Government of the People's Republic of Bangladesh

Department of Shipping

Sample Written/Oral Question Bank

Marine Engineer Officer Class 2 and 1 Combined

Electrotechnology

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1. With reference to electrical short circuits:

(a) state, with reasons, THREE factors that will influence the severity of a short circuit; (6)

(b) explain the role of reactance when selecting protective devices. (4)

2. With reference to alternating current generators:

(a) explain the meaning of the term synchronous impedance; (4)

(b) explain, with the aid of phasor diagrams, the effect of altering the excitation of one of a

pair of machines that is operating in parallel. (6)

3. (a) Explain why it is necessary to provide reverse power protection for a.c. generators

operating in parallel. (2)

(b) Sketch a generator protecting circuit. (5)

(c) Explain how to check the operation of the reverse power trip. (3)

4. State the main electrical items covered in a Classification Society periodical survey. (10)

5. (a) Explain why it is necessary to provide reverse power for a.c generators operating in

parallel. (2)

(b) Describe, with the aid of a sketch, a reverse power relay trip. (8)

6. Describe, with the aid of a block diagram, the operation of a load sensing electronic governor

controller for an a.c. generator. (10)

7. With reference to testing High Voltage equipment:

(a) explain why earthing down is considered essential; (2)

(b) state the operating voltage for an insulation resistance tester (meggar) suitablefor

6.6 KV equipment; (1)

(c) describe how an insulation resistance test is carried out on High Voltage equipment,

making reference to personnel safety; (5)

(d) explain why infra red temperature measurement is used on High Voltage equipment. (2)

8. With reference to main circuit breakers on a switchboard:

(a) sketch a main circuit breaker when in test position, explaining the function tests that

(b) can be carried out; (5)

(c) list the routine maintenance for the main circuit breakers; (3)

(d) state why it is bad practice to open circuit breakers whilst under load and underwhat

(e) conditions it would be carried out.

9. (a) Describe, with the aid of a sketch, a static excitation system for a generator. (8)

(b) Explain TWO advantages of static excitation. (2)

10.(a) Describe, with the aid of a sketch, a static excitation system for a generator. (8)

(b) Explain TWO advantages of static excitation. (2)

11. With reference to the paralleling of a.c. generators:

(a) outline the requirements of synchronisation; (2)

(b) explain how KW power is shared; (1)

(c) explain how Kvar power is shared; (1)

(d) state SIX types of damage that may be caused when machines are incorrectly synchronised. (6)

12. (a) Explain the principle of operation of an insulation resistance test, stating why the test is

carried out on a regular basis. (6)

(b) Describe how EACH of the following electrical tests is carried out:

(i) resistance; (2)

(ii) continuity. (2)

13. With reference to electrical shortcircuits:

(a) state, with reasons, THREE factors that will influence the severity of a short circuit; (6)

(b) explain the role of reactance when selecting protective devices. (4)

14. With reference to a THREEphase electrical distribution system:

(a) discuss the advantages and disadvantages of an insulated neutral system; (8)

(b) state how an earthed neutral system is earthed and the measures taken to limit the maximum earth fault current . (2)

15. (a) State the reasons why direct on line starting for large induction motors such

as those for bow and stern thruster units may not be viable. (2)

(b) Describe, with the aid of a sketch, a starting system that may be used for

such motors. (8)

16. With reference to insulated and earthed electrical systems operating at High Voltage:

(a) state the regulations pertaining to tankers; (4)

(b) describe, with the aid of a sketch, a method to detect earth leakage in EACH of the

following systems:

(i) earthed; (3)

(ii) insulated. (3)

17. (a) Explain the meaning of EACH of the following types of electrical equipment:

(i) intrinsically safe; (2)

(ii) flameproof; (2)

(iii) increased safety; (2)

(iv) pressurised enclosure. (2)

(b) State TWO types of lighting equipment that may be installed in the pump room areas of a

crude petroleum carrier. (2)

18. Describe, with the aid of a block diagram, how automatic starting, load sharing and stopping of generators in response to load changes is effected. (10)

19. With reference to electrical short circuits:

(a) state, with reasons, THREE factors that will influence theseverity of a short circuit;

(b) explain the role of reactance when selecting protective devices.

20. With reference to star delta starters used for three phase induction motors:

(a) explain in detail why this type of starter is employed; (4)

(b) explain, with the aid of a circuit diagram, the sequence of operation of a star delta

starter. · (6)

21. Describe, with the aid of a diagram, a shaft generator that uses a frequency converter. (10)

22. With reference to voltage variation profiles caused by load changes imposed on alternating

current generators when starting large motors on line:

(a) sketch a voltage dip, showing an acceptable recovery time; (2)

(b) state FOUR salient factors that cause the variation in part (a); (4)

(c) outline FOUR salient factors that assist recovery from the deviation shown in part (a). (4)

23. With reference to a.c switchboards:

(a) state, with reasons, the protective devices that are fitted; (5)

(b) state why a breaker may fail to open under prolonged low voltage conditions; (2)

(c) explain the actions to be taken should a main generator circuit breaker stay connected

despite repeated efforts to trip it off the board. (3)

24. Describe, with the aid of a sketch, an electronic soft starting system that may be used for large a.c. induction motors. (10)

25. (a) Sketch a circuit diagram of a self excited a.c. generator. (5)

(b) Describe the operation of the circuit sketched in part (a). (5)

26. During a complete loss of electrical power, essential vital services can be maintained by means of an Uninterruptable Power Supply (UPS).

(a) Describe, with the aid of a block diagram, the operation of an a.c. input UPS

arrangement. (7)

(b) List SIX essential services that the UPS may support. (3)

27. (a) With reference to the protection of electrical equipment in a distribution system:

(i) state the aims of the protective devices; (3)

(ii) list the parameters that are monitored and acted upon by the protective devices. (4)

(b) State, with reasons, THREE causes of electrical fires. (3)

28. With reference to automatic Power Management Systems for the control of the operation of

main switchboards and generators:

(a) list the features that the Power Management System controls in order to comply with the

requirements for a vessel; (7)

(b) explain how the generators and switchboard would be controlled following a failure of

the Power Management System. (3)

29. Describe, with the aid of a block diagram, the operation of a load sensing electronic governor

controller for an a.c. generator. (10)

30. With reference to a THREE phase electrical distribution system:

(a) explain the advantages and disadvantages of an insulated neutral system; (8)

(b) state how an earthed neutral system is earthed and the measures taken to limit the

maximum earth fault current. (2)

31. State the main electrical items covered in a Classification Society periodical survey. (10)

32. (a) State FIVE essential electrical services that are able to be operable under fire

conditions. (5)

(b) Explain how electric cables for the essential services in part (a) pass through bulkheads

whilst maintaining gas tight and water tight integrity. (3)

(c) State the requirements for the cables which supply electrically driven emergency fire

pumps. (2)

33. With reference to large electrical transformers on board ships:

(a) state where these transformers may be used; (1)

(b) state a typical efficiency range for a transformer; (1)

(c) state the regulations pertaining to transformers; (3)

(d) state the protective devices that are fitted; (2)

(e) describe the maintenance requirements. (3)

34. With reference to overcurrent protection for electrical circuits:

(a) explain THREE methods of protection, stating where EACH may be used; (6)

(b) explain, with the aid of a diagram, the meaning of the term inverse current time characteristic. (4)

35. With reference to three-phase induction motor starters:

(a) explain why star-delta starters are employed; (2)

(b) explain what is meant by reduced voltage starting in the context of star-delta starters; (2)

(c) explain, with the aid of a power circuit, the sequence of operation of a start-delta starter. (6)

36. (a) Explain the meaning of EACH of the following types of electrical safety equipment:

(i) intrinsically safe; (2)

(ii) flameproof; (2)

(iii) increased safety. (2)

(b) State the electrical tests for equipment in hazardous areas, describing the safety precautions. (4)

37. (a) Explain why it is necessary to provide reverse power for a.c generators operating in

parallel. (2)

(b) Describe, with the aid of a sketch, a reverse power relay trip. (8)

10. Describe, with the aid of a sketch, an electronic soft starting system that may be used for

large a.c. induction motors. (10)

38. (a) With reference to battery systems for emergency purposes, explain the precautions

that must be taken with regard to personnel safety, storage and maintenance. (7)

(b) Explain how batteries are kept at the correct rate of charge. (3)

39.Describe, with the aid of a circuit diagram, the operation of a shaft generator that uses a

frequency converter.

(a) Sketch a circuit diagram of an emergency generator power supply and distribution

system, indicating the essential services provided.

(b) State the emergency generator regulations. (4)

40. With reference to lithium-ion batteries:

(a) explain why this type of battery has been adopted for shipboard use; (4)

(b) state ONE advantage and ONE disadvantage of lithium-ion batteries; (2)

(c) define EACH of the following:

(i) cell drift; (2)

(ii) thermal runaway. (2)

41. With reference to electrical equipment in potentially flammable atmospheres:

(a) explain why conventional equipment is considered hazardous; (2)

(b) explain the concept of intrinsic safety; (3)

(c) describe, with the aid of a sketch, a safety barrier for an electrical power supply. (5)

42. (a) Explain the meaning of EACH of the following types of electrical equipment:

(i) intrinsically safe; (2)

(ii) flameproof; (2)

(iii) increased safety; (2)

(iv) pressurised enclosure. (2)

(b) State TWO types of lighting equipment that may be installed in the pump room areas

of a crude petroleum carrier. (2)