MEO CLASS 2
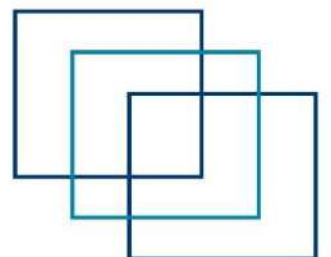# WRITTEN: MET
(MARINE ELECTRO TECNOLOGY)

FOR INDIAN COMPETENCY EXAM

JAN-2023

SECTION – I

Q1. 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 2023/JAN/Q1
Click Here to See the Answer

Q2. A. Describe a brush less alternator with a.c. exciter static A.V.R.; B. State the output voltage characteristics for this type of machine.
2020/NOV/Q5 2022/APR/Q4 2023/JAN/Q2
Click Here to See the Answer

Q3. With the aid of sketch describe the main features and principle of operation of a D.C. moving Coil meter. If such a meter is designed to give full scale deflection with 150 Ma, State how it May be adapted; (i) As an ammeter to read up to 150 A; (ii) As a voltmeter to read up to 150 V.; No calculations are required.
2023/JAN/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.
2020/NOV/Q2 2021/APR/Q4 2021/JUL/Q3 2021/SEP/Q5
2021/NOV/Q4 2022/APR/Q2 2023/JAN/Q4
Click Here to See the Answer

Q5. 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 2021/APR/Q5 2021/NOV/Q3 2021/DEC/Q4 2022/FEB/Q5 2022/JUL/Q4 2023/JAN/Q5
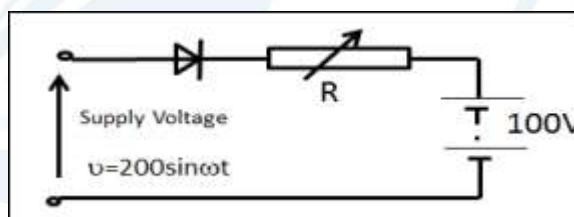
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SECTION – I

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/JUL/Q10 2023/JAN/Q6

Click Here to See the Answer

Q7. 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.
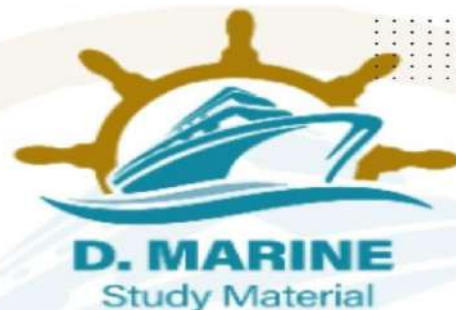

2021/MAR/Q8 2021/JUL/Q8 2021/SEP/Q9 2022/JUN/Q7 2022/OCT/Q7 2023/JAN/Q7

Click Here to See the Answer

Q8. A. Why is it important to maintain high efficiency of operation and low values of voltages regulation for power transformers? B. A 100 KVA transformer has 400 turns on the primary and 80 turns on the secondary. The primary and secondary resistances are 0.3 ⬜⬜ and 0.01 ⬜⬜ respectively, and

2

the corresponding leakage reactance's are 1.1 ⬚⬚ and 0.035 ⬚⬚ respectively. The supply voltage is 2200 V.
Calculate:

2021/MAR/Q8 2021/JUL/Q8 2021/SEP/Q9 2022/JUN/Q7
2022/OCT/Q7 2023/JAN/Q7

Click Here to See the Answer

Q9 (i) The equivalent impedance referred to the primary circuit;
(ii) The voltage regulation and secondary terminal voltage for full load having a power factor of
(a) 0.8 lagging and
(b) 0.8 leading.

2020/MAR/Q8 2022/OCT/Q8 2023/JAN/Q8

Click Here to See the Answer

Q9. A. List the factors that determine the starting torque of the three-phase induction motor. How does this torque generally compare with the value of the rated torque? B. The low-voltage release of an a.c. motor-starter consists of a solenoid into which an iron plunger is drawn against a spring. The resistance of the solenoid is 35 ohm. When connected to a 220 V, 50 Hz, a.c. 3supply 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.

2023/JAN/Q9
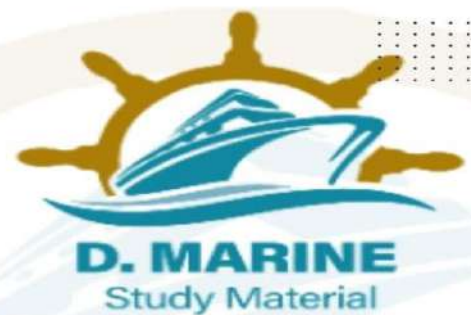
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Q10. A. With the aid of delta and star connection diagrams, state the basic equation from which delta – star – delta conversion equation can be derived. B. Three batteries A, B and C have their negative terminals connected together, between the positive terminals of A and B there is a resistor of 0.5 ohm and between B and C three is a resistor of 0.3 ohm, i. Battery A 105 V, Internal resistance 0.25 ohm' ii. Battery B 100 V, Internal resistance 0.2 ohm iii. Battery C 95 V, Internal resistance 0.25 ohm Determine the current values in the two resistors and the power dissipated by them.

2020/OCT/Q6 2023/JAN/Q10

Click Here to See the Answer

FEB-2023
SECTION – I

Q1. 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 2021/DEC/Q2
2023/FEB/Q1
Click Here to See the Answer

2. Diesel electric propulsion is now being chosen as the power plant for an increasingly wide variety of vessels. Sketch a simple layout of such an installation. Explain the advantages of selecting such a plant.
2023/OCT/03
Click Here to See the Answer

3. In a ship's power system, the neutral on the low voltage side is not grounded, but it is mandatory to ground the neutral in high voltage systems. Discuss in detail for the above difference and with suitable sketches, explain the different earthing arrangements for HV system.
2023/FEB/03
Click Here to See the Answer

4. Describe/troubleshooting the problems in a typical PLC based system taking care of the safety requirements. (Explain each test method according to various steps to be taken in serial order Including setting-up of any instrument to be used)
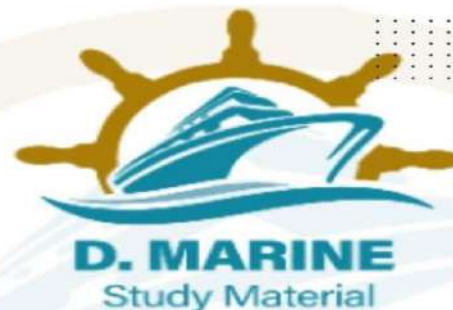**Click Here to See the Answer**

5.a) Sketch and describe the method of speed control of synchronous motors by variable frequency.
b) State the advantages of this method over the other methods of speed control.
Click Here to See the Answer

SECTION-II

6.a) Explain the applications of PN junction diode.

b) A full-wave, 1-phase rectifier employs a double diode valve, the internal resistance of each element of which may be assumed constant at 500 2. The transformer r. m. s. secondary voltage from the centre-tap to each anode is 300 V and the load has a resistance of 20002 Evaluate :-

(i) means load current.

(ii) r.m.s value of load current

iii) the d.c. output power

(iv) the input power to the anode circuit

(v) the rectification efficiency.

2023/FEB/06 2024/FEB/06

Click Here to See the Answer

7. a) What is back emf ? Derive the relation for the back emf and the supplied voltage in terms of armature resistance.

b) An 8 kw, 230 V, 1200 rpm dic. shunt motor has R, = 0.7 2. The field current is adjusted until, on no-load with a supply of 250 V, the motor runs at 1250 rpm and draws armature current of 1.6 amps. A load torque is then applied tot he motor shaft which causes I, to raise to 40 A and the speed falls to 1150 rpm. Determine the reduction in the flux per pole due to the armature reaction

2023/FEB/07 2024/FEB/07

Click Here to See the Answer

8.a) What are the factors which determine the synchronous speed of a motor?

b) The star-connected rotor of an induction motor has a stand-still resistance of 4.5 ohms/phase and a resistance of 0.5 Ω/phase. The motor has an induced emf of 50 V between the sliprings at stand-still on open circuit when connected to its normal supply voltage. Find the current in each phase and the power factor at start when the sliprings are short-circuited.

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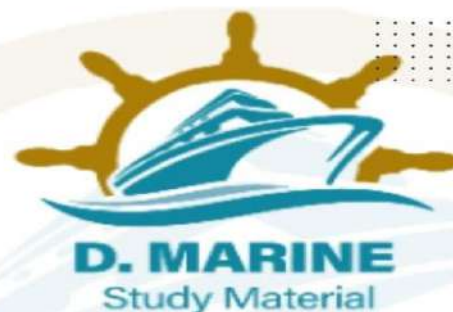
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9.a) Explain how drooping characteristics cater for stable operation when running in parallel.
b) Two shunt generators X and Y work in parallel. Their external characteristics may be assumed to be linear over their normal working range. The terminal voltage of X falls from 265 V on no load to 230 V when delivering 350 A to the bus bars, while the voltage of Y falls from 270 V on no load to 240 V when delivering 400 A to the bus bars. Calculate the current which each machine delivers when they share a common load of 500 A. What is the bus bar voltage under this condition and the power delivered by each machine?
2023/FEB/09 2024/FEB/09
Click Here to See the Answer

10. a) Describe how protection against short circuit is provided.
b) An eight-pole alternator running at a speed of 720rev/min supplies current to synchronous and Induction motors with forty-eight poles Calculate the frequency and speed of rotation of the motors if the induction motor runs with 2 per cent slip.
Click Here to See the Answer

MARCH – 2023

Q1. What is a marine high voltage system? Sketch and describe a shipboard high voltage switch board and its protective devices.
2023/MAR/01 2024/JUN/04
Click Here to See the Answer

Q2. What is soft starting of an Induction motor? Describe with a circuit using thyristors used for soft starting. Discuss its advantages and dis-advantages.
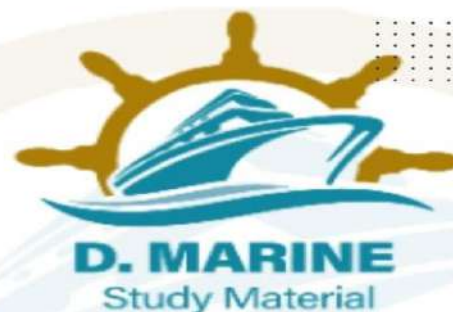**Click Here to See the Answer**

Q3. Differentiate between half and full wave rectification. State where half wave rectification may be used and the purpose for which it is not **well** adapted. Sketch a bridge connection by which full wave rectification may be obtained.
2023/MAR/03 2023/AUG/01 2024/JUN/05 2025/APR/01

Click Here to See the Answer

Q4 A. Describe with the aid of a simple sketch the arrangement of the threephase 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?
 2023/MAR/04 2023/AUG/02 2025/APR/02 2025/AUG/02 2025/NOV/02
Click Here to See the Answer

Q.5 Explain the effect of reduced voltage on standard cage motors with respect to EACH of the following:
(i) Burn out
(ii) Starting current
(iii) Starting torque
(iv) Speed.
2023/MAR/05   2024/OCT/04
Click Here to See the Answer

Q6 A. Describe the effect of the following loads on power factor: -
(i) Induction motors
(ii) Transformers
(iii) Partly loaded motors
(iv) Cage type motors. B. In a 50-Kav, star-connected, 440-V, 3-phase, 50-Hz alternator, the effective armature resistance is 0.25 ohm per phase. The. synchronous reactance is 3.2 ohm per phase and leakage reactance is 0.5 ohm phase. Determine at rated load and unity power factor: A) internal e.m.f Ea B) no- load e.m.f Eo C) percentage regulation on full - load D) value of synchronous reactance which replaces armature reaction.
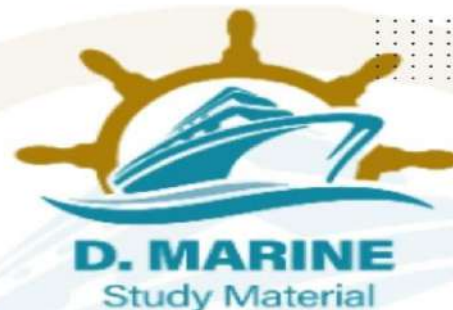2022/OCT/06 2023/MAR/06
Click Here to See the Answer

Q7 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.

2023/JAN/07 2023/MAR/07 2023/JUN/07 2024/NOV/07

Click Here to See the Answer

Q8 A. Why is it important to maintain high efficiency of operation? And low values of voltages regulation for power transformers? B. A 100 KVA transformer has 400 turns on the primary and 80 turns on the secondary. The primary and secondary resistances are 0.3 and 0.01 respectively, and the corresponding leakage reactance's are 1.1 and 0.035 respectively. The supply voltage is 2200 V. Calculate:
(i) The equivalent impedance referred to the primary circuit;
(ii) The voltage regulation and secondary terminal voltage for full load having a power factor of
(i) 0.8 lagging and
(ii) 0.8 leading.

2023/MAR/08 2023/JUN/08 2024/JUN/07 2024/AUG/07
2024/NOV/08 2025/OCT/08

Click Here to See the Answer

Q9 A. Explain the working principal of a 3-phase induction motor. What are the various types of rotors? B. An 18.65Kw, 6-pole, 50Hz, 3 phase slip ring induction motor runs at 960 rpm on full load with a rotor current per phase of 35A, allowing 1Kw for mechanical losses, find the resistance per phase of 3-phase rotor winding.
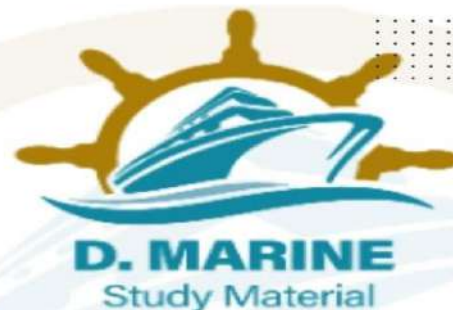
2023/MAR/09 2023/SEP/07 2024/MAR/07

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Q10 A. Which of the following three motors has the poorest speed regulation: shunt motor, series Motor or cumulative compound motor? Explain. B. A 440V shunt motor takes an armature current of 30A at 700 rev/min. The armature resistance is 0.7ohm. If the flux is suddenly reduced by 20 per cent, to what value will the armature current rise momentarily? Assuming unchanged resisting torque to motion, what will be the new steady values of speed and armature current? Sketch graphs showing armature current and speed as functions of time during the transition from initial to final, steadystate conditions.

APR– 2023

Q.1 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?
2023/APR/01 2024/JUL/01

Q2. 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.
2022/AUG/03 2022/OCT/02 2012/NOV/02 2023/APR/02
2024/JUN/02 2024/JUL/02

Q3 A. Explain how the efficiency and regulation of a transformer can be assessed by open circuit and short circuit tests? B. What is meant by equivalent resistance?
2024/JUL/03 2025/JAN/03 2025/JUN/03

Q4. With reference to a 3 speed a.c. cage motor driven cargo winch: A. Sketch a circuit diagram for a pole change motor; B. Describe how speed change and braking are achieved.
2023/APR/04 2023/JUN/04 2023/SEP/04 2024/JUN/03
2024/JUL/04 2025/JAN/04

Q5 With reference to the condition monitoring of electrical machinery: A. State TWO important parameters that may be recorded; B. Explain how the parameters are measured and what defects may be revealed
2022/OCT/05 **2011/FEB/05** **2023/APR/05** **2023/JUN/05** **2023/SEP/05**
Click Here to See the Answer

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.
2023/JAN/06 **2023/APR/06** **2023/JUN/06** **2023/OCT/06** **2024/JUL/06** **2024/NOV/06** **2025/OCT/06**
Click Here to See the Answer

Q7A. 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, mot three phase synchronous motor, d.c. motor. B. A 220 V, d.c. shunt motor has an armature resistance of 0.5 ohm and an armature current of 40 A on full load. Determine the reduction in flux necessary for a 50 % reduction in speed. The torque for both conditions can be assumed to remain constant.
2023/APR/07 **2024/JUL/07** **2025/JAN/07** **2025/SEP/07**
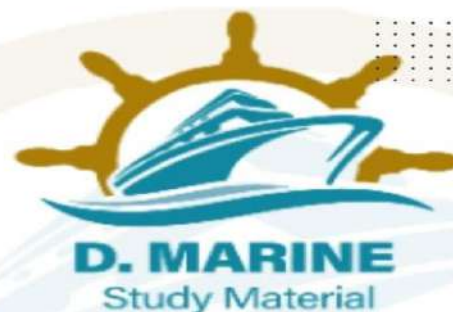**Click Here to See the Answer**

Q. 8A. Show how the power that is transferred across the air gap of the three-phase induction motor is represented. Explain the terms. What portion of this is useful power? B. A 440 load of 400 KW at 0.8 (lagging) power factor is jointly supplied by two alternator A and B. The KW load on A is 150 KW and the KVAr load on B is 150 KVAr (lagging). Determine the KW load on B, the KVAr load on A, the power factor of operation on each machine and the current loading of each machine.
2023/NOV/08
Click Here to See the Answer

Q9 A. Explain the preference for a 60 Hz system. Describe the dangers of running a 50 Hz system from a 60 Hz supply. (6) B. A 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 kilometer, 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/07 2022/APR/10 2023/APR/09 2024/JUL/09
2025/JAN/09 2025/JUN/09 2025/SEP/09
Click Here to See the Answer

Q10 A. (i) What is direct-connected alternator? (ii) How is a direct-connected exciter arranged in an alternator? 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 200V.
2024/JAN/10 2025/JAN/10 2018/AUG/10 2023/APR/10
2024/JUL/10 2025/JUN/10 2025/SEP/10
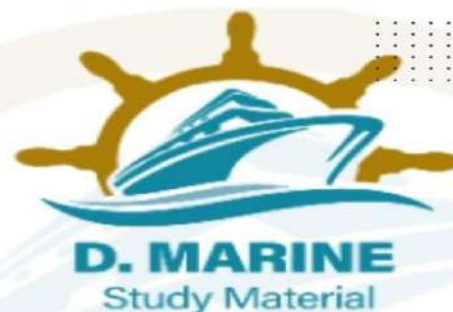**Click Here to See the Answer**

JUNE – 2023

Q1A. State the necessary conditions required prior to the synchronizing of electrical alternators. B. Describe the type of cumulative damage that may be caused when alternators are incorrectly synchronized C. Explain how the damage referred to in (b) can be avoided / reduced. D. For two alternators operating in parallel state the consequences of: (i) Reduced torque from the prime mover of one machine. (ii) Reduced excitation on one machine.
Click Here to See the Answer

Q2 In the event of a failure, of the main electrical power supply on a: ship, an emergency source of power must be available, state the circuits which must be fed from such a source and discuss the reasons governing the selection of such circuits.

2023/JUN/02 2023/SEP/02
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Q3. 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/01 2023/JUN/03 2023/SEP/03
Click Here to See the Answer

Q4 With reference to a 3 speed a.c. cage motor driven cargo winch: A. Sketch a circuit diagram for a pole change motor; B. Describe how speed change and braking are achieved.
2023/APR/04 2023/JUN/04 2023/SEP/04 2024/JUN/03
2024/JUL/04 2025/JAN/04
Click Here to See the Answer

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2022/OCT/05 2011/FEB/05 2023/APR/05 2023/JUN/05
2023/SEP/05
Click Here to See the Answer

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2021/NOV/06 2022/FEB/08 2022/MAR/09 2022/JUN/06
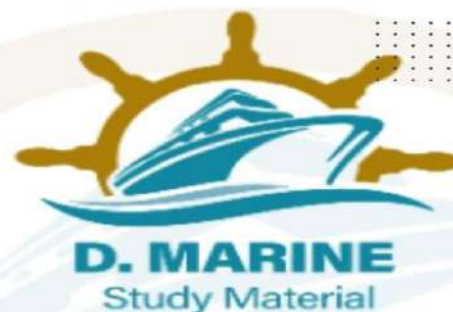2021/JUL/10 2021/SEP/06 2023/APR/06 2023/JUN/06
2023/OCT/06 2024/JUL/06 2024/NOV/06 2025/OCT/06
Click Here to See the Answer

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2023/JAN/07 2023/MAR/07 2023/JUN/07 2024/NOV/07
Click Here to See the Answer

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(i) 0.8 lagging and
(ii) 0.8 leading.

2023/MAR/08 2023/JUN/08 2024/JUN/07 2024/AUG/07
2024/NOV/08 2025/OCT/08
Click Here to See the Answer

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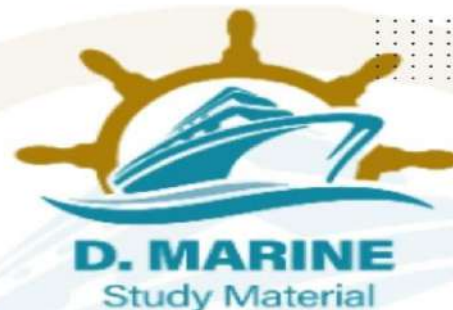
2023/JAN/09 2023/JUN/09 2023/OCT/09 2024/JUN/08
2024/AUG/08 2024/NOV/09 2025/OCT/09
Click Here to See the Answer

JULY – 2023

Q1. Differentiate between squirrel cage and wound rotor motor of the three phases: a.c. induction. In respect of the following;
A. Rotor construction
B. Torque characteristic
C. Speed variation.
2023/JUL/01 **2023/DEC/01** **2024/APR/01**
Click Here to See the Answer

Q2 With reference to an emergency source of electrical power in cargo ships:
A. Describe a typical power source. B. Give a typical list of essential services, which must be supplied simultaneously C. Explain how the emergency installation can be periodically tested.
2023/JUL/02 **2023/OCT/04** **2023/DEC/02** **2024/APR/02**
Click Here to See the Answer

Q3. The direct online start of squirrel cage motor is used for most electrical drives on a.c. powered ships. Describe with sketches as necessary one method of overcoming each of the following Problems: A. High starting current B. Low starting torque.
2023/JUL/03 **2023/OCT/05** **2023/DEC/03** **2024/APR/03**
Click Here to See the Answer

Q4.A.(i) Discuss the various hazards and problems which are associated with electric cable Insulation in the event of fire. (ii) Suggest remedies for these problems. B. State how the spread of fire may be reduced by the method used for installing electric cables.
2023/JUL/04 **2023/DEC/04** **2024/APR/04**
Click Here to See the Answer

Q5.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?
2023/JUL/05 **2023/DEC/05** **2024/APR/05**
Click Here to See the Answer

Q6.A. What are the characteristics of PN junction diode? Point out its specifications. Also point out the significance of dynamic and static resistances. B. Draw the circuit of Half-wave rectifier and its output waveform. A diode whose internal resistance is 20 is to supply power to 1000 load from 110 V (RMS) source. Calculate (I) peak load current (II) Dc load current (III) AC load current.

2023/JUL/06 2023/DEC/06 2024/APR/06
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

2023/JUL/07 2023/DEC/07 2024/APR/07
Click Here to See the Answer

Q8 A. What is a commutator? Discuss its rectifying action in detail. B. Calculate the e.m.f. generated by a 4-pole, wave wound armature having 40 slots with 18 conductors per slot when driven at 1000 r.p.m. The flux per pole is 0.015 wb.

Click Here to See the Answer

Q9.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.
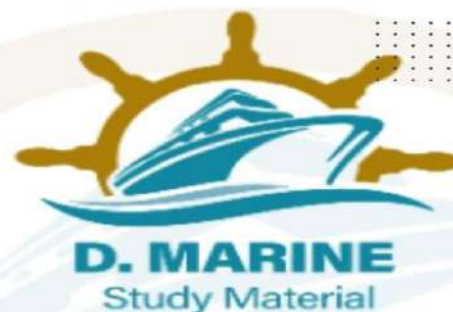
2023/JUL/09 2023/DEC/09 2024/JAN/07 2024/APR/09
Click Here to See the Answer

Q10.A. Why is a synchronous motor not self-starting? What are the various ways in which it can be started? B. A 500V, single phase synchronous motor gives a net output mechanical power of 7.46kW and operates at 0.9 power factor lagging. Its effective resistance is 0.8. If the iron and friction losses are

500 w and excitation losses are 800w, calculate the armature current and the commercial efficiency.

2023/JUL/10 2023/DEC/10 2013/APR/10 2024/APR/10

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AUG-2023

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

2023/MAR/03 2023/AUG/01 2024/JUN/05 2025/APR/01

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2.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.

2023/MAR/04 2023/AUG/02 2025/APR/02 2025/AUG/02
2025/NOV/02

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3.a) State the necessary conditions required prior to the synchronizing of electrical alternators.
b) Describe the type of cumulative damage that may be caused when alternators are incorrectly synchronized.
c)Explain how the damage referred to in (b) can be avoided/reduced djFor two alternators operating in parallel state the consequences of:
(i) Reduced torque from the prime mover of one machine.
(ii) Reduced excitation on one machine.

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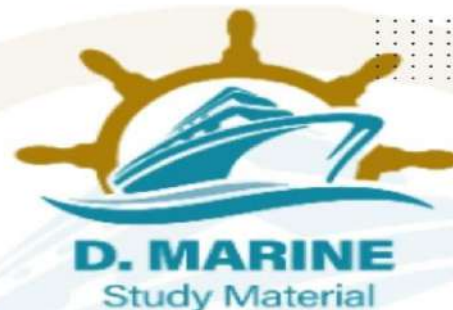
4. a) What is intrinsic electric safety?
b) Can live maintenance be done on intrinsically safe circuits?
c) Describe intrinsically safe equipment used on tioard ship

2023/AUG/04 2025/APR/04 2025/AUG/04 2025/NOV/04

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5.a) (i) Sketch a diagrammatic arrangement of a static or self-excited alternator
(ii)Describe the operation of the self-excited alternator.
b) State why the voltage dip is less in the self-excited alternator than in brushless or conventional alternators.
Click Here to See the Answer

SECTION - ll

6.a) What are the factors on which the speed of a motor depends? Discuss them for series and shunt motors.
b) A shunt motor supplied at 230 V runs at 900 rpm. When the armature current is 30 A, the resistance of the armature circuit is 0.40, calculate the resistance required in series with the armature circuit to reduce the speed to 500 rpm. Assume that the armature current is 25 Amps.
Click Here to See the Answer

7.a) Derive an expression for the emf induced in an ac. generator.
(b) A 3000 KVA, 6-pole alternator runs at 1000 rpm. In parallel with other mactunes on 3300 V bus-bars. The synchronous reactance is 25%. Calculate the vynchronizing power for one mechanical degree of deplacement and the corresponding Synchronizing torque.
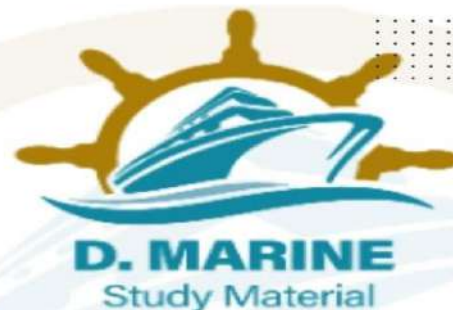**Click Here to See the Answer**

8.a) Explain the purpose of interpoles and state their magnetic polarity relative to the main poles of both generators and motors.
b) A 200V, long-thunt compound wound generator has a full-load output of 20kW. The various resistances are as follows, armature (including brush contact) 0.15 otum, series fleid 0.025ohm, interpole field 0028ohmshunt field (including the field-regulator resistance 115ohm The won losses at full load are 780W, and the friction and windage insses 550W Calculate the efficiency at full load.
 2022/AUG/09 2022/SEP/09 2023/AUG/08 2024/JAN/09 2025/APR/08
Click Here to See the Answer

9 a) What are the factors which determine the synchronous speed of a moter?
b)A 72 AVA transformer supplies (a) a heating and lighting load of 12 kW at sinity power factor (b) a motor load of 70 kVA at 0 766 (lagging) power factor.
Calculate the minimum rating of the power factor improvement capacitors which must be connected in the circuit to enture that the transformer does not become overloaded.
Click Here to See the Answer

10.a) Compare the effectiveness of a current limiting circuit breaker with that of a HRC fuse.
b) Evaluate for a frequency of 15 kHz, the amplification and the phase difference between input and output signals of a voltage amplifier using a triode having an amplification factor of 48 and a mutual conductance of 1.2 mA/V with an anode-load resistant of 160 KΩ. The output p. d. is fed by a coupling capacitor of negligible reactance to a subsequent circuit of resistance 480 k and the total shunt capacitance is 90μ F.
2023/AUG/10 | 2025/APR/10 | 2025/AUG/10 | 2025/NOV/10
Click Here to See the Answer

SEP-2023
SECTION-1

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2023/JUN/01 | 2023/AUG/03 | 2023/SEP/01 | 2024/OCT/03
2025/APR/03 | 2025/AUG/03 | 2025/NOV/03
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2. in the event of a fature of the main electrical power supply on an emergency souter of power must be available State the which must be fed

from such a source and discuss the reinos governing the selection of such circuits.

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3.With reference squirrel cage induction, electric motors a) Describe the constheition of such a motor b) Sketch the torque against speed curve of such a motor. c) Describe a method employed by a retrofitted deve es to improve the part load reperformance of an induction motor.

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4. With reference to a 3 speed a.c. cage motor driven cargo winch: a) Sketch a circuit diagram for a pole change motor b) Describe how speed changes and braking are achieved.

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5. With reference to the condition monitoring of electrical machinery a) State TWO important parameters that may be recorded b) Explain how the parameters are measured and what defects may be revealed.

2022/OCT/05 2011/FEB/05 2023/APR/05 2023/JUN/05
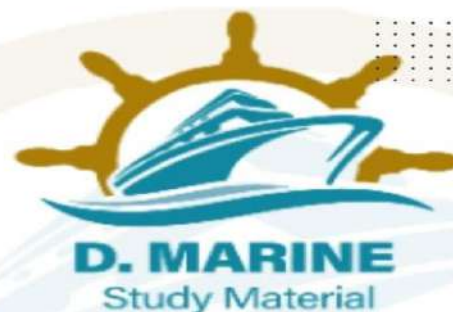2023/SEP/05

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6.a) A series circuit having resistance, inductance and capacitance is to be operated on a constant voltage supply of available frequency. Indicate graphically how change takes place in the current and voltage in resistance, inductance and capacitance, and also capacitive reactance and inductive reactance. b) A resistance of 130 Q and a capacitor of 30 μF are connected in parallel across a 230volt, 50 Hz supply. Find the current in each component, total current, phase angle and the power consumed.

Click Here to See the Answer

7.a) Explain the working principle of a three-phase induction motor. What are the various types of rotors? b) An 18.65 KW, 6-pole, 50 Hz, 3-4 slip-ring

induction motor runs at 960 rpm on full load with a rotor current per phase of 35 A. Allowing 1 KW for mechanical losses, find the resistance/phase of 3-phase rotor winding.

2023/MAR/09 **2023/SEP/07** **2024/MAR/07**
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8.a) What is direct-connected alternator? (i) How is a direct connected exciter arranged in an alternater? b) 12-pole, 3-phase, delta connected alternator runs at 600 rev/min and supplies a balanced star-connected load Each phase of the load is a call of res stance 35 ohm and inductive reactance 25 ohm. The line tensional vantage of the alternator is 440V, Determine
(i) frequency of supply.
(ii) current in each coil,
(iii) current in each phase of the alternator,
(iv) total power supplied to the load.
Click Here to See the Answer

9.a) Sketch a graph of starting current and torque against the speed of rotation for a single cage motor. b) A 230V motor, which normally develops 10kW at 1000 rev/min with an efficiency of 85 percent, is to be used as a generator. The armature resistance is 0.15 ohm and the shunt field resistance is 220ohm. if it is driven at 1080 rev/min and the field current is adjusted to 1.1A, by means of the shunt regulator, what output in kW could be expected as a generator, if The armature copper loss was kept down to that when running as a motor?
2023/SEP/09 **2024/MAR/09**
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10.A) Compare the effectiveness of a current limiting circuit breaker with that of a HRC fuse. b)A coil having a resistance of 10Ω and an inductance of 0.15 His connected in series with a capacitor across a 100 V, 50 Hz supply. If the current and the voltage are in phase what will be the value of the current in the circuit and the voltage drop across the coil?
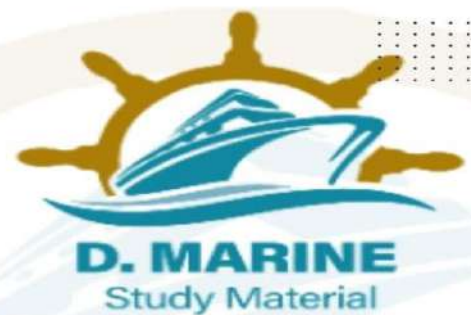**2023/SEP/10** **2024/MAR/10** **2024/JUN/10** **2024/AUG/10**
2024/SEP/10 **2025/MAR/10**
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OCT – 2023

Q.1With 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?
2023/FEB/03 2023/APR/03 2023/JUN/03 2025/SEP/03 2025/NOV/03
Click Here to See the Answer

Q2With reference to electronic control systems A. Draw a simple block diagram for temperature control B. Describe each component shown in the diagram in.
2023/OCT/02 2024/JAN/05 2024/MAR/02 2024/JUN/01 2024/AUG/03 2024/OCT/01
 Click Here to See the Answer

Q3 Diesel electric propulsion is now being chosen as the power plant for an increasingly wide variety of vessels. (a) Sketch a simple layout of such an installation. (b) Explain the advantages of selecting such a plant.
2020/FEB/03 2023/FEB/02
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Q4 With reference to an emergency source of electrical power in cargo ships: A. Describe a typical power source. B. Give a typical list of essential services, which must be supplied simultaneously C. Explain how the emergency installation can be periodically tested.
2024/APR/3 2024/NOV/04   2025/MAR/04   2025/NOV/04
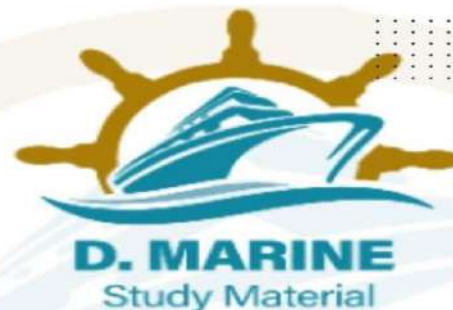**Click Here to See the Answer**

Q.5 The direct online start of squirrel cage motor is used for most electrical drives on a.c. powered ships. Describe with sketches as necessary one method of overcoming each of the following Problems: A. High starting current B. Low starting torque.
 2023/JUL/03 2023/OCT/05 2023/DEC/03 2024/APR/03
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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. Jan ,2023 Q6
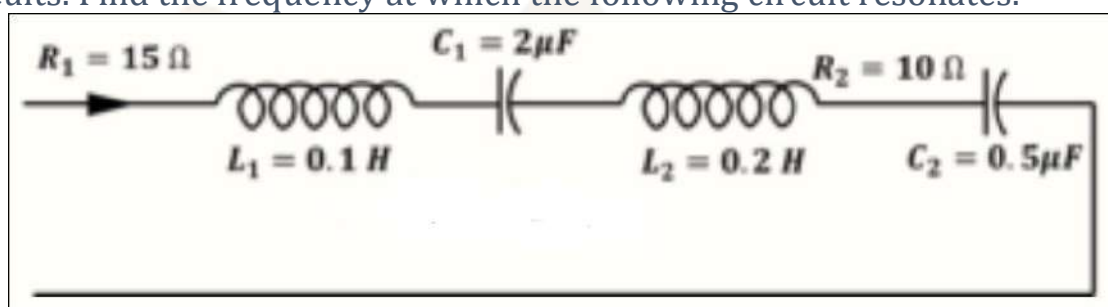**2023/APR/06** **2023/JUN/06** **2023/OCT/06** **2024/JUL/06** **2024/NOV/06** **2025/OCT/06**
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Q7 A. Sketch an arrangement showing the principal of proportional plus integral (P+I) control loop. B. Compare the series and parallel resonance circuits. Find the frequency at which the following circuit resonates.

2023/OCT/07
Click Here to See the Answer

Q8 A. Explain the potential hazards if liquid-cooled transformers are used. B. What are the losses in transformers? Mention the various factors which affect these losses. In a 25 KVA, 3300/233 V, single phase transformer, the iron and full-load Cu. Losses are respectively 350 and 400 watts. Calculate the efficiency at half-full load, 0.8 power factor.
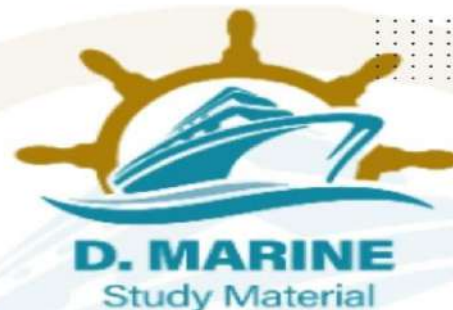**2023/OCT/08**
Click Here to See the Answer

Q9 A. List the factors that determine the starting torque of the three- phase induction motor. How does this torque generally compare with the value of the rated torque?
B. The low-voltage release of an a.c. motor-starter consists of a solenoid into which an iron plunger is drawn against a spring. The resistance of the solenoid is 35 ohm. When connected to a 220 V, 50 Hz, a.c. supply the current taken is at first 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.

2022/DEC/08 2025/FEB/08

Q10 A. With the aid of delta and star connection diagrams, state the basic equation from which delta - star - delta conversion equation can be derived.
B. Three batteries A, B and C have their negative terminals connected together, between the positive terminals of A and B there is a resistor of 0.5 ohm and between B and C three is a resistor of 0.3 ohm, i. Battery A 105 V, Internal resistance 0.25 ohm' ii. Battery B 100 V, Internal resistance 0.2 ohm iii. Battery C 95 V, Internal resistance 0.25 ohm Determine the current values in the two resistors and the power dissipated by them.

2023/JUL/06 2024/JUL/06 2024/OCT/06 2024/FEB/06
2025/FEB/06
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NOV-2023
SECTION-1

1. Explain the methods used to control the speed of a 3 Phase induction motors. Draw and Explain a Vanable Frequency Drive used for optimization of energy efficiency of auxiliary machineries on board vessels.

2023/NOV/01 2024/SEP/03
Click Here to See the Answer

2. 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.
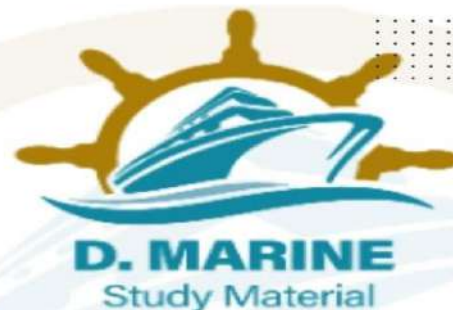
2022/NOV/01 2023/NOV/02
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4. With reference in alkaline batteries used on board ship.
a) Describe the operation of a battery cell and state the material used.
b). Describe how the cells are mounted to form a battery
c) State the advantages and disavantages compared with lead and battenes.
 2023/NOV/04

Click Here to See the Answer

5. What in a soft starting of as induction motor? Describe with a circuit using a thyristor used for soft starting Discuss its advantages and disadvantages.
Click Here to See the Answer

SECTION-2

6.a) What are the factors on which the speed of a muter depends? Discuss them for series and shant maters

b) Three equal resistors are connected to three phase vystem, one reistar is removed find the reduction in soud if they are connected in (a) star, (b) Delta.
Click Here to See the Answer

7. a) Derive an expression for the emf induced in an a c. generator

b) A 220 V, d.c. shunt motor has an armature resistance of 0.5 ohm and an armature current of 40 A on full load Determine the reduction in flux necessary for a 50 per cent reduction in speed. The torque for both conditions can be assumed to remain constant.
2023/NOV/07
Click Here to See the Answer

8. a) How do the leakage fluxes effect the operation of a transformer? How are minimized? they

b) A 440 V load of 400 kW at 0.8 (lagging) power factor is jointly supplied by two alternators A and B. The kW load on A is 150 kW and the kVAr load on B is 150 kVAr (lagging) Determine the kW load on B, the KWAr load on A, the power factor of operation on each machine and the current loading of each machine.
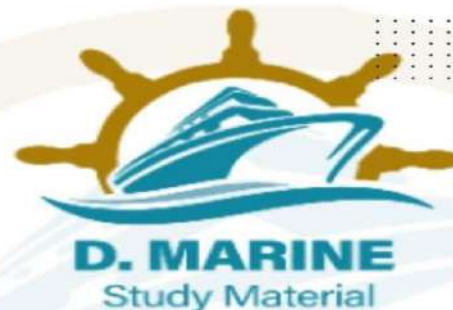2023/NOV/08
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9.a) What is the operational impedance of an R.C. Circuit? Describe its usefulness.

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 potencial difference across the main, at the load where It is lowest?

2023/NOV/09

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10.a) What is back emf? Derive the relation for the back emf and the supplied voltage in terms of armature resistance.

b) Find the synchronous impedance and 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 SOV 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 100 A at a p.f. of 0.8 lagging, with a terminal voltage of 200 V.

2023/NOV/10

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DEC-2023

Q1. Differentiate between squirrel cage and wound rotor motor of the three phases: a.c. induction. In respect of the following; A. Rotor construction, B. Torque characteristic, C. Speed variation.

2023/JUL/01 **2023/DEC/01** **2024/APR/01**

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Q2. With reference to an emergency source of electrical power in cargo ships:
A. Describe a typical power source.
B. Give a typical list of essential services, which must be supplied simultaneously;
C. Explain how the emergency installation can be periodically tested.

2023/JUL/02 **2023/OCT/04** **2023/DEC/02** **2024/APR/02**

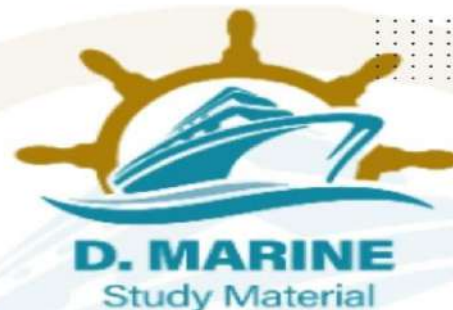**Click Here to See the Answer**

Q3. The direct online start of squirrel cage motor is used for most electrical drives on a.c. powered ships. Describe with sketches as necessary one method of overcoming each of the following Problems:
A. High starting current; B. Low starting torque.

2023/JUL/03 **2023/OCT/05** **2023/DEC/03** **2024/APR/03**

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Q4. A. (i) Discuss the various hazards and problems which are associated with electric cable Insulation in the event of fire.
(ii) Suggest remedies for these problems.
B. State how the spread of fire may be reduced by the method used for installing electric cables.
2023/JUL/04 **2023/DEC/04** **2024/APR/04**
Click Here to See the Answer

Q5. 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?
2023/JUL/05 **2023/DEC/05** **2024/APR/05**
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Q6. A. What are the characteristics of PN junction diode? Point out its specifications. Also point out the significance of dynamic and static resistances.
B. Draw the circuit of Half-wave rectifier and its output waveform. A diode whose internal resistance is 20 is to supply power to 1000 load from 110 V (RMS) source. Calculate
(i) peak load current,
(ii) DC load current,
(iii) AC load current.
2023/JUL/06 **2023/DEC/06** **2024/APR/06**
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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.
Click Here to See the Answer

Q8. A. What is a commutator? Discuss its rectifying action in detail.
B. Calculate the e.m.f. generated by a 4-pole, wave wound armature having 40 slots with 18 conductors per slot when driven at 1000 r.p.m. The flux per pole is 0.015 wb.
Click Here to See the Answer

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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 230Ω. Calculate the drop in speed when the motor is loaded and takes the line current of 41 amperes. Neglect armature reaction.
2023/JUL/09 2023/DEC/09 2024/JAN/07 2024/APR/09
Click Here to See the Answer

Q10. A. Why is a synchronous motor not self-starting? What are the various ways in which it can be started?
B. A 500V, single phase synchronous motor gives a net output mechanical power of 7.46kW and operates at 0.9 power factor lagging. Its effective resistance is 0.8 . If the iron and friction losses are 500 w and excitation losses are 800w, calculate the armature current and the commercial efficiency.
2023/JUL/10 2023/DEC/10 2013/APR/10 2024/APR/10
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