT/Q2**
Click Here to See the Answer

Q3. (a) Sketch and describe a power (watt) meter for an a.c. switchboard.
(b) State why type of lo
ad governs power factor and give examples of power factor for a resistance load and for normal marine operation. (8)
2024/MAY1/Q3 **2024/OCT/Q3**
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Q4. Explain clearly why, in D.C. installation, a compound-wound electric generator is usually adopted for ship lighting purposes. Compare its performance with that of shunt and series wound machines. What attention does such a machine require when working and what care is necessary for its maintenance in a satisfactory condition? (16)
2023/JUL/Q2 **2024/MAY1/Q4** **2024/OCT/Q4**
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Q5. With reference to an emergency source of electrical power in cargo ships:
(a) Describe a typical power source. (6)
(b) Give a typical list of essential services, which must be supplied simultaneously. (5)
(c) Explain how the emergency installation can be periodically tested. (5)
2023/DEC/Q1 **2024/MAY1/Q5** **2024/OCT/Q5**
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Q6. (a) What are the different types of DC motors? (6)
(b) A 10 H.P. 230 V shunt motor takes an armature current of 6A from 230 V mains at no load runs at 1200 r.p.m. The armature resistance is 0.25Ω. Determine speed and electromagnetic torque when the armature takes 36 amps. with the same flux. (10)
2024/MAY1/Q6 **2024/OCT/Q6**
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Q7. An amplifier has an open-circuit voltage gain of 1000, an input resistance of 2000 Ω and an output resistance of 1.0 Ω. Determine the input signal voltage required to produce an output signal current of 0.5A in a 4.0Ω resistor connected across the output terminals. If the amplifier is then used with negative series voltage feedback so that one tenth of the output signal is fed back to the input, determine the input signal voltage to supply the same output signal current. (16)
2024/MAY1/Q7 **2024/OCT/Q7**
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Q8. (a) Explain how fluorescent tubes power factor is improved. (6)
(b) A fluorescent lamp taking 80W at 0.7 power factor lagging from a 230V, 50-Hz supply is to be connected to unity power factor. Determine the value of the correcting approach required. (10)
2024/MAY1/Q8 **2024/OCT/Q8**
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Q9. (a) Explain about non-linear resistors with some examples and illustration on how they differ from linear resistor. (6) (b) A half-wave rectifier is used to supply 50V d.c. to a resistive load of 800Ω. The diode has a resistance of 25 Ω. Calculate a.c. voltage required. (10)
2024/MAY1/Q9 **2024/OCT/Q9**
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NOVEMBER – 2024

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)
2024/JAN/Q1 **2024/JUN/Q1** **2024/NOV/Q1**
Click Here to See the Answer

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)
2024/JAN/Q2 **2024/JUN/Q2** **2024/NOV/Q2**
Click Here to See the Answer

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)
2024/JAN/Q3 **2024/JUN/Q3** **2024/NOV/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 on-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)
2024/JAN/Q4 **2024/MAR/Q9** **2024/JUN/Q4** **2024/SEP1/Q4** **2024/NOV/Q4**
Click Here to See the Answer

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)

2024/JAN/Q5 **2024/JUN/Q5** **2024/NOV/Q5**

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Q6. a) Explain how excitation of the rotor is produced and supplied. (6)
b) A shunt motor has an armature resistance of 0.2 ohms and with an armature current of 120 amperes runs at 750 r.p.m. off a 400-volts supply. Calculate the speed and armature current of the motor if the flux per pole is reduced to 75 per cent of its initial value, the total torque remaining unaltered. (10)

2024/JAN/Q6 **2024/JUN/Q6** **2024/NOV/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) State the advantages and disadvantages of the lamps-bright system over lamps-darks system. (4)

2024/JAN/Q7 **2024/SEP2/Q2** **2024/NOV/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)
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/JAN/Q8 2024/NOV/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 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)
2024/JAN/Q9 **2024/NOV/Q9**
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DECEMBER – 2024

Q1. (a) How busbar inspection and maintenance is carried out. (10)
(b) What are safety precautions taken while doing maintenance on the busbar? (6)
2023/FEB/Q5 **2024/DEC1/Q1**
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Q2. Draw and explain the shape of the characteristic curve of a p-n junction diode in forward and reverse bias modes (16)
2022/AUG/Q2 **2022/SEP/Q2** **2023/MAR/Q2** **2024/DEC1/Q2**
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Q3. a) Explain the working of a Megger with the aid of its internal circuit. b) What safety measures are taken while using a Megger? (4)
2023/MAY1/Q2 **2023/SEP/Q3** **2024/DEC1/Q3**
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Q4. a) What is the purpose of preferential Tripping system on ship's electrical network? (6)
b) Explain the various stages of preferential trips including the loads connected to those stages. (10)
2023/MAY1/Q3 **2024/DEC1/Q4**
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Q5. a) The current transformer (CT) and potential transformer (PT) or voltage transformer are both measuring devices. List their shipboard application. (6)
b) Sketch and describe any one type of current transformer. (10)
2023/MAY1/Q4 **2024/DEC1/Q5**
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Q6. a) What are the safety devices provided on the steering gear system?
b) What is the significance of the shaft hull earthing device on the shafting?

2024/DEC1/Q6
Click Here to See the Answer

Q7. a) Explain Fleming's Right-hand rule. (6)
b) A one-turn armature coil has an axial length of 0.4m and a diameter of 0.2m. It is rotated at a speed 500 rev/min in a field of uniform flux density of 1.2 T. Calculate the magnitude of the e.m.f. induced in the coil. (10)
2023/JUN/Q9 **2024/DEC1/Q7**
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Q8. a) Describe in detail the method used to measure the capacitance of a capacitor.(6)
b) A circuit has a resistance of 3R and an inductance of 0.01 H. The voltage across its ends is 60V and the frequency is 50Hz. Calculate (i) the impedance.
(ii) the power factor
(iii) the power absorbed.(10)
2023/JUN/Q8 **2024/DEC1/Q8**
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Q9. a) What is the difference between a DC Generator and a DC motor? (6)
b) A 4-pole, 32 conductor, Lap-wound DC shunt generator with terminal voltage of 200 V delivering 12 A to the load has ra = 2 and field circuit resistance of 200 Ω. It is driven at 1000 RPM .
i) Calculate the flux per pole in the machine.
ii) If the machine has to be run as a motor with the same terminal voltage and drawing 5 A from mains, maintaining the same magnetic field, find the speed of the machine. (10)
2023/JUN/Q7 **2024/DEC1/Q9**
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