Government of the People's Republic of Bangladesh

Department of Shipping

Sample **Oral /Written** Question Bank

Electro Technical Officer/ Junior Marine Electro-Technical Officer

Version : 2, Nov 2023

Table Of Contents

1.0 ELECTRICAL FUNDAMENTALS

1. What is electricity?
2. How to produce Electricity?
3. Define current and voltage?
4. Difference between EMF and Voltage?
5. Define Resistor, capacitor and inductor and their characteristic?
6. What is RLC circuit .
7. Why use capacitor in electrical system?
8. Why use inductor in electrical system?
9. What kind of energy stored in inductor and capacitor?
10. Explain behavior of capacitor in AC and DC circuit.
11. Describe the Transient and Steady-state phase of Capacitor both in charging and discharging mode with a sketch.
12. Describe the Transient and Steady-state phase of Inductor both in charging and discharging mode with neat sketch.
13. Define Active, Reactive and Apparent power?
14. What is power factor? Why power factor is lagging in ship?
15. What is form factor and peak factor?
16. Define cycle, frequency, time period & wave form.
17. What is Peak value, average value & R.M.S value?
18. a)Find the average, apparent and reactive power of fig 01.

b) Find out the power factor of the system shown in fig 01.

19. Make the system (shown in fig. 01) power factor equal to 1.0.

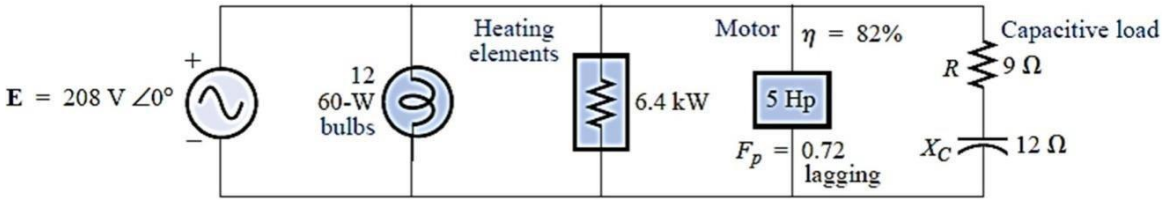


Fig:01

20. Explain KVL & KCL.

21. Explain Ohm's law, Faraday's law, lenz's law, Fleming's right hand and left hand rules.

22. How to improve power factor and its benefit?

23. What is Harmonics in power system, what is the acceptable range of harmonics in marine electrical system? How can it effect the Ship's Electrical system?

24. What are the remedies to get rid of harmonics if a ship's system is suffering from harmonics?

25. What is a snubber circuit? Why it is used in relay oriented with ship's controlboards?

26. Solve the following circuit in fig.02.

27. Find the I, check for K.V.L and draw the impedance diagram of figure 03

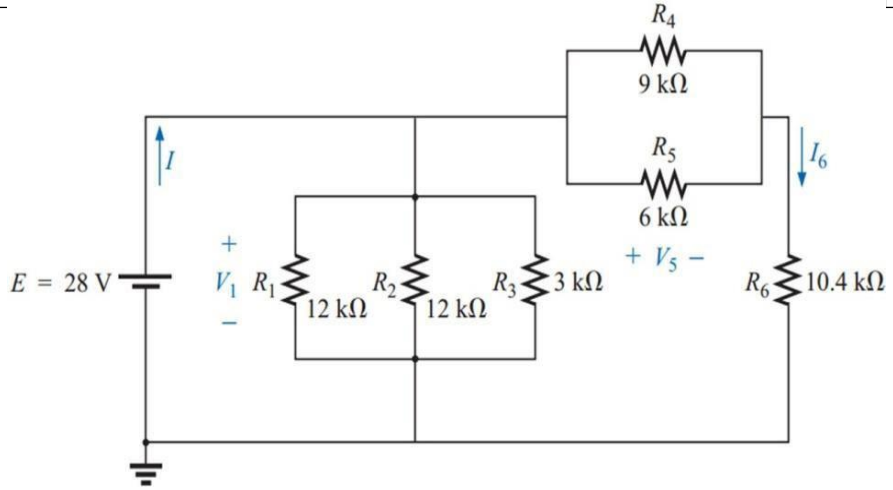


Fig:03

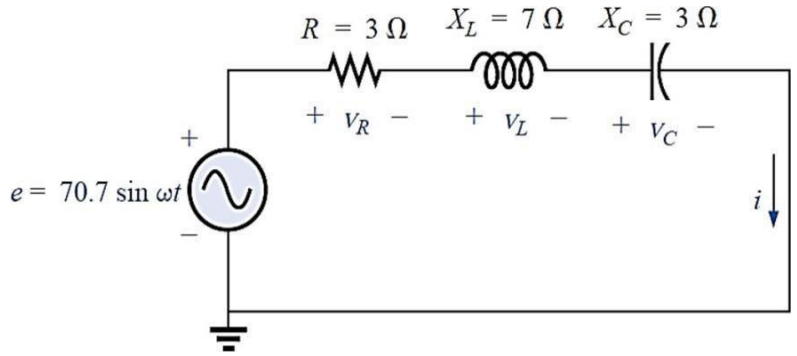


Fig:03

2.0 ELECTRONICS FUNDAMENTALS

1. What is defining by electronics?
2. What is semi conductor?
3. What are P-type and N-type materials? What is depletion layer and how it is formed?
4. Explain the Forward bias and Reverse bias characteristics curve of a diode.
5. Types of diode.
6. What are Zener breakdown and Avalanche breakdown?
7. For the circuit shown in figure 04, find the maximum and minimum values of Zener diode current.

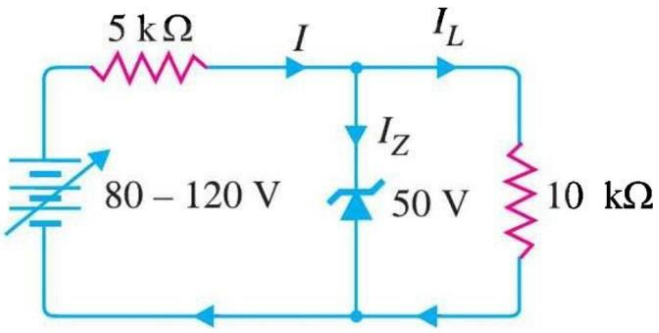


FIG:04

8. What is transistor?
9. Type of transistor and their biasing with characteristic.
10. Use of transistor.
11. What is BJT and FET?
12. What is MOSFET?
13. What is thyristor?
14. Explain SCR,BCT,GTO,MTO,MCT,LASCR,SITH,TRIAC,IGCT,GATT.
15. What is IGBT?
16. What is rectifier and its uses?
17. Write down the three basic types of rectifier.
18. Draw the diagram of Full wave Bridge rectifier circuit and describe.

19. Draw the three phase inverter circuit diagram and ac synchronous motor explain briefly.

20. Draw the controlled rectification converter and dc motor diagram explain.

21. What is the difference between inverter and converter?

22. What is the purpose of an inverter?

23. What is inverter and its uses?

24. What is Pass & stop Band?

25. What is cut-Off frequency?

26. What is rheostat?

27. What is Modulation and demodulation?

28. What is AM and FM?

29. What is amplifier and repeater in telecommunication?

30. What is analog and digital signal?

31. Working principle of A/D and D/A converter?

32. What is PWM, PPM, PAM in signal modulation?

33. What is cyclo-converter and synchro-converter?

34. Working principle of cyclo-converter and synchro-converter.

35. How can you use cyclo-converter to control the propeller speed?

36. What is notch filter?

37. What is logic gate?

38. What are derivative logic gate?

39. What are universal logic gate?

40. What is positive and negative logic gate?

41. What is multiplexer and de-multiplexer and their application.

42. Different between transmitter and transducer.

43. What is sensor?

44. Types of sensor.

45. Working principle of proximity sensor and use of it in ship?

46. What is ON-OFF control and continuous control?

47. Difference between open & close loop controller.

48. What is PID controller? Explain Integral and Derivative circuit using Op-Amp.

49. What is measuring value, desired value, deviation and offset?

50. What Direct action and reverse action controller

51. What is proportional band?

52. What is gain? Relation between gain and proportional band.

53. What is reset action?

54. What is bump-less transfer?

55. Difference between feedback and feed forward control.

56. Difference between linier and non liner control.

57. What is 4-20 mA sensor? Why is it mostly used in remote tank sounding system?

58. What is 0-5 V sensor? What are the applications of these type of sensors found in ship's control system?

59. What is thermistor, thermocouple, wheat stone bridge sensor, RTD, inductive sensor and capacitive sensor?

60. What is photo cell and use of it in ship.

61. Working principle of relay.

62. What is solid state relay?

63. Working principle of timer.

64. Types of timer.

3.0 ELECTRICAL MOTOR

Power generation system

1. Working principle of brushless alternator with diagram.

2. Brushless alternator excitation diagram.

3. Working principle of PMG alternator with diagram.

4. What is emergency generator?

5. What is the SOLAS regulation of Emergency generator.

6. What is shaft generator and its working principle.

7. What is excitation? Why is it necessary? What are brushless and slip-ring based excitations?

8. What is armature reaction?

9. What is the damper winding

10. What is cross magnetizing effect?

11. Two generators are running in parallel and suddenly load transfers from one to other, what is reason and what will be your action? Or, automatic shifting of generator load from one to another, what are the reasons?

12. If two generators are sharing equal load but amps are different why?

13. How will you test over-voltage, over current, preferential trip and reverse power trip?

14. What Reverse power Trip? What will happen if reverse power flow? when does reverse power flow? What protection is provided against this?

15. Functions of under voltage trip & under voltage relay working principle.

16. What is the meaning of preferential trip? Why is it provided? what are essential and non- essential loads?

17. What is Under-voltage protection?

18. What is the power output of marine generator /alternator and how to check under voltage /over voltage & under frequency/over frequency?

19. Alternator maintenance. Or Alternator routine maintenance.

20. How many types of excitation system?

21. Why DC supply used for excitation instead of AC

22. How will you parallel generator without AVR?

23. What is AVR? Working principle of AVR.

24. How to start generator when AVR is not working?

25. Droop characteristics and AVR setting relation.

26. If the AVR, is defective, when additional loads come on will the generator be able to take it?

27. Write down the function of compensating.

28. How to remove ACB with procedure?

29. Maintenance of ACB, what is testing position of ACB.

30. ACB safeties

31. ACB not closing what are reasons?

32. How are arc quenched in ACB?

33. If you press ACB close button on an idle generator what will happen?

34. Why use anti pumping relay in ACB?

35. Working principle of VCB.

36. Working Principle of SF6 circuit breaker.

37. Working principle of synchronoscope and if fail what to do? Explain light/bulb method.

38. What is dark lamp and bright lamp method for synchronizing? How is the connection made?

39. How could you monitor the correct Intel synchronising without the aid ofsynchroscope or synchronising lamp?

40. For what synchropcope pointer rotating fast in clock wise/counter clock wisedirection?

41. Alternator safeties.

42. Emergency generator Safety.

43. Emergency generator starting requirements and procedure.

44. Emergency generator testing procedure.

45. How does the emergency generator start automatically?

46. What is air gap, what is the reason of air gap and how to measure? Or what is Significance of Air Gap in alternator or motor?

47. Why air gap, how to check, only filler gauge or anything else, what happens if air gap is low, how much value?

48. What is the result of an uneven air gap between rotor and stator of the generator?

49. Difference between AE governor and ME governor.

50. Explain the 4 knobs on governor.

51. What is Electronic Fuel Controller? Why controlling in Fuel flow is necessary?

52. Draw a block diagram of electronics Governor describe briefly

53. What is droop? Why it is so important to have a good parallel operation system? Describe with graph.

54. What are the conditions to have reverse power in term of droop?

55. Generator running, not producing voltage what is the reason?

56. What causes the generator under a voltage problem?

57. Generator started but voltmeter on MSB shows no reading reason.

58. Voltage not coming how to recover load?

59. What is induction generator? When does a synchronous generator become an induction generator

60. What is the meaning of excitation of alternator You have 4 batteries of 6 volt how you connect them to start the emergency generator.

61. If diode is faulty can generator run?

62. How to increase A/E frequency.

63. Why do we close the switch at 11 o'clock and not at 12 o' clock?

64. What does different position of the synchroscope needle mean; what is the difference between 6 o clock and 12 clock?

65. Out at sea, if there is a black out during your watch, what action will you take?

66. After a black out the emergency generator comes on; On restoring the main supply we are closing the circuit breaker of the main generator without bothering about synchronizing. How is this possible?

67. Can reverse power trip occur with one generator running? If yes, how? If no, why?

68. What is the meaning of Star winding/ Delta winding?

69. Is the ship's alternator Star wound or Delta wound?

70. Why is it necessary that incoming alternator frequency is more than bus bar?

71. Why is this reverse power used instead of reverse current in alternators?

72. Is the field current in an alternator AC or DC ? Is the field rotating or stationary? How is it supplied?

73. What is a brush less alternator? How is the excitation achieved in this? What is the meaning of residual magnetism?

74. How to test emergency generator without switching off main supply

75. Why are motor ratings given in KW and that of alternator and transformer given in KVA?

76. There is something done to bearing pedestal of an alternator, what is it?

77. If all your air bottles are at low pressure and there is a blackout how do you start the generators?

78. Explain the condition for the Paralleling of Alternators?

79. Where is a slip ring used and where is a commutator used?

80. Give a brief outline of the care maintenance that should be given to the stator and rotor of an A.C. generator.

81. What will happen if alternator is over excited? Or if we over excite what will happen to PF? What is the effect in PF of the bus bar when over excitation?

82. Two generators are running parallel with different KW (200,800kw) with unequal kW sharing what is your action?

83. What are transient and sub transient reactance? Why these are necessary forany marine type generators?

84. What is synchronous motor or generator? Describe the working principle.

85. What are the maintenances of generators?

86. What type of faults generally occur in marine type generators?

87. What are positive base and negative base diode?

88. Sketch and describe the working principle of brushes Generator excitation system.

89. Write down the periodical maintenance of brushless generator.

90. What is luckily to happen if one of the rotating diode fails: An open circuit? Or a short circuit?

91. What is starter motor? Why use this?

92. Would an IR test results of 0.5Meg ohm to earth be acceptable for a 440 volts Main Generator?

4.0 POWER DISTRIBUTION SYSTEM

1. Tell me Electrical installation system SOLAS regulation.

2. Tell me MSBD SOLAS regulation.

3. What is the general concept of AC power distribution?

4. Why AC distribution is preferred over DC distribution onboard a ship?

5. Draw a typical Single line diagram of ship electrical system.

6. What are the differences between feeders and distributors?

7. What is a cross-linked distribution system? Explain its significance with a simple diagram.

8. What is a radial distribution system? Explain the same with a suitable diagram.

9. What do you understand by a primary and secondary distribution system?

10. What is the difference between three-phase three-wire and three-phase four-wire systems?

11. What is bus bar? Why bus bar is used in the power distribution panel?

12. What are the safety devices fitted on MSBD?

13. What is main switchboard and write down the function of main switch board?

14. What is the difference between switch board and switch gear describe briefly?

15. What is IP for MSBD? Why 0.6 m gap is given behind?

16. What is dead front panel? What is the mechanism of dead front panel?

17. How identify the hot spot and thermal profile inside the switch board?

18. What is the meaning of earthing in a ship?

19. What is the difference between earthling & bonding?

20. What is the purpose of bonding, Earthling and grounding describe briefly?

21. What are the types of grounding? Explain reactance and resistance grounding.

22. What is Earth fault? How do you trace earth faults?

23. Low insulation. How to rectify?

24. How is earthing given to the ship?

25. What is NER? What purpose? If not given what would happen?

26. What is insulated system and non-insulated system?

27. Why is 440 V used for motors and 110/220 V used for lighting?

28. What is the purpose of the earth fault indication on the switch board?

29. Why does negative phase sequence occur in unbalanced system? What is the knock on effect of it?

30. Why negative phase sequence filters are used with most of the heavy motor loads in ship?

31. Difference between Relay and contactor.

32. There is no neutral on board then how do we get 220V supply?

33. Difference between fuse and circuit breaker

34. If HRC fuse is blown off what test will you will carry out?

35. What Short circuit? Or , What is short circuit fault?

36. How to protect OL & Short ckt?

37. What is fault current and over current?

38. What are load balance and short circuit calculation?

39. What is Sag/Dip? Why do transient and steady state sag occur in a system?

40. Why short circuit analysis is necessary to select M.S.B master circuit breaker?

41. What is discrimination of circuit breaker?

42. What factors determine the fault current?

43. What is short circuit calculation? what data do you need for this calculation?

44. What is load calculation? Why does ship's load vary?

45. What is shunt trip and under voltage trip? And its mechanism.

46. What kind relay are use for under voltage protection.

47. Why starters are fitted with under voltage trips.

48. How would you arrange relay switching and circuit breaker trip?

49. What is bus tie?

50. What are the advantages and disadvantages of both 3 phase 3 wire and 3 phase4 wire system?

51. What is single earth fault and double earth fault?

52. What is surge?

53. Working principle of reverse power relay.

54. What is reverse power trip?

55. What is preferential trip?

56. What is sequential start? Why it is necessary?

57. Write down Function of circuit breaker and how many types of circuit breaker used in ship?

58. How does thermal O/L relay work?

59. How does magnetic relay work?

60. What is advantage of thermal relay over a magnetic relay.

61. What is PMS and why use this?

62. What is emergency switch board?

63. Which critical equipments are connected to ESBD?

64. What is your precaution if you maintenance MSBD & ESBD in dry dock.

65. What is shore supply?

66. What is your duties and responsibility during shore supply?

67. What you will check before connect Shore supply? Shore supply connection procedure.

68. What will happen if shore supply voltage is 380V and ships voltage is 440v , or vice versa ?

69. What will happen if shore supply frequency is 50Hz and ships Frequency is 60Hz , or vice versa?

70. Working principle of phase sequence indicator with diagram.

71. How can phase sequence be checked if the on display sequence meter isdamaged?

72. MSBD and ESBD interlock diagram and explain.

73. How does a transformer work? What are the maintenance of it?

74. What is a transformer and how does work?

75. Draw the diagram of transformer.

76. What is power transformer and describe briefly?

77. Describe the basic working principle of transformer.

78. Why laminated core is used in transformer?

79. Explain about Auto transformer.

80. EMF equation of a transformer.

81. Why transformers are rated in KVA instead of kilo watt?

82. Step down transformer used for which purpose. Function of instrument transformer.

83. What is the ratio of turns used in step up transformer and step down transformer?

84. Function of potential transformer.

85. Function of current transformer.

86. What is the different type of transformer and there diagram describe.

87. Which type of ship do need transformer and why? How do those ship run 220V/ 110V lighting loads?

5.0 HIGH VOLTAGE

1. What is high voltage? How can high voltage be generated on board ship?

2. What are the advantages of high voltage?

3. What are protective equipment necessary in high voltage working environment?

4. What are step, touch potential? How can they be avoided?

5. How does a Vacuum Circuit Breaker work?

6. What is arc flash? What are the effects of it?

7. What is di-electric strength of any material? How can insulation be checked of any insulators?

8. What is high voltage cable? Describe the potential stress around the insulation ofcable.

9. What type of instruments meters and probe meters are used in H.V system?

10. What is lightning? How does it happen? Why lightning arrester is used?

11. What is earth connector switch? Why is it necessary before any H.V maintenanceor routine work?

12. What is ring main unit in HV system?

13. Describe safe working procedure on HV system.

14. What is limitation of access in HV system?

15. Explain earthling procedure.

16. What is additional earth? Why use?

17. What is your responsibility to ensure safe working place if you are “permit issuer”?

18. What is your responsibility to ensure safe working place if you are “permit Receiver”?

19. What is Sanction for test?

20. Explain some sign of abnormal of switchgear during switching room inspection.

21. Explain maintenance schedule of VCB and SF6?

22. What are partial discharges?

23. What is periodic partial discharge test?

24. What is high voltage testing equipment and their names?

25. When it is safe to work on high voltage?

26. What is meant is by electrically isolated?

27. What precaution should be taken after applying a circuit main earth to ensure that it is not removed?

28. What special precautions should be observed when electrical pressure testing is being undertaken?

29. What is the difference between High voltage danger and caution notice?

30. What is requirement of Earthing conductor used in High voltage?

6.0 AC MACHINE

1. How many types of AC motor are there?

2. Why an AC motor take heavy starting current?

3. Principal of AC motor and Why revolving magnetic field is necessary?

4. Why single phase motor is not self starting?

5. Explain capacitor start motor.

6. What are the disadvantages of split phase motor?

7. What is the speed-torque characteristics of an SCIM(squirrel cage inductionmotor)?

8. What is constant torque, constant H.P region?

9. What will happen if an induction motor run at synchronous speed?

10. What is the condition that an induction machine be run in generator mode ormotor mode?

11. Can an induction motor be made generator? how?

12. What are the starters used with SCIM?

13. What is motor protection circuit breaker (MPCB)? what protection we get fromthis device?

14. How would you measure the negative phase sequence intensity of a motor?

15. What is priming/purging in a centrifugal motor?

16. Why the core of a motor is sheeted?

17. Why fan is used with motor?

18. What is soft starter? can I change speed of a motor with this device?

19. If you change any 2 phase of a 3 phase system, why the rotation get reversed?

20. What will happen to a motor during single earth fault in insulated system?

21. What is single phasing? can a 3 phase motor be run at 1 phase?

22. How you will understand your motor is single phasing.

23. What Is slip ring motor? draw block diagram of SCIM, slip ring, synchronousmotor.

24. What is the advantage of Slip ring motor over SCIM?

25. What will you find in a motor nameplate?

26. How a motor be started remotely and locally?

27. What will you do if a motor is submerged under salty water?

28. How to take megger readings of a motor?

29. What is Polarization Index? Why is it necessary for electrical machinery?

30. What is series lamp test of a motor?

31. Name some motor parts.

32. What will be the cable size, O/L setting, C.B setting of 15 K.W motor?

33. What are the maintenances of a motor?

34. For what reasons can a motor be over loaded?

35. What will you find in a motor terminal box?

36. If supply voltage becomes low what will happen to a motor?

37. If supply frequency is low what will happen to a motor?

38. What is the common cause that makes supply cable of a motor to be heated up?

39. What are the most common causes of induction motor failure and how oftenshould a motor be cleaned?

40. Why does rotor rotate?

41. How can you change the rotation of three phase induction motor?

42. Write down the working principle of three phase induction motor.

43. Draw and describe the construction of three phase induction motor advantagesand disadvantages of induction motor.

44. Describe the difference problem of single phase induction motor.

45. Draw the block diagram of wound rotor motor and describe briefly.

46. If a cage rotors induction motor has been flood with sea water and its insulation resistance is down to zero Meg ohms, what is the procedure for putting the motor back into service?

47. How can you change the rotation of three phase induction motor?

48. How often should a motor be cleaned?

49. What is the necessity of starter and controller describe briefly.

50. Sketch and describe the working principle of star/delta starter.

51. Draw & describe the working principle of Auto Transformer Starter.

52. Sketch and describe the working principle of DOL Starter.

53. Why timer required in auto transformer and start delta types?

54. Magnetic locking phenomenon in synchronous motor and excitation method. Applications onboard

55. What is VFD?

56. Working principle of VFD.

57. Write down the main parts of AC motor & DC motor.

58. Why induction motor called asynchronous motor?

59. How does slip very with load?

60. What is the normal setting of overload relays?

61. Sometimes, when you change the running direction of a E/R blower (from supply to exhaust) it trips. Why?

62. Explosion proof motor and where it is used.

63. What is Fire class motors ?

64. Greasing of motor, how much greasing? What will happen if more greasing?

65. What is reducing voltage starter and how it is work?

66. Why auxiliary contact used?

67. What is the difference between starter and controller?

68. How to measure fuse rating of motor?

69. Why does vibration of motor occur?

70. Draw the power stages and efficiency of a motor.

71. What is back EMF and regenerative breaking?

72. What is IP rating on motor & how to get it?

73. Why use thermistor in motor?

74. Which type thermistor use in motor ?

75. Explain Starter maintenance?

7.0 DC MACHINE

1. Name some parts of a D.C motor. Principal of DC motor.

2. How many types of D.C motors are there? Is D.C motor an Induction motor?

3. Why a D.C motor take heavy starting current? how to reduce the starting currentof a

D.C motor?

4. On which factors does back E.M.F depend? What is commutator? why it is usedin D.C motor?

5. Why in some A.C motor we also have commutator?

6. Why speed remains almost constant in a shunt D.C motor?

7. Why a series D.C motor never to be started without any load?

8. Why a shunt D.C motor does not start with dangerously high speed?

9. What is a four point starter? what are the points?

10. Draw and describe the thyristor control of DC motor speed?

11. What is WARD-LEONARD method?

12. What are the applications of D.C motors in ship?

13. What is an universal motor? what are the main advantages of it?

14. What are appliances used onboard ship with D.C motor?

15. How will you determine the force's direction in a D.C motor?

16. What is critical field resistance?

17. What is over, flat and under-compounding?

18. What is diverter and how it is working?

8.0 MAIN ENGINE & MAIN ENGINE SAFETIES

1. What are the Main Engine safety devices?
2. Why main engine slow down occur and shutdown occur?
3. How slow down process is activate?
4. What pressure required for start main engine?
5. What are the safety interlocks are arrange for main engine?
6. Describe Engine governing system.
7. Describe Engine control system.
8. Describe engine safety system.
9. How to test temperature sensor is good or not?
10. How to test pressure transmitter sensor is good or not?
11. Working principle of Proximity sensor used for Main engine speed counting.
12. What are the maintenance of Speed sensor as an ETO?
13. In which method speed sensor calculate speed?
14. How to test fuel oil leakage alarm?
15. How to test Engine over speed alarm.
16. Why shaft grounding is important?
17. Maintenance of Shaft grounding system.
18. What are the Safeties ER overhead cranes?
19. Draw ER overhead crane diagram.
20. What is OMD?
21. What is the regulation for OMD?
22. Explain Working principle of OMD with diagram.
23. How to test oil mist detector?
24. Explain OMD maintenance.
25. Why use OMD?
26. What is your action if OMD alarm rise. Or, what are immediate step should taken if OMD alarm rise.
27. How does oil mist eliminator work and how does oil mist lubrication work?

28. What is Controllable pitch propeller and Fixed propeller system?
29. What is diesel electric propulsion system?
30. What is ringer?
31. What is engine order telegraph?

9.0 STEERING GEAR

1. What is steering gear?
2. Why use steering gear onboard?
3. What is the SOLAS regulation of Steering gear?
4. How many Types of steering gear use in ship and their working principle.
5. What is hunting gear?
6. What are the safeties are fitted in Steering gear system?
7. What are the indications of air in steering gear system?
8. How to check phase failure alarm?
9. What you will check in steering gear system before departure?
10. What are the daily inspections of Steering gear as an ETO?
11. What are weekly and 3 monthly maintenance you should carry out?
12. What is ward Leonard system?
13. What is hydraulic lock?
14. What are the reasons for hydraulic lock?
15. How to recover the system from hydraulic lock?
16. How to test hydraulic lock alarm?
17. Steering gear doesn't respond the command what are the possible reasons?
18. What is FU & NFU mode?
19. What do mean by 200% insulation of steering gear motor?
20. What are Critical spares for steering gear?
21. Draw the block diagram of steering motor power supply system and describebriefly.

22. Does steering motor have over current protection?

23. Draw the control circuit diagram of steering motor and describe briefly.

24. Why the steering test rudder angle 35 degrees to 35 degrees maintain? How many types of steering systems are there?

10.0 COMPRESSED AIR SYSTEM

1. What is the function of main air compressor?
2. Working principle of air compressor?
3. SOLAS Regulation for Air compressor.
4. What is deck air compressor?
5. What Emergency air compressor?
6. Draw and describe auto control circuit system of main Air compressor motor.
7. Draw power circuit diagram of main air compressor and describe briefly.
8. What is unloaded solenoid?
9. Describe Working principle of unloader.
10. Write down the name of main air compressor safety devices.
11. What is staring air and control air?
12. Write down the use of staring and control air.
13. What is air drier?
14. Describe the working principle of air drier.
15. Why it is use?
16. What is the importance of air drier?
17. What will happen is air drier not in operation?
18. What maintenance you should carried out in air drier?

11.0 BOILER

1. Write down the function of boiler describes?
2. What is the name of Boiler insulation material?

3. Why FD Fan Damper required adjusting?

4. What is the reason some times hunting boiler steam pipes?

5. Draw & explain boiler power circuit diagram.

6. Draw and explain Boiler stem control circuit diagram.

7. Draw and explain Boiler water control circuit diagram

8. Draw and explain Boiler Air fuel ratio control circuit diagram.

9. What are the sensors are used in boiler and How to clean a boiler?

10. How to check flame eye, boiler firing circuit, adjustment of sparking plug and ignition transformer?

11. What are the safeties are fitted in boiler system?

12. How to check boiler Water level HL and LL alarm?

13. Boiler not starting what should need be check by sequence as an ETO?

14. Boiler water level DP cell working principle. How to calibrate?

15. Explain fire sequence of boiler.

16. Explain boiler safety interlock.

17. Manually/ Emergency staring procedure of Boiler.

18. Why boiler relief valve setting is lower than safety valve?

12.0 INCINERATOR

1. What is the function of incinerator described briefly?

2. Regulation of incinerator.

3. What kind of burner use in marine vessel?

4. Write down the incinerator safety and shutdown alarms.

5. What kind of wastes can be incinerated?

4. Explain advantages of incinerator.

5. Draw an Incinerator electrical firing circuit diagram &explain.

6. How much voltage of ignition transformer?

7. Which things are can't burn in incinerator?

13.0 HVAC & REFRIGERATION

1. What is HVAC/AC plant?

2. Write down working principle of A.C plant? Draw the air conditioning cycle diagram.

3. Starting & stopping procedure of A.C plant.

4. What are the safety devices are fitted in HVAC?

5. Draw the power circuit diagram of ac plant and describe briefly.

6. How many types of Air conditions are used onboard?

7. Where use package AC?

8. Why ECR have separate air conditioning system?

9. What is your responsibility if ECR AC is not working? What is your action if can't repair for spare parts during sailing?

10. What is AHU? AHU maintenance.

11. What is relative humidity?

12. What is Superheat, Saturated & sub cold temperature?

13. What is psychometric chart? What is represented by this?

14. How to control humidity?

15. What is BTU?

16. Why air condition capacity represented by TON? What is the value of One ton in HVAC system?

17. How much temperature and RH is comfort to human body?

18. What is the characteristic of refrigerant?

19. Why Ammonia and CO2 not use as refrigerant in ship?

20. What is critical temperature?

21. Oil charging procedure refrigeration system.

22. When you will change oil of compressor?

23. Oil changing procedure.

24. What is reed valve?

25. What is oil differential pressure?

26. Refrigerant charging procedure.

27. How you will understand present of air in system?

28. What is purpose of Refrigeration system?

29. Working principle of refrigeration system with diagram.

30. Draw A typical power and control circuit diagram of refrigerator system

31. What are the safeties are fitted in refrigeration system?

32. What you will check in refrigeration system during safety round as an ETO?

33. What is defrosting? What is the purpose of a defrost cycle in a refrigeration system?

34. What is the function of accumulator?

35. Why use oil separator and why it is necessary?

36. Why ice formations in evaporator explain possible causes and its effect?

37. How you will understand there is a leakage in system and how you will find out?

38. Maintenance of refrigeration system?

39. What is your responsibility before taking provision and after taking provision?

40. Which alarm you should check in Provision chamber?

41. What is thermal expansion valve ad its working principle?

42. What you need to know before order TXV for your system?

43. How you will know your TXV is defective? What are the signs?

44. TXV replacement procedure.

45. Difference between solenoid valve and Thermal expansion valve? Why use both valves in same line?

46. What is drier? Why use drier?

47. Types of drier.

48. How you will understand drier is dirty? Drier replacement procedure.

49. What is short cycling? Why it happens and how to rectify?

50. Possible causes for temperature too high.

51. Possible causes for high discharge pressure.

52. Possible causes for low discharge pressure.

53. Possible causes for high suction pressure.

54. Possible causes for low suction pressure.

55. Why Compressor doesn’t attain design speed?

56. What you will check if compressor doesn’t start?

57. How many types of compressor are uses in HVAC and Refrigeration system?

58. How you will check domestic fridge /reciprocating single phase compressor is good or defective?

14.0 MISCELLANEOUS MACHINERIES AND EQUIPMENTS

1. What is ICCP?
2. Describe Working principle of ICCP with diagram.
3. What is the role of magnetic amplifier in cathodic protection?
4. What is the role of reference anode in ICCP?
5. What is MGPS/ICAF system?
6. Describe Working principle of MGPS/ICAF with diagram.
7. What is purifier?
8. What are the safeties are arranged in purifier?
9. What maintenance you should carry in purifier system as an ETO?
10. What is FWG system?
11. Describe Working principle of FWG system with diagram.
12. Describe Working principle of salinometer with diagram.
13. Describe Working principle of fresh water hydrophore system.
14. What is Ballast water management system (BWMS)?
15. What is Ballast Water treatment System (BWTS)?
16. Describe working principle of BWTS with block diagram.
17. What maintenance you should carried out in BWTS?
18. Describe Working principle of gas analyzer with diagram?

19. What you will check if low insulation from galley?

20. What you will check if hotplate or electric heater oven not working in galley?

21. Why use Capacitor in florescent lamp?

22. Why use Igniter in sodium lamp?

23. Why use choke on lighting system?

24. What is bow thruste?

25. What is OWS?

26. OWS regulation.

27. Working principle of OWS?

28. OWS alarm testing procedure.

29. What you will maintenance in sewage system?

15.0 BRIDGE EQUIPMENTS

1. What is bridge control console (BCC)?

2. Write down the names of BCC equipment.

3. Write down the communication equipment used in marine vessel and write briefly

4. Which equipment very important for effective communication system?

5. What is the importance of marine communication system?

6. What are the internal and external communication on board and describes therepower system?

7. Write down the radio equipment used in marine vessel

8. How does an echo sounder work?

9. Draw an antenna arrangement of a ship.

10. What is RADAR?

11. Working principle of RADAR with block diagram.

12. Why two types of RADAR is needed?

13. What is magnetron and its function?

14. What are the four main parts of radar?

15. Which waves are used in radar?

16. What kind of motor use in X band And S band RADAR?

17. What is GMDSS?

18. Write down the function of GMDSS equipment describes briefly.

19. Explain GMDSS load test Procedure.

20. What is the regulation for GMDSS battery?

21. Where is the location of GMDSS antenna?

22. What is Global Positioning System (GPS)? Write down basic principle of gps andwrite down the types of Global Positioning System (GPS).

23. What is AIS and function of it?

24. What is the difference between Gyrocompass and magnetic compass?

25. What is NAVTEX.

26. What is VDR?

27. Why use VDR in ship?

28. What is LRIT?

29. What is Speed Log?

30. What is PA system?

31. What you will check if general alarms not generate in auto mode by PA system?

32. What is anemometer?

33. What are the angles of PORT, STBD and STERN light view?

34. What is the function of navigation light? Draw the circuit diagram and explain andhow to check navigation light.

35. What is the function of Xmas TREE light?

36. What signaling projector draws the electrical diagram and describe briefly.

37. What is ALDIS lamp and why use?

38. Which type of battery use for ALDIS lamp?

39. How many types of repeater used in marine in marine vessel.

40. How to check/adjust gyro repeater and alignment of repeater.

41. What is BNWAS?

42. Why BNWAS is important?

16.0 BATTERIES

1. How does a lead acid battery work?

2. What is hydrometer? What is specific gravity? How voltmeter can be used to get the state of charge of the battery?

3. Difference between Hydrometer & Hygrometer.

4. What are the problems of battery (Lead Acid) and what are the remedies?

5. What precautions should be taken before entering the battery room and using the battery room gadgets?

6. What is cold cranking amperes (CCA) and Marine cranking ampere (M.C.A) of a battery?

7. How can you tradeoff between voltage level and back up capacity?

8. Why never to use different size cables in parallel while cranking a starter motor?

9. What happens to both battery and starter motor of engine if motor kick is stuck?

10. Write down the purpose of lead acid battery and why lead acid battery used onboard vessel? Write down the main parts of batteries.

11. Write down the Maintenance of lead acid battery.

12. Write down the battery charging system.

13. What is special charge of the battery?

14. Draw the diagram of trickle charge and describe.

15. How many types of charge?

16. Draw a circuit diagram of battery charger and describe briefly.

17. Describe the safety procedure when working in battery room.

18. Draw the diagram of bridge rectifier and describe.

19. Draw the diagram of Emergency battery charger and describe.

20. Draw the diagram of battery charging from a direct current supply.

21. Draw the diagram of Nickel-cadmium cell write down the simplified equation.

22. Draw the diagram of lead acid cell and write down the name of components.

23. What is the procedure of battery installations and there safety measures.

24. What is topping up of battery and what is the ratio when making electrolyte whatis safety procedure explain.

25. What are the main safety requirements of the battery charging room and how you handle safety battery?

26. Battery room entry procedure.

27. Why ventilation required. From where does gas produce in battery room?

28. What is the different between life boat and GMDSS batteries?

29. GMDSS Battery Regulation.

30. How will you know battery fully charged?

31. What you will check if Battery charging failure alarm rise?

32. Compare between lead acid and nickel-cadmium batteries?

33. Why is special lighting used in battery rooms?

34. How much voltages need to charge a set of battery of 24V?

17.0 FIRE ALARM

1. What is the function of fire Alarm on board ship and how many types of fire alarm sensor?

2. Draw the fire alarm circuit. Explain briefly onboard ship.

3. What are the basic Principles of fire protection? What is the safety on board ship?

4. How to check heat detector, flame detector and smoke detector sensor?

5. Write down the name of test equipment used on board.

6. What is testing kit?

7. Working principle of Smoke, flame and heat detector?

8. What is sprinkler / water mist system?

9. How to test water mist system?

10. What is MCP? How to test?

18.0 UMS

1. What is the function of UMS and describe briefly?
2. Regulation for UMS ship.
3. What are the criteria for UMS?
4. What is the most important requirement for (UMS) ship?
5. What is the preparation for UMS operation on ships (checklist).
6. Briefly Describe UMS ships alarm control system.
7. Explain unmanned machinery space operation onboard cargo ship.
8. Explain Alarm monitoring and control system on board vessel.
9. Write down Modern automation systems in engine room.
10. What is dead man alarm?
11. Mode of operation of UMS system?
12. What is pre-warning in dead man alarm?

19.0 CABELS

1. SOLAS regulation of electric cable.
2. What is Multi cable transit? what is bulkhead penetration?
3. What is cable termination and cable gland?
4. What type of cable should be used for fire detection system?
5. Which kind of cable use in hazardous area?
6. Which kind of cable is suitable for wet and damp location?
7. What is a cable tray? Why is it used in ship?
8. What is an armor/shield/screen? Why is it necessary?
9. What type of cable should be used for bridge equipment?
10. What is XLPE, PVC insulation?

11. Write down the Class of insulation and their temperature rating,

12. What is capacity of a 1x95 rm cable and 3x95 rm cable?

13. What are the limitations of cable capacity?

14. If the insulation of cable shows low resistance, what will you do to bring back the insulation strength?

15. Why flex cable carries more current than stranded being of the same dimension?

16. Why is a.c resistance higher than d.c resistance?

17. What is bending radius of a cable? Why should it be maintained below a certainlevel?

18. Difference between signal cable and control cable.

20.0 ELECTRIAL SAFETIES

1. What is work permit?

2. What is isolation permit?

3. What is work aloft permit?

4. What is enclosed space entry permit?

5. What safeties are ensuring before working on Main mast?

6. What safeties are ensuring before working on any electrical machine or equipment?

7. How you will check your tools before doing any electrical job? Why this necessary?

8. What is shock voltage and shock current? Why control voltage should be kept low?

9. What is R.C.B? How does it work?

10. What are the shock physiological effects?

11. Why earthing is necessary? Describe the earthing system.

12. What will you do if someone is electrocuted?

13. When working in main freeze compartment safety of personnel must be ensure.

14. When working in battery room and when working in cargo hold or any confined spaces.

15. What is explosion proof and Intrinsic Safety?

16. What is hazardous zone?

21.0 SURVEY RELATED

1. Write down the name of Electrical survey Equipment on board vessel.

2. Name what are the safety alarm and sensor must be ready/prepared before arrivalof surveyor during annual survey.

3. What you should prepare for surveyor before alternator survey?

4. What you should prepare for surveyor before Switchboard survey?

5. What you should prepare for surveyor before Emergency power and associate equipment survey?

6. What you should prepare for surveyor before insulation resistance survey?

7. What you should prepare for surveyor before navigation light survey?

8. What you should prepare for surveyor before Fire detection and firefighting equipment survey?

9. What you should prepare for surveyor before battery room survey?

10. Which files are you need to maintain for surveyor as an ETO?

11. What are the electrical CSM items on board and what are the electrical items outside CSM regime

22.0 CRANE

1. What is crane and why use this in ship?

2. Describe the function of crane.

3. How many types of crane use in ship?

4. Draw the power circuit diagram of Electric crane and explain briefly.

5. Draw & describe the hydraulic power circuit diagram and Write down the main part hydraulic crane.

6. What safeties are arranged in crane?

7. What you will check if crane motors are not working?
8. What is rocking test?
9. Explain the procedure of rocking test?
10. How much value is acceptable for rocking test?
11. What is load test and load test procedure?
12. What maintenance you should carried out in crane as an ETO?

23.0 TANKER (IGGS,FRAMO & Fixed gas analyzer system)

1. What is an Inert Gas or IG system?
2. What are the regulation for IGG system?
3. Describe working principle of IGG system with diagram.
4. What is your duties if you get one hour notice for IGG?
5. Describe IGGS starting procedure?
6. What are the safeties are arranged in IGG system?
7. Describe the alarm and trips of IGGS.
8. How to test alarm in IGGS?
9. Describe the auto firing sequence of IGGS.
10. What is Oxygen analyzer?
11. Working principle of Oxygen analyzer?
12. How to calibrate Oxygen analyzer?
13. Working principle of Oxygen sensing probe.
14. What you will do if Oxygen level increase or decrease?
15. What you will check if pilot or main burner not firing?
16. What is scrubber tower?
17. What is deck seal?
18. Why deck seal is important?
19. What is PV breaker?
20. What is atmospheric valve?
21. What are the requirements for Inert gas plant blower on tanker vessel?

22. What are regulations and requirements for I.G blower?

23. What is volatile organic compound (VOC) write-down there name describe briefly?

24. What is flue gas system?

25. What is FRAMO system?

26. Write down function of FRAMO system and main components of FRAMO system.

27. Draw and explain the power circuit diagram of FRAMO system.

28. Draw and explain the control circuit diagram of FRAMO system.

29. Describe FRAMO alarm and trips.

30. What is the entry procedure in PUMP room?

31. What is pump room interlock system?

32. What safety you should take before working in pump room?

33. What is ODME?

34. What you will maintenance in ODME system?

35. What is fixed gas analyzer system?

36. What you will maintenance in Fixed Gas analyzing system?

24.0 REEFER CONTAINER

1. What is reefer container and does it works describe briefly.

2. What is TEU?

3. Types of container ship depend on container capacity.

4. Types of reefer container.

5. What is chilled mode?

6. What is frozen mode?

7. What is Cold treatment mode?

8. What is super freezer mode?

9. What is Controlled atmosphere reefer and its working principle?

10. What is USAD?

11. Where are the Location of sensing (sensor 1,2 &3) probe in 20 & 40 feet container according to USAD?

12. Why defrost management is necessary?

13. Will defrost affect on cargo quality?

14. What is the function of data logger in reefer ?

15. What is ventilation in reefer and why need ?

16. How does incorrect ventilation affect on cargo?

17. What is PTI?

18. What is pre cooled in the term of reefer?

19. What is hot stuffing? How you will determine?

20. Write down the reefer cargo stuffing-pre-cooling treatment and handling of reefer container.

21. What is starvent?

22. What are the checks carried out after reefer loading at port?

23. What are the pre check carried out for controlled atmosphere (CA) reefer?

24. What is blast freezer?

25. How many type of reefer container used in merchant vessel and what type goods are carry?

26. Write down the reefer container monitoring system after receiving on board ship.What are the documentation maintain by electrical officer?

27. Write down if reefer container doesn’t give proper reading then what will be the action of electrical officer?

28. What are the refrigerant used reefer container white down there name?

29. Why reefer containers required special care for what factor/which important factor?

25.0 DIAGRAM LIST

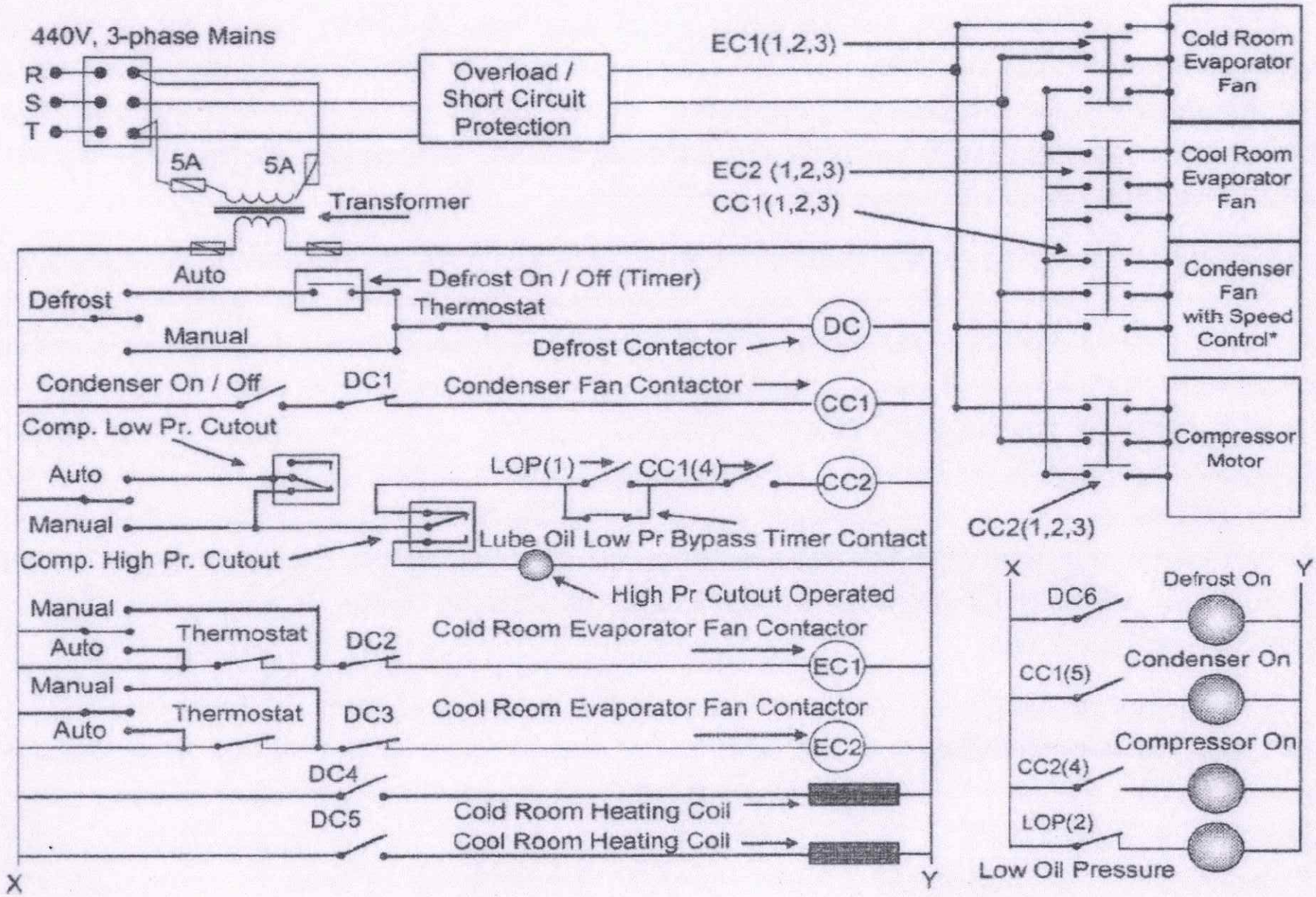
1. Insulated and non insulated system

2. Generator protection scheme

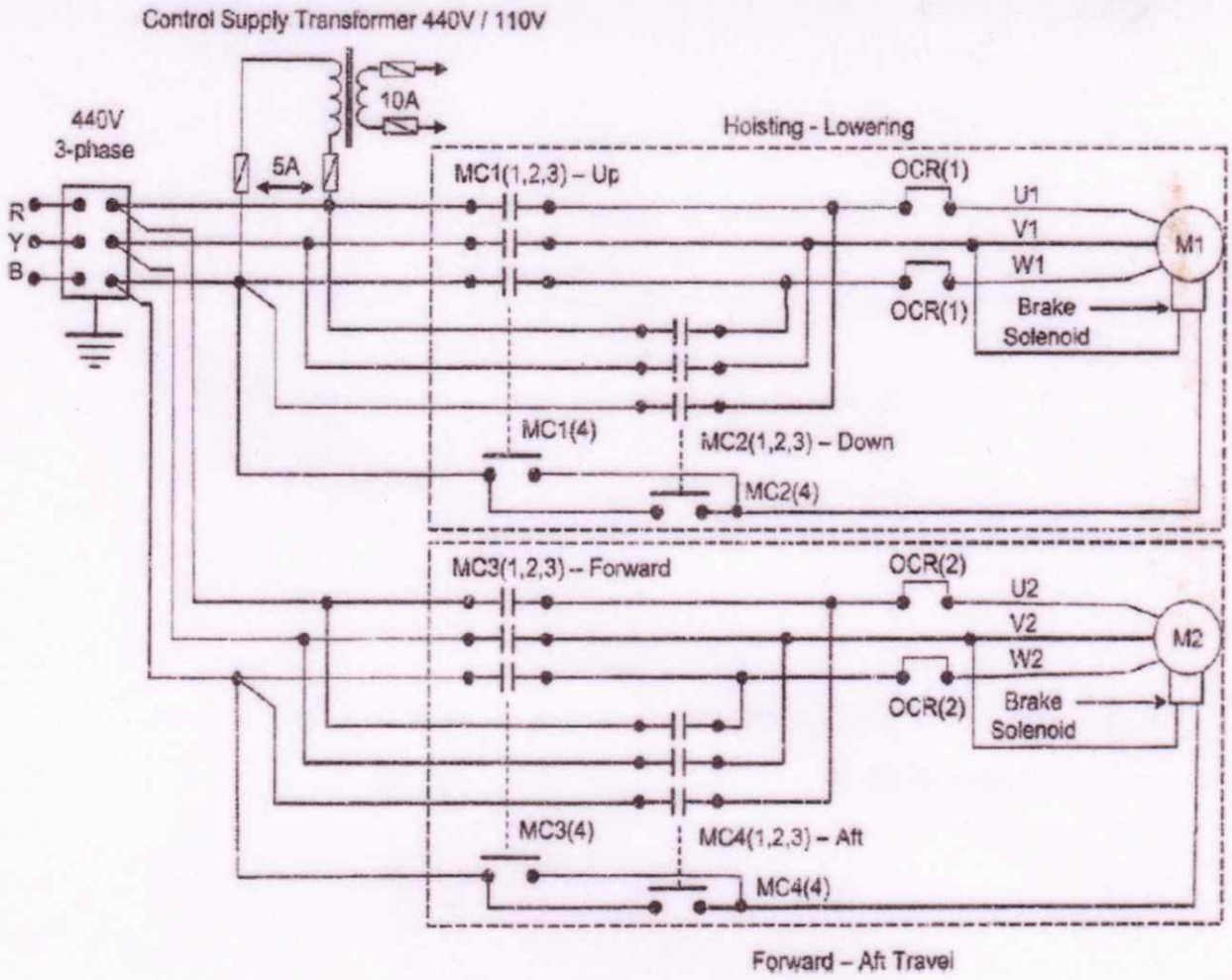
3. Insulation checking by lamp test

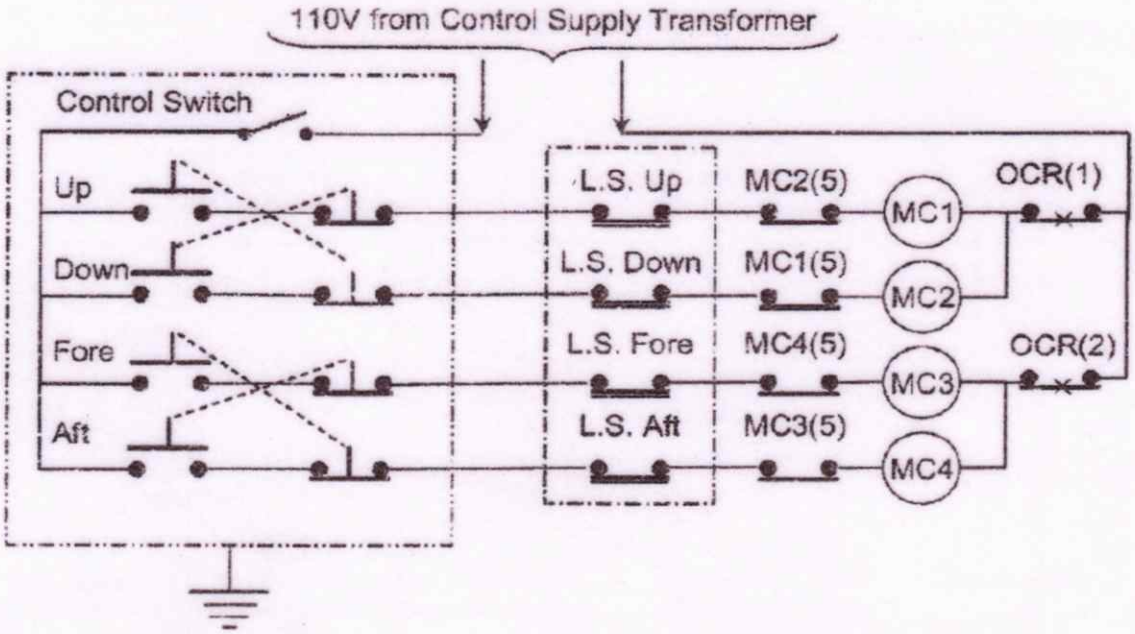
4. A typical Single line diagram of a ship

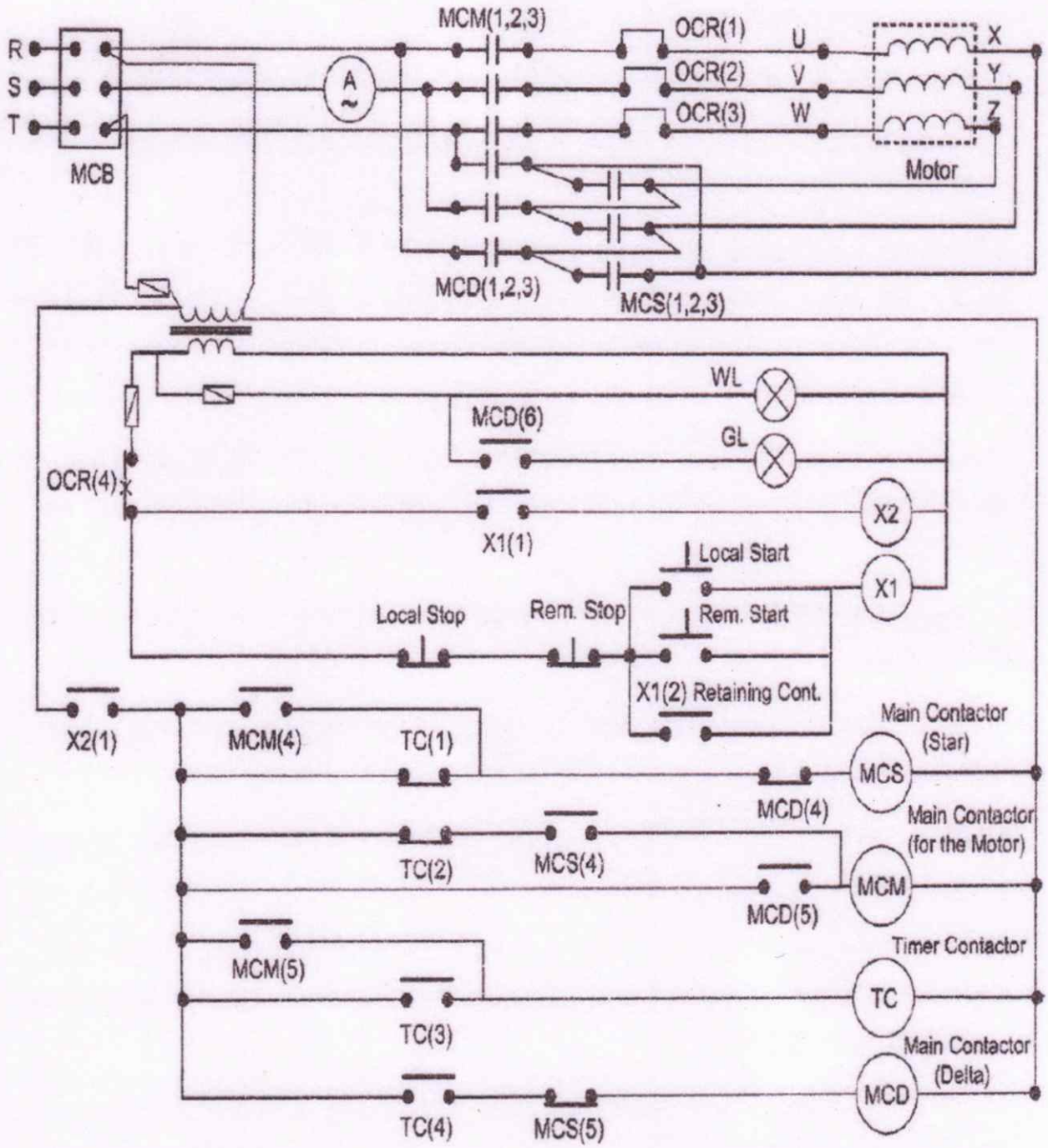
5. A typical single line diagram of an emergency switchboard
6. Antenna arrangement
7. Navigational lighting arrangement
8. Clamp on ammeter, (DC & AC)
9. Insulation testing process of a motor
10. Starter diagram: DOL/Reverse-Forward/Star Delta/DC 4 point
11. Ward Leonard system
12. DC series/Shunt motor
13. Brushless alternator
14. AVR diagram
15. Megger meter electrical diagram
16. Motor protection scheme
17. Typical Marine type Cable construction
18. H.R.C fuse
19. Shore connection board box
20. Parallel operation switchboard box
21. Typical marine electrical switchboard section
22. High voltage ship single line diagram
23. Refrigeration system
24. Governor (electronic) block diagram
25. Steering gear system diagram,
26. Hydraulic crane control diagram.
27. Battery charger circuit diagram.
28. An Inverter diagram.
29. E/R overhead crane diagram.
30. Power factor meter diagram.
31. Phase sequence indicator diagram.
32. Salinometer diagram.
33. ICCP control diagram.
34. Typical Refrigeration diagram.

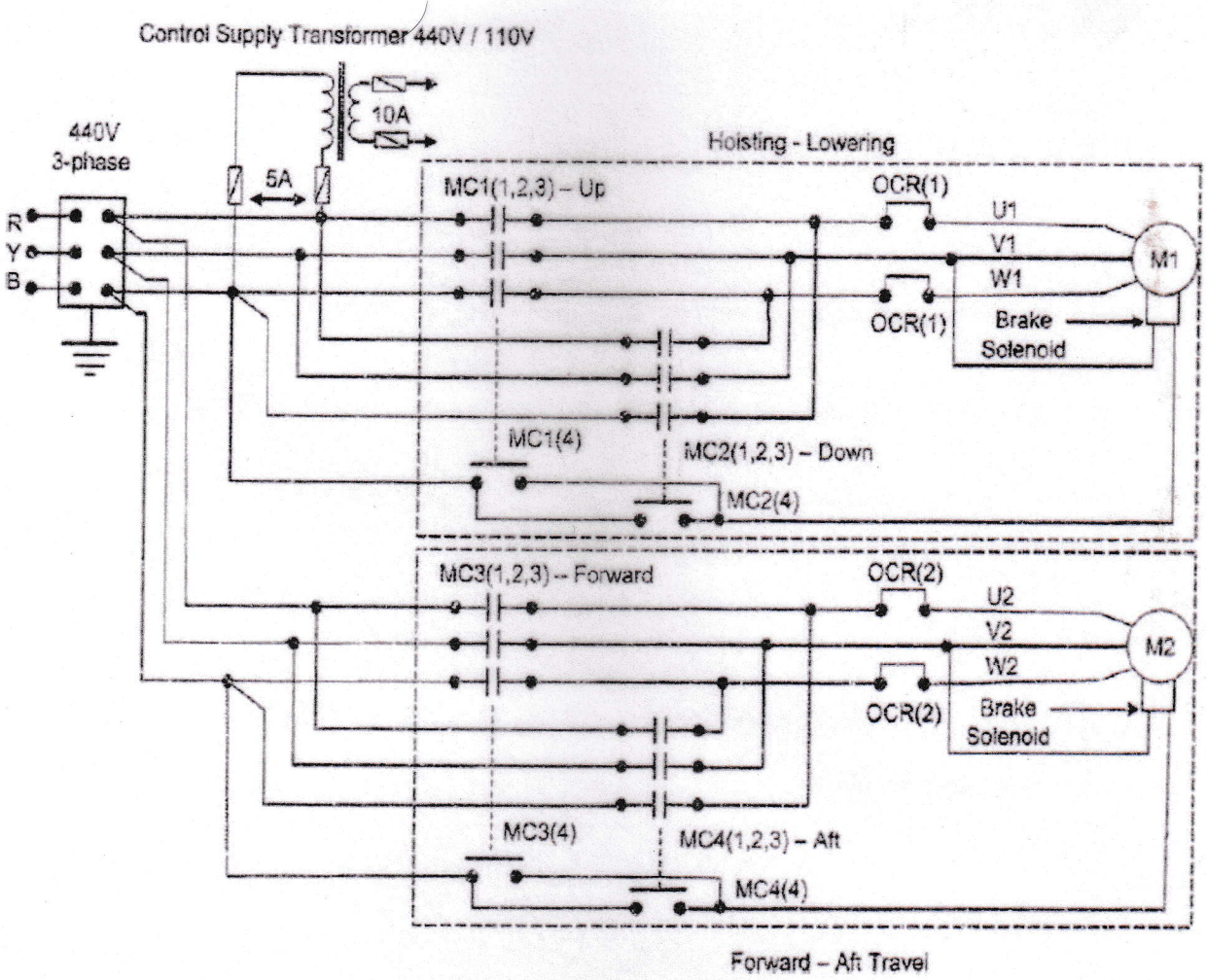


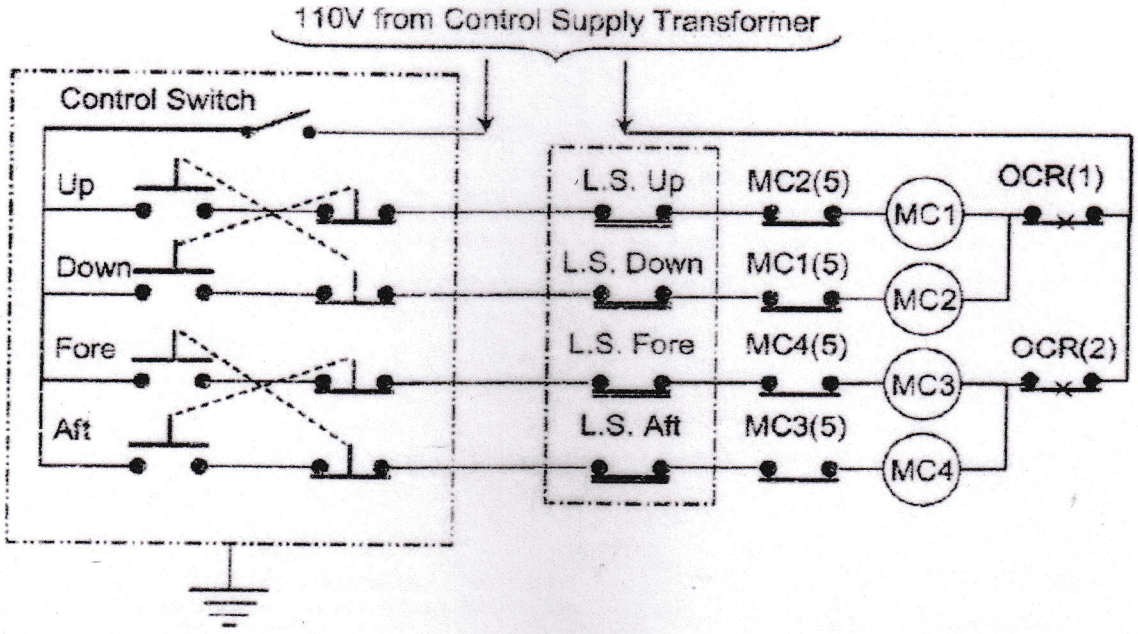
***Note:** Each motor in the circuit will have dedicated overload and short circuit protection*


Control Supply Transformer 440V / 110V
440V
3-phase
R
Y
B
5A
10A
Hoisting - Lowering
MC1(1,2,3) – Up
OCR(1)
U1
V1
W1
M1
OCR(1)
Brake
Solenoid
MC1(4)
MC2(1,2,3) – Down
MC2(4)
MC3(1,2,3) – Forward
OCR(2)
U2
V2
W2
M2
OCR(2)
Brake
Solenoid
MC3(4)
MC4(1,2,3) – Aft
MC4(4)
Forward – Aft Travel


110V from Control Supply Transformer
Control Switch
Up
Down
Fore
Aft
L.S. Up
L.S. Down
L.S. Fore
L.S. Aft
MC2(5)
MC1(5)
MC4(5)
MC3(5)
MC1
MC2
MC3
MC4
OCR(1)
OCR(2)


R
S
T
MCB
A
MCM(1,2,3)
OCR(1)
OCR(2)
OCR(3)
U
V
W
X
Y
Z
Motor
MCD(1,2,3)
MCS(1,2,3)
WL
GL
MCD(6)
OCR(4)
X1(1)
X2
X1
Local Start
Rem. Start
Local Stop
Rem. Stop
X1(2) Retaining Cont.
X2(1)
MCM(4)
TC(1)
Main Contactor (Star)
MCS
MCD(4)
TC(2)
MCS(4)
Main Contactor (for the Motor)
MCM
MCD(5)
MCM(5)
Timer Contactor
TC
TC(3)
Main Contactor (Delta)
MCD
TC(4)
MCS(5)


Control Supply Transformer 440V / 110V
440V
3-phase
R
Y
B
5A
10A
Hoisting - Lowering
MC1(1,2,3) – Up
OCR(1)
U1
V1
W1
M1
OCR(1)
Brake
Solenoid
MC1(4)
MC2(1,2,3) – Down
MC2(4)
MC3(1,2,3) – Forward
OCR(2)
U2
V2
W2
M2
OCR(2)
Brake
Solenoid
MC3(4)
MC4(1,2,3) – Aft
MC4(4)
Forward – Aft Travel


110V from Control Supply Transformer
Control Switch
Up
Down
Fore
Aft
L.S. Up
L.S. Down
L.S. Fore
L.S. Aft
MC2(5)
MC1(5)
MC4(5)
MC3(5)
MC1
MC2
MC3
MC4
OCR(1)
OCR(2)