MIZORAM PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF INSPECTOR OF FACTORIES UNDER LABOUR, EMPLOYMENT, SKILL DEVELOPMENT & ENTREPRENEURSHIP DEPARTMENT, GOVERNMENT OF MIZORAM, 2019

ELCTRICAL ENGINEERING
PAPER - II

Time Allowed : 2 hours   Full Marks : 200

All questions carry equal marks of 2 each.
Attempt all questions.

1. A good control system has all the following features except -
   - (a) Good stability
   - (b) Slow response
   - (c) Good accuracy
   - (d) Sufficient power handling capacity

2. The initial response when the output is not equal to input is called -
   - (a) Transient response
   - (b) Error response
   - (c) Dynamic response
   - (d) All of these

3. A control system with excessive noise is likely to suffer from -
   - (a) Saturation in amplifying stage
   - (b) Loss of gain
   - (c) Vibration
   - (d) Oscillation

4. Transfer function of a system is used to calculate which of the following?
   - (a) The order of the system
   - (b) The time constant
   - (c) The output for any given input
   - (d) The steady state gain

5. The position and velocity errors of a type-2 system are -
   - (a) Constant, constant
   - (b) Constant, infinity
   - (c) Zero, constant
   - (d) Zero, zero

6. Phase margin of a system is used to specify which of the following?
   - (a) Frequency response
   - (b) Absolute stability
   - (c) Relative stability
   - (d) Time response

7. If the gain of the critical damped system is increased it will behaves as -
   - (a) oscillatory
   - (b) critically damped
   - (c) over damped
   - (d) under damped

8. Gain margin is the factor by which the gain of the system is increased to make it -
   - (a) damped
   - (b) oscillatory
   - (c) stable
   - (d) unstable

9. For root loci which of the following are starting points?
   - (a) open loop zeros
   - (b) closed loop zeros
   - (c) closed loop poles
   - (d) open loop poles

10. Nyquist criterion is used to find which of the following?
    - (a) absolute stability
    - (b) relative stability
    - (c) both (a) & (b)
    - (d) none of these

11. The bode-plot is valid for -
    (a) minimum phase network
    (b) all phase network
    (c) non-minimum phase network
    (d) none of the above

12. The transfer function is $\dfrac{1+0.5S}{1+S}$. It represents a -
    (a) lead network
    (b) lag network
    (c) lag-lead network
    (d) proportional network

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

14. The phase angle for the transfer function $G(S)=\dfrac{1}{(1+ST)^3}$ at corner frequency is -
    (a) -45^0
    (b) -90^0
    (c) -135^0
    (d) -270^0

15. Signal flow graph is used to find -
    (a) stability of the system
    (b) controllability of the system
    (c) transfer function of the system
    (d) poles of the system

16. Nichol's chart is useful for detailed study and analysis of -
    (a) closed loop frequency response
    (b) open loop frequency response
    (c) close loop and open loop frequency response
    (d) none of these

17. What is the steady state error for a unity feedback control system having $G(S)=\dfrac{1}{S(S+1)}$ due to unit ramp input?
    (a) 1
    (b) 0.5
    (c) 0.25
    (d) $\sqrt{0.5}$

18. The instrument used for plotting the root locus is called -
    (a) Slide rule
    (b) Spirule
    (c) Synchro
    (d) Selsyn

19. Which one of the following techniques is utilized to determine the actual point at which the root locus crosses the imaginary axis?
    (a) Nyquist technique
    (b) Routh-Hurwitz criterion
    (c) Nichol's criterion
    (d) Bode plot

20. The polar plot of a transfer function passes through the critical point (-1, 0). Gain margin is -
    (a) zero
    (b) - 1 dB
    (c) 1 dB
    (d) infinity

21. If the gain of the loop system is doubled, the gain margin of the system is -
    (a) not affected
    (b) doubled
    (c) halved
    (d) one fourth of original value

22. The effect of adding poles and zeros can be determined quickly by -
    (a) Nichol's chart
    (b) Requisite plot
    (c) Bode plot
    (d) Root-locus

23. Consider the loop transfer function $G(S)H(S) = \dfrac{K(S+6)}{(S+3)(S+5)}$. In the root-locus diagram, the centroid will be located at -

    (a) -4 (b) -1

    (c) -2 (d) -3

24. Consider the following equation $2S^4 + S^3 + 3S^2 + 5S + 10 = 0$. How many roots does this equation have in the right half of 'S' plane?

    (a) one   (b) two

    (c) three   (d) four

25. If the gain margin of a certain feedback system is given as 20 dB, the Nyquist plot will cross the negative real axis at the point -

    (a) $S = -0.05$ (b) $S = -0.2$

    (c) $S = -0.1$ (d) $S = -0.01$

26. Derivative feedback control -

    (a) increase feedback time   (b) increase overshoot

    (c) decrease steady state error   (d) does not affect the steady state error

27. When the time period of observation is large, the type of the error is -

    (a) Transient error   (b) Steady state error

    (c) Half power error   (d) Position error constant

28. The maximum overshoot of a second order system can be increased by -

    (a) decreasing damping frequency   (b) increasing natural frequency

    (c) increasing damping factor   (d) all of these

29. The Root-locus are the plots of the variations of the poles of the closed loop system function with changes in -

    (a) open loop gain   (b) open loop poles

    (c) closed loop zeros   (d) none of these

30. Type 0 system has -

    (a) high gain constant   (b) small steady state error

    (c) either (a) or (b)   (d) both (a) & (b)

31. The eigen values of a linear system are the locations of -

    (a) finite poles   (b) poles of the system

    (c) zeros of the system   (d) none of these

32. In control systems stepper motors can be used for -

    (a) tape drives   (b) capstan drives

    (c) computers   (d) none of these

33. A closed loop system is distinguished from open loop system by which of the following?

    (a) Servomechanism   (b) Feedback

    (c) Output pattern   (d) Input pattern

34. The voltage build up process of a d.c. generator is -

    (a) difficult   (b) delayed

    (c) cumulative   (d) infinite

35. The induced EMF in the armature conductors of a d.c. motor is -
    (a) sinusoidal   (b) trapezoidal
    (c) rectangular   (d) alternating

36. In an ideal transformer -
    (a) winding have no resistance   (b) core has no losses
    (c) core has infinite permeability   (d) all of these

37. If the pole flux of a d.c. motor approaches zero, its speed will -
    (a) approaches zero
    (b) approaches infinity
    (c) no change due to corresponding change in back emf
    (d) approaches a stable value somewhere between zero and infinity

38. The main purpose of using core in transformer is to -
    (a) decrease iron losses
    (b) prevent eddy current loss
    (c) eliminate magnetic hysteresis
    (d) decrease reluctance of the common magnetic circuit

39. Transformer cores are laminated in order to -
    (a) simplify its construction   (b) minimize eddy current loss
    (c) reduce cost   (d) reduce hysteresis loss

40. In performing the short circuit test of a transformer -
    (a) high voltage side is usually short circuited   (b) low voltage side is usually short circuited
    (c) any side is short circuited with preference   (d) none of these

41. No load test on a transformer is carried out to determine -
    (a) copper loss   (b) magnetizing current
    (c) magnetizing current and no load loss   (d) efficiency of the transformer

42. The effect of increasing the length of air-gap in an induction motor will be to increase the -
    (a) power factor   (b) speed
    (c) magnetizing current   (d) air-gap flux

43. The power factor of a squirrel-cage induction motor is -
    (a) low at light loads only   (b) low at heavy loads only
    (c) low at light and heavy loads both   (d) low at rated load only

44. A 6-pole, 50 Hz, 3-phase induction motor has a full load speed of 950 rpm. At half-load, its speed would be -
    (a) 475 rpm   (b) 500 rpm
    (c) 975 rpm   (d) 1000 rpm

45. The fractional slip of an induction motor is the ratio -
    (a) rotor Cu loss/rotor input   (b) stator Cu loss/stator input
    (c) rotor Cu loss/rotor output   (d) rotor Cu loss/stator Cu loss

46. The efficiency and p.f. of a SCIM increases in proportion to its -
    (a) speed   (b) mechanical torque
    (c) voltage   (d) rotor torque

47. For proper parallel operations, a.c. polyphase alternators must have the same -
    (a) speed   (b) voltage rating
    (c) kVA rating   (d) excitation

48. A two-winding transformer is used as an auto-transformer. The kVA rating of the auto transformer compared to the two winding transformer will be -
    (a) 3 times   (b) 2 times
    (c) 1.5 times   (d) same

49. The synchronous reactance is the -
    (a) Reactance due to armature reaction of the machine
    (b) Reactance due to leakage flux
    (c) Combined reactance due to leakage flux and armature reaction
    (d) Reactance either due to armature reaction or leakage flux

50. If the applied voltage to a dc machine is 230 V, then the back emf for maximum power delivered is-
    (a) 115 V   (b) 200 V
    (c) 230 V   (d) 460 V

51. If the speed of a dc motor increases with load torque, then it is a -
    (a) series motor   (b) permanent magnet motor
    (c) differentially compound motor   (d) cumulatively compound motor

52. The rotor power output of a 3-phase induction motor is 15 kW. The rotor copper losses at a slip of 4% will be -
    (a) 600 W   (b) 625 W
    (c) 650 W   (d) 700 W

53. Stepper motor are mostly used for -
    (a) high power requirements   (b) control system applications
    (c) very high speed of operation   (d) very low speed of operation

54. An induction motor having 8 poles runs at 727.5 rpm. If the supply frequency is 50 Hz, the emf in the rotor will have a frequency of -
    (a) 1.5 Hz   (b) 48.5 Hz
    (c) 51.5 Hz   (d) 75 Hz

55. The field coils of D.C. generators are usually made of -
    (a) mica   (b) copper
    (c) cast iron   (d) carbon

56. In lap winding, the number of brushes is always -
    (a) double the number of poles   (b) same as the number of poles
    (c) half the number of poles   (d) two

57. Brushes of D.C machines are made of -
    (a) carbon   (b) soft copper
    (c) hard copper   (d) all of these

58. The purpose of providing dummy coils in a generator is -
    (a) to enhance flux density   (b) to amplify voltage
    (c) to provide mechanical balance for the rotor   (d) to reduce eddy currents

59. The polarity of a D.C. generator can be reversed by -
    (a) reversing the field current
    (b) increasing field current
    (c) reversing field current as well as direction of rotation
    (d) none of these

60. The number of brushes in a commutator depends on -
    (a) speed of armature   (b) type of winding
    (c) voltage   (d) amount of current to be collected

61. In a D.C. generator the critical resistance refers to the resistance of -
    (a) brushes   (b) field
    (c) armature   (d) load

62. If a D.C. motor is to be selected for conveyors, which motor would be preferred?
    (a) series motor   (b) shunt motor
    (c) differentially compound motor   (d) cumulative compound motor

63. The speed of a D.C. series motor is -
    (a) proportional to the armature current
    (b) proportional to the square of the armature current
    (c) proportional to field current
    (d) inversely proportional to the armature current

64. Which of the following motors one will choose to drive the rotary compressor?
    (a) D.C shunt motor   (b) D.C series motor
    (c) Universal motor   (d) Synchronous motor

65. The term 'cogging' is associated with -
    (a) three phase transformer   (b) compound generators
    (c) D.C. series motor   (d) induction motors

66. The condition for maximum efficiency for a D.C. generator is -
    (a) eddy current loss = stray loss   (b) hysteresis losses = eddy current losses
    (c) copper loss = 0   (d) variable losses = constant losses

67. Power transformers are designed to have maximum efficiency at -
    (a) nearly full load   (b) 70% full load
    (c) 50% full load   (d) no load

68. Natural oil cooling is used for transformer upto a rating of -
    (a) 3000 kVA   (b) 1000 kVA
    (c) 500 kVA   (d) 250 kVA

69. A Buchholz relay can be installed on -
    (a) auto-transformer   (b) air-cooled transformer
    (c) welding transformer   (d) oil cooled transformer

70. The value of flux involved in the e.m.f. equation of a transformer is -
    (a) average value   (b) r.m.s. value
    (c) maximum value   (d) instantaneous value

71. Which type of winding is used in 3-phase shell-type transformer?
    (a) circular type
    (b) sandwich type
    (c) cylindrical type
    (d) rectangular type

72. The 'crawling' in an induction motor is caused by -
    (a) high loads
    (b) low voltage supply
    (c) improper design of machine
    (d) harmonics developed in the motor

73. In the circle diagram for induction motor, the diameter of the circle represents -
    (a) slip
    (b) rotor current
    (c) running torque
    (d) line voltage

74. The skin effect does not depends on -
    (a) nature of material
    (b) size of wire
    (c) supply frequency
    (d) temperature

75. ACSR conductor have the central core made of -
    (a) copper
    (b) steel
    (c) aluminium
    (d) cadmium

76. Ferranti effect on long overhead line is experienced when it is -
    (a) lightly loaded
    (b) on full load at unity pf
    (c) on full load at 0.8 pf
    (d) on full load at zero pf

77. By using guard ring in a transmission line, its string efficiency -
    (a) increase
    (b) decrease
    (c) remain constant
    (d) none

78. Major share of power produced in India is through -
    (a) thermal plants
    (b) hydroelectric plants
    (c) nuclear plants
    (d) diesel plant

79. The most common type of unsymmetrical fault is -
    (a) single line to ground
    (b) double line to ground
    (c) line to line
    (d) three phase

80. The positive, negative and zero sequence impedances of a solidly grounded system under steady state condition always follow the relation -
    (a) $Z_1 > Z_2 > Z_0$
    (b) $Z_1 < Z_2 < Z_0$
    (c) $Z_0 < Z_1 < Z_2$
    (d) $Z_0 = Z_1 = Z_2$

81. In hydro power stations, what is an enlarged body of water just above the intake and used as a regulating reservoir, called?
    (a) Spillways
    (b) Forebay
    (c) Reservoir
    (d) Penstock

82. How many relays are used to detect inter phase fault of a three line system?
    (a) One
    (b) Two
    (c) Three
    (d) Six

83. The daily energy produced in a thermal power station is 720 MWh at a load factor of 0.6. What is the maximum demand of the station?
    (a) 50 MW
    (b) 30 MW
    (c) 72 MW
    (d) 720 MW

84. In a 3-phase, 5 kV, 5 MVA system, what is the base impedance?

    (a) 5 ohms   (b) 50 ohms

    (c) 500 ohms   (d) 0.5 ohms

85. Maximum efficiency of modern coal-fired steam-raising thermal power plants is restricted to about 0.35 (a low value), mainly because of -

    (a) low alternator efficiency

    (b) high energy loss in boilers

    (c) low steam turbine mechanical efficiency

    (d) high energy loss from turbine exhaust to condenser

86. The use of high speed CB -

    (a) reduces the short circuit current   (b) improves system stability

    (c) decreases system stability   (d) increases the shorter circuit current

87. Equal area criteria given the information responding -

    (a) stability region   (b) absolute stability

    (c) relative stability   (d) swing curves

88. Equal area criteria is applicable for -

    (a) single machine system   (b) two-machine system

    (c) multi-machine system   (d) any one of the above

89. The Y_{bus} matrix of a 100 bus interconnected system is 90% sparse. Hence the number of transmission lines in the system must be -

    (a) 450   (b) 500

    (c) 900   (d) 1000

90. A generated station has a maximum demand of 30 MW, a load factor of 60% and a plant capacity factor of 50%. The reserve capacity of the plant is -

    (a) 5 MW   (b) 4 MW

    (c) 6 MW   (d) 10 MW

91. In the HVDC system, the ac harmonics which gets effectively eliminated with 12 pulse bridge converters are -

    (a) triplen harmonics   (b) triplen and 5th harmonics

    (c) triplen, 5th and 7th harmonics   (d) 5th and 7th harmonics

92. If the excitation of the synchronous generators fails, it acts as a -

    (a) synchronous motor   (b) synchronous generator

    (c) induction motor   (d) induction generator

93. If the inertia constant H of a machine of 200 MVA is 2 p.u. its value corresponding to 400 MVA will be -

    (a) 4.0 p.u.   (b) 2.0 p.u.

    (c) 1.0 p.u.   (d) 0.5 p.u

94. A lightning arrestor connected between the line and earth in a power system to -

    (a) protects the terminal equipment against travelling surges

    (b) protects the transmission line against lightning stroke

    (c) suppresses high frequency oscillations in the line

    (d) reflects back the travelling wave approaching it

95. The insulation of modern EHV lines is designed based on -
    (a) the lightning voltage   (b) corona
    (c) radio interference   (d) switching voltage

96. In a power station, the cost of generation of power reduces most effectively when -
    (a) diversity factor alone increases
    (b) both diversity factor and load factor increase
    (c) load factor alone increases
    (d) both diversity factor and load factor decrease

97. The relay which is most sensitive to power swings is -
    (a) Mho relay   (b) Reactance relay
    (c) Impedance relay   (d) All are equally affected

98. If the fault current is 2 kA, the relay setting is 50% and the C.T ratio is 400/5, then the plug setting multiplier of a relay will be -
    (a) 5   (b) 7
    (c) 8   (d) 10

99. A voltage control bus is characterised by the specified -
    (a) real and reactive powers   (b) real power and voltage phase angle
    (c) real power and voltage magnitude   (d) reactive power and voltage magnitude

100. Normally Z_{bus} matrix is a -
    (a) Null matrix   (b) Sparse matrix
    (c) Full matrix   (d) Unity matrix

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