MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, 2014

ELECTRICAL ENGINEERING
PAPER - II

Time Allowed : 3 hours Full Marks : 200

Attempt all questions.

Part A - Objective Type Questions (100 Marks)

All questions carry equal marks of 2 each.

1. As compared to a closed-loop system, an open-loop system is
(a) more stable as well as more accurate (b) less stable as well as less accurate
(c) more stable but less accurate (d) less stable but more accurate

2. The best method for determining the stability and transient response is
(a) Bode plot (b) Nyquist plot
(c) root locus (d) none of these

3. Which compensator is used to increase the damping of a badly under-damped system?
(a) Phase-lag (b) Phase-lead
(c) Phase lag-lead (d) None of these

4. Transformer cores are laminated to reduce
(a) eddy current loss (b) hysteresis loss
(c) both hysteresis and eddy current loss (d) copper loss

5. The regulation of a transformer is negative when the load is
(a) purely resistive (b) purely inductive
(c) capacitive (d) regulation can never be negative

6. Distribution transformers preferably should be
(a) Delta-Delta (b) Delta-Star
(c) Star-Delta (d) Star-Star

7. Oil in transformer is used for
(a) lubrication purpose (b) insulation
(c) cooling (d) both (b) and (c)

8. Direction of rotation of rotor in a d.c. motor is given by
(a) Faraday's law (b) Fleming's right hand rule
(c) Fleming's left hand rule (d) Lenz's law

9. A d.c. series motor should always be started with some load on its shaft, because otherwise
(a) it will draw a very high current from the supply
(b) it will run at an excessively high speed
(c) it will not be able to develop any torque
(d) all of these

10. Which motor can conveniently operate at lagging as well as leading power factor?
(a) Squirrel cage induction motor (b) Wound rotor induction motor
(c) Synchronous motor (d) D.C. shunt motor

11. Which of the following motors is used in household refrigerator?
(a) Synchronous motor (b) D.C. shunt motor
(c) 3-phase induction motor (d) 1-phase induction motor

12. The stator winding of a single-phase induction motor is split into two parts in order to
(a) improve power factor (b) improve efficiency
(c) develop starting torque (d) increase speed

13. The direction of rotation of d.c. shunt motors can be reversed by interchanging
(a) the supply terminal (b) the field terminals only
(c) the armature terminals only (d) either field or armature terminals

14. Which type of plant has the minimum running cost per Kwh of energy generated?
(a) Hydro-electric plant (b) Thermal power plant
(c) Nuclear power plant (d) Diesel power plant

15. A relay performs the function of
(a) fault isolation (b) fault detection
(c) fault prevention (d) all of these

16. Buchholz's relay is used
(a) in alternator for external faults (b) in transformer for internal fault
(c) in alternator for internal faults (d) all of these

17. ACSR stands for
(a) all copper standard reinforced (b) aluminum copper steel reinforced
(c) aluminum conductor steel reinforced (d) all copper steel reinforced

18. Bundled conductors are used to improve
(a) appearance of the transmission line (b) mechanical stability of the line
(c) current carrying capacity of the line (d) corona performance of the line

19. Bulk power transmission over very long HVDC lines are preferred on account of
(a) low cost of HVDC terminals (b) no harmonic problems
(c) minimum line power losses (d) simple protection

20. As the load factor of a power plant increases, the cost per KWh of the energy generated
(a) increases (b) decreases
(c) may increase or decrease (d) remains the same

21. The transfer function of a system is 10/(1+s). The steady state error to unit step input when operated as a unity feedback system is
(a) 10 (b) 0
(c) 1/11 (d) ∞

22. If the gain of an open loop system is doubled, the gain margin
(a) Is not affected
(b) Gets doubled
(c) Becomes half
(d) Becomes one-fourth

23. Direction of rotation of d.c. motor is reversed by
(a) Reversing armature connection
(b) Interchanging armature and field connection
(c) Adding resistance to field circuit
(d) Reversing supply connection

24. If the field of synchronous motor is under excited, power factor will be
(a) Lagging
(b) Leading
(c) Unity
(d) Zero

25. A synchronous motor draws 2000KVA at a power factor of 90% leading. If the efficiency of the motor is 95%, the developed power will be
(a) 1800 KW
(b) 2000KW
(c) 1710KW
(d) 1897.7KW

26. Which of the following type of motor is not self starting?
(a) Synchronous motor
(b) DC series motor
(c) Induction motor with medium slip
(d) Induction motor with high slip

27. A single phase transmission line of impedance 0.8 ohm supplies a resistive load of 500 A at 300 V. The sending end power factor is
(a) unity
(b) 0.8 lagging
(c) 0.8 leading
(d) 0.6 lagging

28. In control system, the use of negative feedback
(a) eliminates the chance of instability
(b) increases the reliability
(c) reduces the effects of disturbance and noise signals in the forward path
(d) increases the influence of variations of component parameters on the system performance

29. In a speed control system, output rate feedback is used to
(a) Limit the speed of motor
(b) Limit the acceleration of the motor
(c) Reduce the damping of the system
(d) Increase the gain margin

30. A phase-lag compensator will
(a) improve relative stability
(b) increase the speed of response
(c) increase bandwidth
(d) increase overshoot

31. A 4 pole generator with 16 coils has a two layer winding. The pole pitch is
(a) 32
(b) 16
(c) 8
(d) 4

32. An electric train employing a dc series motor is running at a fixed speed, when a sudden slight drop in the mains voltage occurs. This would result in
(a) drop in speed and rise in current
(b) rise in speed and drop in current
(c) rise in speed and rise in current
(d) drop in speed with current unaltered

33. The inductive reactance of a transformer depends on
(a) electromotive force
(b) magnetomotive force
(c) magnetic flux
(d) leakage flux

34. The efficiency of a 100 KVA transformer is 0.98 at full as well as half load. For this transformer at full load the cooper loss

(a) is less than core loss
(b) is equal to core loss
(c) is more than core loss
(d) none of these

35. Which three-phase connection can be used in a transformer to introduce a phase difference of 30° between its output and corresponding input line voltages?

(a) Star – star
(b) Star – Delta
(c) Delta – delta
(d) Delta – Zigzag

36. The phase sequence of a three-phase alternator will reverse if

(a) the field current is reversed keeping the direction of rotation same
(b) the field current remains the same but the direction of rotation is reversed
(c) the field current is reversed and the number of poles is doubled
(d) the number of poles is doubled without reversing the field current

37. How can the reactive power delivered by a synchronous generator be controlled?

(a) By changing the prime mover input
(b) By changing the excitation
(c) By changing the direction of rotation
(d) By changing the prime mover speed

38. A synchronous motor is operated from a bus voltage of 1.0 pu and is drawing 1.0 pu zero power factor leading current. Its synchronous reactance is 0.5 pu. What is the excitation emf of the motor?

(a) 2.0
(b) 1.5
(c) 1.0
(d) 0.5

39. A cylindrical rotor synchronous motor is switched on to the dc supply with its field windings shorted on themselves. It will

(a) not start
(b) start but not run at synchronous speed
(c) start as an induction motor and then run as a synchronous motor
(d) start and run as a synchronous motor

40. In hand tool applications, which one of the following single-phase motor is used?

(a) Shaded pole motor
(b) DC motor
(c) Capacitor run motor
(d) AC series motor

41. When there is a change in load in a power station having a number of generator units operating in parallel, the system frequency is controlled by

(a) adjusting the steam input to the units
(b) adjusting the field excitation of the generators
(c) changing the load divisions between the units
(d) injecting reactive power at the station bus-bar

42. The rating of a 3-phase power system is given as

(a) rms phase voltage
(b) peak phase voltage
(c) rms line to line voltage
(d) peak line to line voltage

43. Which of the following motors is used on traction?

(a) d.c series
(b) d.c. shunt
(c) induction
(d) synchronous

44. Circle diagram is used to find the performance of

(a) Synchronous motor (b) Induction motor

(c) Alternator (d) 3-phase transformer

45. Distributed winding is preferred over concentrated winding as it

(a) reduces noise (b) reduces the machine size

(c) reduces the amount of copper required (d) improves the generated waveform

46. The leakage flux in a transformer depends on

(a) the applied voltage (b) the frequency

(c) the load current (d) the mutual flux

47. An over excited synchronous motor acts as

(a) a capacitor (b) an inductor

(c) a resistor (d) none of these

48. The per unit impedance of a circuit element is 0.15. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be

(a) 0.075 (b) 0.15

(c) 0.30 (d) 0.600

49. For a fault at the terminals of synchronous generator, the fault current is maximum for a

(a) 3-phase fault (b) 3-phase to ground fault

(c) line-to-ground fault (d) line-to-line fault

50. Zero-sequence currents can flow from a line to transformer bank if the windings are in

(a) grounded star/delta (b) delta/star

(c) star/grounded star (d) delta/delta

Part B - Short Answer Questions (100 Marks)

All questions carry equal marks of 5 each.

51. Distinguish between 'open loop' and 'closed loop' control systems. Also explain the significance of feedback in control systems.

52. What do you understand by the term 'steady-state error' in reference to control system dynamics? Describe the Nyquist criteria for a system to be stable.

53. A shunt generator has an induced voltage of 127 V on open circuit. When the machine is on load, the terminal voltage is 120 V. Find the load current if the field circuit resistance is 15 Ω and the armature resistance 0.02 Ω. Ignore armature reaction.

54. Explain the mechanism of power transfer from primary to secondary when a transformer is loaded.

55. State and explain the conditions to be satisfied for satisfactory parallel operation of single-phase transformers.

56. Explain the necessity of starter in a D.C. motor.

57. What is a pumped storage scheme, and what are its advantages and disadvantages?

58. What are the advantages and disadvantages of using high transmission voltages?

59. What is meant by symmetrical component? What is the need of symmetrical component? Define positive, negative and zero sequence component.

60. Describe lag compensator.

61. What is meant by the frequency response of a control system? Explain.

62. Define the terms: Resonant peak, resonant frequency, bandwidth, cut-off frequency

63. Distinguish between generated emf and back emf in electrical machines.

64. Write briefly the various methods of speed control of dc shunt motor?

65. Define the terms 'efficiency' and 'regulation' of a transformer. What is the condition for maximum efficiency of a transformer?

66. Two alternators are sharing a load. What will happen if emf of one machine tends to drop from operating value?

67. What are the advantages of using a stationary armature in large synchronous generators?

68. Deduce the expression for generated emf of a three phase alternator.

69. What do you understand stability of a power system? How it is classified?

70. Explain clearly the basic principle of operation of a differential relay.

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