D. MARINE
Study Material

MEO CLASS 2 WRITTEN: MET

(MARINE ELECTRO TECNOLOGY)

FOR INDIAN COMPETENCY EXAM

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JAN-2021

SECTION – I

Q1. A. Give a brief outline of the care maintenance that should be given to the stator and rotor of an A.C. generator;
B. Explain what is likely to occur if the driving power of one A.C. generator suddenly fails when two generators are running in parallel. What safety devices are usually provided for such events?
2021/JAN/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.
B. Indicate, on a sketch of the typical characteristic curves of current and torque against Speed, disadvantages of a direct on line start squirrel cage induction motor.
2021/JAN/Q2
Click Here to See the Answer

Q3. A. Describe with the aid of a simple sketch the arrangement of the three phase winding of an alternator showing the neutral point;
B. Explain why for most ships the neutral point is insulated;
C. Explain why in some installation the neutral point is Earthed.
2021/JAN/Q3
Click Here to See the Answer

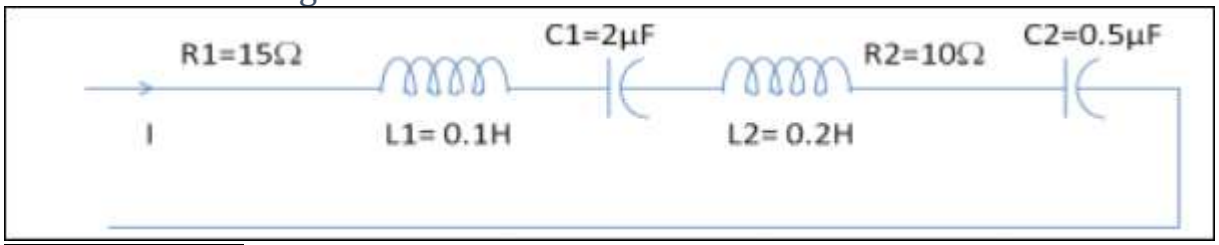
Q4. With reference to preferential tripping in a marine electrical distribution system;
A. With the aid of a sketch, describe a typical arrangement to provide three stages of tripping an instantaneous protection against short circuit.
B. State why this protection is required;
2021/JAN/Q4
Click Here to See the Answer

Q5. Compare methods of obtaining speed regulation of three-phase induction motor generally used in tankers by means of:
A. Rotor resistance; B. Cascade system; C. Pole-changing.
Give examples where each system may be employed with advantage.
2021/JAN/Q5
Click Here to See the Answer

SECTION – II

Q6. A. Electric motors contain a stationary member as well as a rotating member. For each of the following machines, identify in which part of the motor three field winding and the armature winding are located: three phase induction motor, three phase synchronous motor, d.c. motor.
B. An 18.65 kW,4-pole,50HZ, 3 phase induction motor has friction and windage losses of 2.5 percent of the output. The full load slip is 4% compute for full load
(a) the rotor Cu loss
(b) the rotor input
(c) the shaft torque
(d) the gross electromagnetic torque.
2021/JAN/Q6
Click Here to See the Answer

Q7. A. Sketch an arrangement showing the principal of proportional plus integral (P+I) control loop.
B. Compare the series and parallel resonance circuits. Find the frequency at which the following circuit resonates.



2021/JAN/Q7
Click Here to See the Answer

Q8. 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 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.

2021/JAN/Q8

Click Here to See the Answer

Q9. A 20kVA, 2000/220V, single-phase transformer has a primary resistance of 2.1ohm and a secondary resistance of 0.026ohm. The corresponding leakage reactance's are 2.5ohm and 0.03ohm. Estimate the regulation at full load under power-factor conditions of.
(a) Unity;
(b) 0.5 (lagging) and
(c) 0.5 (leading).

2021/JAN/Q9

Click Here to See the Answer

Q10. A. Describe the normal criteria used for setting thermal protection relays and its advantage compared to magnetic types.
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. 2supply the current taken is at first 2A, 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.

2021/JAN/Q10

Click Here to See the Answer

FEB-2021

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?
B. Describe the method of safely connecting the arrangement sketched in (A) to the shore Supply?
2021/FEB/Q1
Click Here to See the Answer

Q2. 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.
2021/FEB/Q2
Click Here to See the Answer

Q3. A. Describe with the aid of a simple sketch the arrangement of the three-phase winding of an alternator showing the neutral point.
B. Explain why for most ships the neutral point is insulated.
C. Explain why in some installation the neutral point is earthed?
2021/JAN/Q3 **2021/FEB/Q3**
Click Here to See the Answer

Q4. What is the meant by "excitation" in an alternator? With the help of a neat diagram of brushless alternator labeling all the important parts. explain how the excitation is achieved in a brushless alternator.
2021/FEB/Q4
Click Here to See the Answer

Q5. What is a soft starting of an Induction motor? Describe with a circuit using a thyristors used for soft starting. Discuss its advantages and dis-advantages.
Click Here to See the Answer

Q10. 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 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.
2021/JAN/Q8 **2021/FEB/Q8** **2021/MAR/Q10**
Click Here to See the Answer

MAR-2021

Q1. 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 on line start squirrel cage induction motor.
2021/JAN/Q2 **2021/MAR/Q1**
Click Here to See the Answer

Q2. 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. Describe how the A.V.R. monitors output and controls the excitation system.
2021/MAR/Q2
Click Here to See the Answer

Q3. Tank liquid level sensors are an integral part of ships. Describe with aid of suitable sketches the working principle of,
(a) capacitive type level sensor;
(b) Ultrasonic level sensor;
(c) Float.
2021/MAR/Q3
Click Here to See the Answer

Q4. A. What are the causes of overheating of an induction motor?

B. What preventive measures are provided against damage to an induction motor in installed condition?
C. What is the purpose of 'fuse back up protection' provided to an induction motor?
D. How does an induction motor develop torque?
E. What is the condition to be satisfied for achieving maximum running torque in an induction motor?
Click Here to See the Answer

Q5. With reference to alkaline batteries used on board ship.
A. Describe the operation of a battery cell and state the material used;
B. Describe how the cells are mounted to form a battery;
C. State the advantages and disadvantages compared with lead-acid batteries.
2021/MAR/Q5
Click Here to See the Answer

SECTION-2

Q6. A. Describe the normal criteria used for setting thermal protection relays and its advantage compared to magnetic types.
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.
2supply the current taken is at first 2A, 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.
2021/JAN/Q10 **2021/MAR/Q6**
Click Here to See the Answer

Q 7. With reference to Synchronous Motors.
A. Draw and explain the principle of operation Synchronous Motors.
B. Find the synchronous impedance reactance of an alternator in which a given field current produces an armature current of 200 A on short circuit and a generated e.m.f. of 50V on open circuit. The armature resistance is 0.1

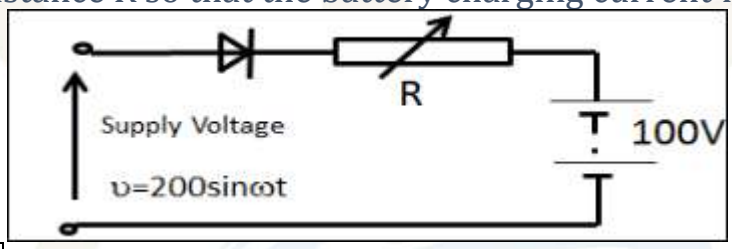
ohm. To what induced voltage must the alternator be excited if it is to deliver a load of 100A at a p.f of 0.8 lagging, with a terminal voltage of 200 V.

2021/MAR/Q7

Click Here to See the Answer

Q8. A. By means of a schematic circuit diagram illustrate the peak rectifier. If the supply voltage is v(t) = Vm 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.



2021/MAR/Q8

Click Here to See the Answer

Q9. 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 100V, 50Hz 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?

2021/FEB/Q10 **2021/MAR/Q9**

Click Here to See the Answer

APRIL-2021

Q1. With reference to squirrel cage, induction, electric motors:
A. Describe the construction of such a motor.
B. Sketch the torque against speed curve of such a motor;
C. Describe a method employed by a retrofitted device used to improve the part load performance of an induction motor.

2021/APR/Q1

Click Here to See the Answer

Q2. Sketch and describe an arrangement for automatic connection of emergency batteries upon loss of main power. Include in your answer:
A. Means of obtaining D.C. charging supply from a.c. mains;
B. A method of maintaining charge on lead acid batteries;
C. The arrangement to check that a battery operates a loss of main power
D. The length of time for which emergency batteries of passenger and cargo ships must provide power.

2021/APR/Q2

Click Here to See the Answer

Q3. 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;
(C) Give a safe procedure to follow should a main circuit breaker fail to open under fault Condition.

2021/APR/Q3

Click Here to See the Answer

Q4. With reference to U.M.S. operations:
A. State with reasons the essential requirements for unattended machinery spaces;
B. As second Engineer, describe how you would respond to the irretrievable failure of the Machinery space fire alarm system whilst the ship is on voyage.

Click Here to See the Answer

Q5. (a) With reference / to the insulation testing of marine electrical plant:
i. State the reason for insulation testing:
ii. State the precautions to be observed when testing intrinsically safe equipment type Ex.1.
(b). Describe the overhaul of a D.C. motor which has been subject to excessively damp condition or flooding with seawater.s
2021/APR/Q5
Click Here to See the Answer

SECTION-2

Q6. (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 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.
2021/JAN/Q8 **2021/FEB/Q8** **2021/MAR/Q10** **2021/APR/Q6**
Click Here to See the Answer

Q7. A. Explain the preference for a 60 Hz system. Describe the dangers of running a 50 Hz system from a 60 Hz supply.
B. A ring-main, 900m long, is supplied at a point A at a p.d. of 220V. At a point B, 240m from A, a load of 45A is
drawn from the main, and at a point C, 580m from A, measured in the some direction, a load of 78A is taken from the main. If the resistance of the main (lead and return) is 0.25 ohm per kilometre, calculate the current which will flow in each direction round the main from the supply point A and the potential difference across the main, at the load where it is lowest.
2021/APR/Q7
Click Here to See the Answer

Q8. (a). Describe the no-load saturation characteristic of a d.c. generator.
(b). A 4-pole machine running at 1500 r.p.m. has an armature with 80 slots and 6 conductors per pole. The flux per pole is 6 x 106 lines. Determine the terminal e.m.f. of d.c. generator if the coils are lap connected. If the current

per conductor is 100 A, determine the electrical power.
2021/APR/Q8
Click Here to See the Answer

Q9. A. Explain how the efficiency and regulation of a transformer can be assessed by open circuit and short circuit tests?
B. A 25 kVa signal phase transformer 2200:200V has a primary and secondary resistance of 1Ω and 0.01 Ω respectively. Find the equivalent secondary resistance and full load efficiency at 0.8pf lagging, if the iron losses of the transformer are 80% of the full load copper losses.
2021/APR/Q9
Click Here to See the Answer

Q10. A. Explain distribution factor and pitch factor for alternator windings.
B. A 3phase, 4pole 24 slot alternator has its armature coils short pitched by one slot. Find the distribution factor and pitch factor.
2021/APR/Q10
Click Here to See the Answer

JULY-2021
SECTION – I

Q1. A. Describe with the aid of a simple sketch the arrangement of the three-phase winding of an alternator
showing the neutral point.
B. Explain why for most ships the neutral point is insulated.
C. Explain why in some installation the neutral point is earthed?
2021/JAN/Q3 **2021/FEB/Q3** **2021/APR/Q4** **2021/JUL/Q1**
Click Here to See the Answer

Q2. (a) Sketch power circuit diagram for a star/delta starter and label it.
(b) Narrate the sequence of operation of the circuit sketched in Q2(a).
(c) Mention any two advantages of star/delta starter over direct online starter.
(d) State any two limitations of the star/delta starting.

2021/JUL/Q2
Click Here to See the Answer

Q3. With reference to U.M.S. operations:
A. State with reasons the essential requirements for unattended machinery spaces;
B. As second Engineer, describe how you would respond to the irretrievable failure of the Machinery space fire alarm system whilst the ship is on voyage.
2021/APR/Q4 **2021/JUL/Q3**
Click Here to See the Answer

Q4. Explain why it is necessary to have reverse power protection for alternators intended for operation.
A. Sketch a reverse power trip;
B. Explain briefly the principle on which the operation of this power trip is based and how tripping is activated.
2021/JUL/Q2 **2021/JUL/Q4**
Click Here to See the Answer

Q5. With reference to alkaline batteries used on board ship.
A. Describe the operation of a battery cell and state the material used;
B. Describe how the cells are mounted to form a battery;
C. State the advantages and disadvantages compared with lead-acid batteries.
2021/MAR/Q5 **2021/JUL/Q5**
Click Here to See the Answer

SECTION – II

Q6. 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 the ensure that the transformer does not become overloaded.
2021/JUL/Q6(M)
Click Here to See the Answer

Q7. A. Discuss different methods of speed control of a d.c. series motor by adjusting field ampere turns.
B. A 230 V, d.c. shunt motor runs at 1000 r.p.m and takes 5 amperes. The armature resistance of the motor is 0.025 and shunt field resistance is 230 . Calculate the drop in speed when the motor is loaded and takes the line current of 41 amperes. Neglect armature reaction.

2021/JUL/Q7

Click Here to See the Answer

Q8. A. What are the factors which determine the synchronous speed of a motor?
B. Three conductors fitted side by side in the stator of a salient-pole alternator. Each generates maximum voltage of 200V (sinusoidal). The angle subtended at the centre of the stator between adjacent conductors is 20 electrical degrees. If the three conductors are connected in series, find
(i) the r.m.s. value of the effective voltage and
(ii) the 'breadth factor'. Using the theory that is the basis of this problem, give one reason why three-phase current has been introduced.

2021/JUL/Q8

Click Here to See the Answer

Q9. A. Briefly describe the maintenance routines carried out for emergency batteries onboard.
B. A power of 36 W is to be dissipated in a register connected across the terminals of a battery, having emf of 20V and an internal resistance of 1Ω. Find (i) What value of resistance will satisfy this condition. (ii) The terminal voltage of the battery for each of the resistances and (iii) The total power expenditure in each case.

2021/JUL/Q9

Click Here to See the Answer

Q10. 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 per cent;
iii. The motor frequency when the speed of the rotor is 600 r.p.m
2021/JUL/Q7 **2021/JUL/Q10**
Click Here to See the Answer

AUG-2021

SECTION – I

Q1. A. Give a brief outline of the care maintenance that should be given to the stator and rotor of an A.C. generator;
B. Explain what is likely to occur if the driving power of one A.C. generator suddenly fails when two generators
are running in parallel. What safety devices are usually provided for such events?
2021/JAN/Q1 **2021/AUG/Q1**
Click Here to See the Answer

Q2. (a) Sketch power circuit diagram for a star/delta starter and label it.
(b) Narrate the sequence of operation of the circuit sketched in Q2(a).
(c) Mention any two advantages of star/delta starter over direct online starter.
(d) State any two limitations of the star/delta starting.
2021/JUL/Q2 **2021/AUG/Q2**
Click Here to See the Answer

Q3. A. Describe with the aid of a simple sketch the arrangement of the three-phase winding of an alternator showing the neutral point.
B. Explain why for most ships the neutral point is insulated.
C. Explain why in some installation the neutral point is earthed?
2021/JAN/Q3 **2021/FEB/Q3** **2021/APR/Q4** **2021/JUL/Q1** **2021/AUG/Q3**
Click Here to See the Answer

Q4. Differentiate with the aid of simple sketches between the following types of electronic circuits;
A. Rectifier circuit;

B. Amplifier circuit;
C. Oscillator circuit.
2021/AUG/Q4
Click Here to See the Answer

Q5. With reference to Marine Electrical Circuits:
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.
2021/AUG/Q5
Click Here to See the Answer

SECTION – II

Q6. A. Explain distribution factor and pitch factor for alternator windings.
B. A 3phase, 4pole 24 slot alternator has its armature coils short pitched by one slot. Find the distribution factor and pitch factor.
2021/APR/Q10 **2021/AUG/Q6**
Click Here to See the Answer

Q7. A. Describe the no-load saturation characteristic of a d.c. generator.
B. A d.c. motor takes an armature current of 110 A at 480 V. The resistance of the armature circuit is 0.2□□. 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.
2021/AUG/Q7
Click Here to See the Answer

Q8. 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.
B. Two 10 MVA 3 phase Alternator operate in parallel to supply at 0.8 power factor with lagging load of 15 MVA. If the output of one Alternator is 8 MVA at 0.9 lagging.
1. Calculate the output of second Alternator.
2. Calculate the value of Power factor of second Alternator.

2021/AUG/Q8
Click Here to See the Answer

Q9. A. Briefly describe the maintenance routines carried out for emergency batteries onboard.
B. A power of 36 W is to be dissipated in a register connected across the terminals of a battery, having emf of 20V and an internal resistance of 1Ω. Find
(i) What value of resistance will satisfy this condition.
(ii) The terminal voltage of the battery for each of the resistances and
(iii) The total power expenditure in each case.
2021/JUL/Q9 **2021/AUG/Q9**
Click Here to See the Answer

Q10. 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 per cent;
iii. The motor frequency when the speed of the rotor is 600 r/min.
2021/JUL/Q7 **2021/JUL/Q10** **2021/AUG/Q10**
Click Here to See the Answer

SEP-2021
SECTION – I

Q1. (a) Sketch power circuit diagram for a star/delta starter and label it.
(b) Narrate the sequence of operation of the circuit sketched in Q2(a).
(c) Mention any two advantages of star/delta starter over direct online starter.
(d) State any two limitations of the star/delta starting.
2021/JUL/Q2 **2021/AUG/Q2** **2021/SEP/Q1**
Click Here to See the Answer

Q2. 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. Describe how the A.V.R. monitors output and controls the excitation system.
2021/MAR/Q2 **2021/APR/Q1** **2021/SEP/Q2**
Click Here to See the Answer

Q3. Compare methods of obtaining speed regulation of three-phase induction motor generally used in tankers by means of:
A. Rotor resistance; B. Cascade system; C. Pole-changing.
Give examples where each system may be employed with advantage.
2021/JAN/Q5 **2021/SEP/Q3**
Click Here to See the Answer

Q4. (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 about "Pulse Width Modulation" and how it can be applied for propulsion control.
2021/SEP/Q4
Click Here to See the Answer

Q5. With reference to U.M.S. operations:
A. State with reasons the essential requirements for unattended machinery spaces;
B. As second Engineer, describe how you would respond to the irretrievable failure of the Machinery space fire alarm system whilst the ship is on voyage.
2021/APR/Q4 **2021/JUL/Q3** **2021/SEP/Q5**
Click Here to See the Answer

SECTION – II

Q6. (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 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.

2021/JAN/Q8 **2021/FEB/Q8** **2021/MAR/Q10** **2021/APR/Q6** **2021/SEP/Q6**

Click Here to See the Answer

Q7. 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.

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iii. The motor frequency when the speed of the rotor is 600 r/min.

2021/JUL/Q7 **2021/JUL/Q10** **2021/AUG/Q10** **2021/SEP/Q7**

Click Here to See the Answer

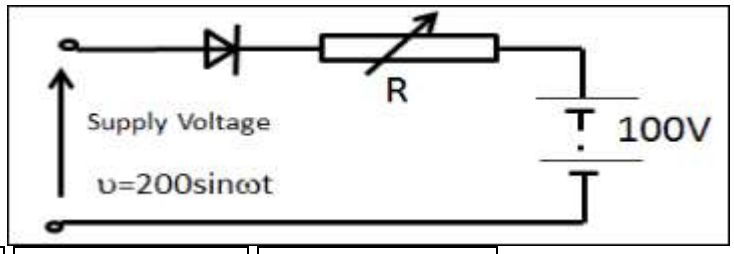
Q8. A 72 KVA transformer supplies a heating and lighting load of 12 KW at unity power factor and a motor load of 70 kVA at 0.766 (lagging) power factor; Calculate the minimum rating of the power-factor improvement capacitors which must be connected in the circuit the ensure that the transformer does not become overloaded.

2021/JUL/Q6 **2021/SEP/Q8**

Click Here to See the Answer

Q9. A. By means of a schematic circuit diagram illustrate the peak rectifier. If the supply voltage is v(t) = Vm 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.



2021/MAR/Q8 **2021/JUL/Q8** **2021/SEP/Q9**
Click Here to See the Answer

Q10. 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 100V, 50Hz 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?
2021/FEB/Q10 **2021/MAR/Q9** **2021/APR/Q8** **2021/JUL/Q9** **2021/SEP/Q10**
Click Here to See the Answer

OCT-2021
SECTION – I

Q1. What is the meant by "excitation" in an alternator? With the help of a neat diagram of brushless alternator labeling all the important parts. explain how the excitation is achieved in a brushless alternator.
2021/FEB/Q4 **2021/OCT/Q1**
Click Here to See the Answer

Q2. Explain the methods used to control the speed of a 3 Phase induction motors. Draw and Explain a Variable Frequency Drive used for optimization of energy efficiency of auxiliary machineries on board vessels.
2021/OCT/Q2
Click Here to See the Answer

Q3. A. Explain why it is necessary to have reverse power protection for alternators intended for operation.

B.(i) Sketch a reverse power trip;
(ii) Explain briefly the principle on which the operation of this power trip is based and how tripping is activated.
2021/JUL/Q2 **2021/JUL/Q4** **2021/OCT/Q3**
Click Here to See the Answer

Q4. A. Sketch a standby battery charging/discharging circuit;
B. Describe the circuit sketched, making special reference to how battery charge is maintained and how it operates upon loss of main power.
2021/JUL/Q3 **2021/OCT/Q4**
Click Here to See the Answer

Q5. What are semiconductor devices? What are its advantages over thermionic devices? With respect to semi- conductor devices describe working principle and application of the following;-
A. Zener Diode,
B. Transistor,
C. Photocell,
D. Thyristor
2021/JUL/Q5 **2021/OCT/Q5**
Click Here to See the Answer

SECTION – II

Q6. 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 the ensure that the transformer does not become overloaded.
2021/JUL/Q6 **2021/SEP/Q8** **2021/OCT/Q6**
Click Here to See the Answer

Q7. A. Discuss different methods of speed control of a d.c. series motor by adjusting field ampere turns.

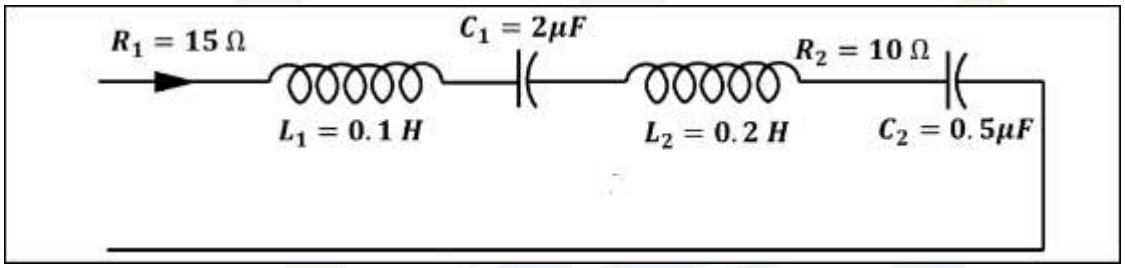
B. A 230 V, d.c. shunt motor runs at 1000 r.p.m and takes 5 amperes. The armature resistance of the motor is 0.025Ω and shunt field resistance is 230 Ω. Calculate the drop in speed when the motor is loaded and takes the line current of 41 amperes. Neglect armature reaction.

2021/JUL/Q7 **2021/OCT/Q7**

Click Here to See the Answer

Q8. A. Sketch an arrangement showing the principal of proportional plus integral (P+I) control loop.

B. Compare the series and parallel resonance circuits. Find the frequency at which the following circuit resonates.



2021/JAN/Q7 **2021/APR/Q7** **2021/OCT/Q8**

Click Here to See the Answer

Q9. (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 6000 kW at 0.9 power factor. Find the KVA rating of the other alternator and the power factor.

2021/JAN/Q8 **2021/FEB/Q8** **2021/MAR/Q10** **2021/APR/Q6** **2021/SEP/Q6** **2021/OCT/Q9**

Click Here to See the Answer

Q10. 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 per cent;
iii. The motor frequency when the speed of the rotor is 600 r/min.
2021/JUL/Q7 **2021/JUL/Q10** **2021/AUG/Q10** **2021/SEP/Q7** **2021/OCT/Q10**
Click Here to See the Answer

NOV-2021

SECTION – I

Q1. (a) Sketch power circuit diagram for a star/delta starter and label it.
(b) Narrate the sequence of operation of the circuit sketched in Q1(a).
(c) Mention any two advantages of star/delta starter over direct online starter.
(d) State any two limitations of the star/delta starting.
2021/JUL/Q2 **2021/AUG/Q2** **2021/SEP/Q1** **2021/NOV/Q1**
Click Here to See the Answer

Q2. What are semiconductor devices? What are its advantages over thermionic devices? With respect to semi- conductor devices describe working principle and application of the following;-
A. Zener Diode, B. Transistor, C. Photocell, D. Thyristor
2021/JUL/Q5 **2021/OCT/Q5** **2021/NOV/Q2**
Click Here to See the Answer

Q3. With reference to preferential tripping in a marine electrical distribution system.
A. State why this protection is required;
B. With the aid of a sketch, describe a typical arrangement to provide three stages of tripping an instantaneous protection against short circuit.
2021/JAN/Q4 **2021/APR/Q5** **2021/NOV/Q3**
Click Here to See the Answer

Q4. With reference to U.M.S. operations:
A. State with reasons the essential requirements for unattended machinery spaces;

B. As second Engineer, describe how you would respond to the irretrievable failure of the Machinery space fire alarm system whilst the ship is on voyage.
2021/APR/Q4 **2021/JUL/Q3** **2021/SEP/Q5** **2021/NOV/Q4**
Click Here to See the Answer

Q5. Tank liquid level sensors are an integral part of ships. Describe with aid of suitable sketches the working principle of,
(a) capacitive type level sensor;
(b) Ultrasonic type level sensor;
(c) Float type level sensor.
2021/MAR/Q3 2021/APR/Q2 **2021/JUL/Q4** **2021/NOV/Q5**
Click Here to See the Answer

SECTION – II

Q6. (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 6000 kW at 0.9 power factor. Find the kVA rating of the other alternator and the power factor.
2021/FEB/Q8 **2021/MAR/Q10** **2021/APR/Q6** **2021/SEP/Q6**
2021/OCT/Q9 2021/NOV/Q6
Click Here to See the Answer

Q7. With reference to A.C Distribution system:
A. Define power factor and explain the effects of low power factor.
B. 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 the ensure that the transformer does not become overloaded.
2021/NOV/Q7
Click Here to See the Answer

Q8. 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 per cent;
iii. The rotor frequency when the speed of the rotor is 600 r/min.
2021/JUL/Q7 **2021/JUL/Q10** **2021/AUG/Q10** **2021/SEP/Q7** **2021/OCT/Q10** **2021/NOV/Q8**
Click Here to See the Answer

Q9. A. What are the factors which determine the synchronous speed of a motor?
B. Three conductors fitted side by side in the stator of a salient-pole alternator. Each generates maximum voltage of 200V (sinusoidal). The angle subtended at the centre of the stator between adjacent conductors is 20 electrical degrees. If the three conductors are connected in series, find
(i) the r.m.s. value of the effective voltage and
(ii) the 'breadth factor'. Using the theory that is the basis of this problem, give one reason why three-phase current has been introduced.
2021/JUL/Q8 **2021/NOV/Q9**
Click Here to See the Answer

Q10. With reference to 3-phase transformers;
(a) Discuss the essential and desire 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?
(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.
2021/NOV/Q10

DEC-2021

SECTION – I

Q1. (a) With reference to the insulation testing of marine electrical plant:
(i). State the reason for insulation testing:
(ii). State the precautions to be observed when testing intrinsically safe equipment
(iii). Explain the procedure for insulation testing of 440 V motor.
(b). Describe the overhaul of a D.C. motor which has been subject to excessively damp condition or flooding with seawater.
2021/APR/Q5 **2021/DEC/Q1**
Click Here to See the Answer

Q2. 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. Describe how the A.V.R. monitors output and controls the excitation system.
2021/APR/Q1 2021/SEP/Q2 2021/DEC/Q2
Click Here to See the Answer

Q3. Compare methods of obtaining speed regulation of three-phase induction motor generally used in tankers by means of:
A. Rotor resistance; B. Cascade system; C. Pole-changing.
Give examples where each system may be employed with advantage.
2021/JAN/Q5 **2021/SEP/Q3** **2021/DEC/Q3**
Click Here to See the Answer

Q4. With reference to preferential tripping in a marine electrical distribution system.
A. State why this protection is required;
B. With the aid of a sketch, describe a typical arrangement to provide three stages of tripping an instantaneous protection against short circuit.
2021/APR/Q5 **2021/NOV/Q3** **2021/DEC/Q4**
Click Here to See the Answer

Q5. With reference to alkaline batteries used on board ship.

A. Describe the operation of a battery cell and state the material used;
B. Describe how the cells are mounted to form a battery;
C. State the advantages and disadvantages compared with lead-acid batteries.
2021/MAR/Q5 **2021/JUL/Q5** **2021/DEC/Q5**
Click Here to See the Answer

SECTION – II

Q6. 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.
B. Two 10 MVA 3 phase Alternator operate in parallel to supply at 0.8 power factor with lagging load of 15 MVA.
If the output of one Alternator is 8 MVA at 0.9 lagging.
1. Calculate the output of second Alternator.
2. Calculate the value of Power factor of second Alternator.
2021/AUG/Q8 **2021/DEC6**
Click Here to See the Answer

Q7. A. Discuss different methods of speed control of a d.c. series motor by adjusting field ampere turns.
B. A 230 V, d.c. shunt motor runs at 1000 r.p.m and takes 5 amperes. The armature resistance of the motor is 0.025 and shunt field resistance is 230 Calculate the drop in speed when the motor is loaded and takes the line current of 41 amperes. Neglect armature reaction.
2021/JUL/Q7 **2021/OCT/Q7** **2021/DEC/Q7**
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Q8. A. What are the factors which determine the synchronous speed of a motor?
B. Three conductors fitted side by side in the stator of a salient-pole alternator. Each generates maximum voltage of 200V (sinusoidal). The angle subtended at the centre of the stator between adjacent conductors is 20 electrical degrees. If the three conductors are connected in series, find
(i) the r.m.s. value of the effective voltage and
(ii) the 'breadth factor'. Using the theory that is the basis of this problem, give one reason why three-phase current has been introduced.
2021/JUL/Q8 **2021/NOV/Q9** **2021/DEC/Q8**

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Q9. A. Briefly describe the maintenance routines carried out for emergency batteries onboard.
B. A power of 36 W is to be dissipated in a register connected across the terminals of a battery, having emf of 20V and an internal resistance of 1Ω. Find (i) What value of resistance will satisfy this condition. (ii) The terminal voltage of the battery for each of the resistances and (iii) The total power expenditure in each case.
2021/JUL/Q9 **2021/AUG/Q9** **2021/DEC/Q9**
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Q10. (A). Compare the effectiveness of a current limiting circuit breaker with that of a HRC fuse.
(B) An AC Voltage Of 24 V is connected in series with the silicon diode and load resistance 500 Ohm having forward resistance 10 Ohms. Calculate the peak output voltage.
2021/DEC/Q10
Click Here to See the Answer