

**MIZORAM PUBLIC SERVICE COMMISSION**  
**TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF**  
**GRADE-V OF MIZORAM ENGINEERING SERVICE (AE/SDO)**  
**UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM**  
**JANUARY, 2012**

**ELECTRICAL ENGINEERING**  
**PAPER – II**

Time Allowed : 3 hours

Full Marks : 200

*All questions carry equal marks of 1 each.*  
*Attempt all questions.*

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 open loop transfer function of a unity feedback control system is given by  $G(s) = \frac{K}{s(s+1)}$ , if the gain  $K$  is increased to infinity, then the damping ratio will tend to become
  - (a)  $1/\sqrt{2}$
  - (b) 1
  - (c) 0
  - (d) infinity
  
3. Which one of the following is an example of an open-loop system?
  - (a) Household refrigerator
  - (b) Respiratory system of an animal
  - (c) Stabilization of air pressure entering into a mask
  - (d) Execution of a program by a computer
  
4. With the feedback system, the transient response
  - (a) decays slowly
  - (b) decays rapidly
  - (c) rises slowly
  - (d) rises quickly
  
5. The transfer function of a system is the Laplace transform of its
  - (a) square wave response
  - (b) step response
  - (c) ramp response
  - (d) impulse response
  
6. The transfer function of a control system depends on
  - (a) initial condition of input and output
  - (b) system parameters alone
  - (c) nature of input
  - (d) nature of output
  
7. The main application of transfer function is in the study of
  - (a) steady-state behaviour of systems
  - (b) steady state as well as transient behaviour of systems
  - (c) only transient behaviour of systems
  - (d) none of these

8. If the system specifications are given in time domain, best approach for designing is  
(a) Nyquist plot (b) Bode plot  
(c) root locus (d) any of these
9. The best method for determining the stability and transient response is  
(a) Bode plot (b) Nyquist plot  
(c) root locus (d) none of these
10. Roots of characteristic equation are  
(a) poles of closed loop (b) poles of open loop  
(c) zero of open loop (d) zero of closed loop
11. The characteristic equation of a second order system is given by  $s^2 + 2\xi\omega_0s + \omega_0^2 = 0$ . If  $\xi=1$ , the poles of the transfer function will be  
(a) real and equal (b) imaginary and equal  
(c) complex and conjugate (d) equal to -1
12. The system in the above question, when  $\xi=1$ , is  
(a) under-damped (b) over-damped  
(c) absolutely damped (d) critically damped
13. In the system of the above question, if  $\xi > 1$ , the system is  
(a) under-damped (b) over-damped  
(c) absolutely damped (d) critically damped
14. The steady state error for unit ramp input to the characteristic equation  $s^2 + 2s + 8 = 0$  is  
(a) 0.20 (b) 0.25  
(c) 0.30 (d) 0.50
15. A second order system is always  
(a) stable (b) unstable  
(c) marginally stable (d) none of these
16. Which of the following is used for Nyquist plot?  
(a) Pole zero plot (b) Closed-loop function  
(c) Open-loop function (d) Characteristic equation
17. A unity feedback system with the open loop transfer function  $G(s) = \frac{1}{s(s+2)(s+4)}$  has gain margin of  
(a) 33.6 dB (b) 32.4 dB  
(c) 32.6 dB (d) 30.6 dB
18. When deriving the transfer function of a linear element  
(a) both initial conditions and loading are taken into account  
(b) initial conditions are taken into account but the element is assumed to be not loaded  
(c) initial conditions are assumed to be zero but loading is taken into account  
(d) initial conditions are assumed to be zero and the element is assumed to be not loaded

192. When all the three phases are short circuited, it gives rise to  
(a) asymmetrical fault currents (b) symmetrical fault currents  
(c) zero current (d) none of these
193. For the interruption of high voltages and low currents, the circuit breaker preferred is  
(a) air blast circuit breaker (b) oil circuit breaker  
(c) vacuum circuit breaker (d) all of these
194. An isolator operates under  
(a) no load condition (b) full-load condition  
(c) 50% load condition (d) 5% load condition
195. For stability and economic reasons, the transmission line is operated with power angle in the range  
(a)  $10^\circ-25^\circ$  (b)  $30^\circ-45^\circ$   
(c)  $60^\circ-75^\circ$  (d)  $75^\circ-90^\circ$
196. Carrier-current protection scheme is normally used for  
(a) HV transmission line only (b) HV cables only  
(c) HV transmission lines and cables (d) none of these
197. Mho relay is used to protect  
(a) long transmission lines (b) medium length lines  
(c) short transmission lines (d) all of these
198. Transient stability of a power system can be improved by  
(a) increasing the system voltage (b) decreasing the system voltage  
(c) keeping the system voltage constant (d) none of these
199. If two synchronous generators connected in parallel loose synchronism, it will lead to  
(a) stalling of generators (b) wild fluctuations in current  
(c) wild fluctuations in voltage (d) both (b) and (c)
200. HVDC transmission is preferred to EHV-AC transmission, because  
(a) HVDC terminal equipment are inexpensive  
(b) VAR compensation is not required in HVDC systems  
(c) system stability can be improved  
(d) harmonics problem is avoided

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183. In the load flow analysis, the load at a bus is represented as  
(a) a constant current drawn from the bus  
(b) a constant impedance connected at the bus  
(c) constant real and reactive powers drawn from the bus  
(d) a voltage-dependent impedance at the bus
184. An equipment has 0.8 per unit impedance on a base of 66KV, 100MVA. It's per unit impedance on a base of 33KV, 100MVA will be  
(a) 0.4 (b) 0.8  
(c) 1.6 (d) 3.2
185. If a transmission line is lossless, its characteristic impedance reduces to  
(a)  $(LC)^{1/2}$  (b)  $(L/C)^{1/2}$   
(c) LC (d) none of the above
186. Corona loss occurs in  
(a) distribution transformer (b) transmission lines  
(c) generators (d) none of these
187. Steady-state stability limit of a power system means that the system is capable of maintaining  
(a) the frequency at 50 Hz exactly  
(b) a constant power flow throughout  
(c) synchronism between machines and on external lines  
(d) all of the above
188. Transient stability of a power system means that the system is capable of  
(a) maintaining a continuous balance between energy input and electrical output  
(b) delivering power over tie lines to other systems during a disturbance  
(c) remaining in synchronism, prior to governor action, following a system disturbance  
(d) all of the above
189. Transient stability of a power system depends on  
(a) the short circuit ratio of the generating units  
(b) the strength of the transmission network  
(c) fault-clearing time  
(d) all of these
190. The equal area criterion can be used to  
(a) find critical reclosure time  
(b) solve the swing equations for a three machine case  
(c) find rate of change of velocity of rotors  
(d) all of these
191. The most common type of fault on the overhead transmission line is  
(a) single line to ground fault (b) line to line fault  
(c) double line to ground fault (d) three-phase fault

19. The two windings of a transformer is  
(a) conductively linked (b) inductively linked  
(c) not linked at all (d) electrically linked
20. A position control system is  
(a) a process control system (b) an automatic regulatory system  
(c) a servomechanism (d) a stochastic control system
21. If the system has multiple poles on the  $j\omega$ - axis, the system is  
(a) stable (b) unstable  
(c) marginally stable (d) conditionally stable
22. Nyquist criterion enables us to find  
(a) absolute stability only (b) relative stability only  
(c) both (d) either of the two
23. The temperature of resistance furnace can be controlled by changing the  
(a) applied voltage (b) number of heating elements  
(c) circuit configuration (d) all of the above
24. For LV applications (below 1KV) \_\_\_\_\_ cables are used.  
(a) paper insulated (b) plastic  
(c) single core (d) oil filled
25. For the system, represented by the characteristic equation  $s^4 + Ks^3 + s^2 + s + 1 = 0$ , to be stable, the value of K should be  
(a)  $K > 1/2$  (b)  $K > 1$   
(c)  $1/2 < K < 1$  (d)  $K < 1/2$
26. Root locus diagrams can be used to determine  
(a) absolute stability (b) relative stability  
(c) conditional stability (d) none of the above
27. A system with gain margin close to unity and phase margin close to zero is  
(a) highly stable (b) oscillatory  
(c) relatively stable (d) none of these
28. The frequency at which Nyquist diagram crosses the negative real axis is  
(a) gain crossover frequency (b) phase crossover frequency  
(c) damping frequency (d) natural frequency
29. An electromechanical device which actuates a train of step angular movements in response to a train of input pulses on one to one basis is  
(a) synchro control transformer (b) LVDT  
(c) stepper motor (d) tachogenerator
30. When a step function is applied to the input of a system, the output remains below a certain level for all the time. The system is  
(a) stable (b) unstable  
(c) not necessarily stable (d) always unstable

31. A system has poles at -1 and -5 and zeros at 1 and -2, the system is  
(a) stable (b) unstable  
(c) marginally stable (d) highly stable
32. A system has some roots with real parts equal to zero, but none with positive real parts. The system is  
(a) absolutely stable (b) relatively stable  
(c) marginally stable (d) absolutely unstable
33. In a force balance type pneumatic controller, the number of bellows required for P- action is  
(a) 1 (b) 2  
(c) 3 (d) 4
34. In a force balance type pneumatic controller, the number of bellows required for PI- action is  
(a) 1 (b) 2  
(c) 3 (d) 4
35. In a force balance type pneumatic controller, the number of bellows required for PID- action is  
(a) 1 (b) 2  
(c) 3 (d) 4
36. Shuttle valve is a pneumatic  
(a) OR gate (b) NOR gate  
(c) AND gate (d) NAND gate
37. In a flapper-nozzle mechanism, if flapper moves close to nozzle, the nozzle back pressure will  
(a) decrease (b) increase  
(c) remain constant (d) depend upon the construction
38. The controlling medium in a pneumatic control system is  
(a) liquid (b) air  
(c) oil (d) helium
39. The root loci of a system have three asymptotes. The system can have  
(a) three poles (b) five poles and two zeros  
(c) four poles and one zero (d) all of these
40. The transient response of a system is mainly due to  
(a) internal forces (b) inertia forces  
(c) friction (d) stored energy
41. Error constants of system are a measure of  
(a) steady-state response (b) transient response  
(c) relative stability (d) steady-state as well as transient response
42. Bandwidth is used as means of specifying performance of a control system related to  
(a) relative stability of the system (b) the speed of response  
(c) the constant gain (d) all of these

172. The maximum short circuit current occurs in the case of:  
(a) a dead short circuit (b) a double line to ground fault  
(c) a line to line fault (d) a single line to ground fault
173. For a line to line fault, the sequence of network is comprised of  
(a) only positive sequence (b) only negative sequence  
(c) only zero sequence (d) positive and negative sequence
174. Loading of a transmission line leads to an increase in  
(a) inductance of the line (b) capacitance of the line  
(c) resistance of the line (d) conductance of the line
175. If the frequency increases, the characteristic impedance of a transmission line  
(a) decreases (b) increases  
(c) remains constant (d) first increases and then decreases
176. If synchronous capacitors are used to provide VAR, leading VAR will be produced by  
(a) increasing the speed of the machine (b) increasing the field current  
(c) reducing the field current (d) none of these
177. Corona causes  
(a) communication interference (b) power loss  
(c) both (a) and (b) (d) none of these
178. Ferranti effect on overhead lines is experienced when  
(a) the line is lightly loaded (b) the power factor is unity  
(c) the power factor is leading (d) corona effect is dominant
179. Which of the following types of power plant is hardly used for supplying base load?  
(a) hydro (b) thermal  
(c) nuclear (d) solar
180. Shunt capacitors in a substation  
(a) consume lagging VAR (b) deliver lagging VAR  
(c) consume active power (d) deliver active power
181. Phase modifier is normally installed in case of  
(a) short transmission lines (b) long transmission lines  
(c) medium length lines (d) for any length of lines
182. Which of the following acts as a protection against high voltage surges due to lightning and switching?  
(a) Breather (b) Conservator  
(c) Horn gaps (d) Thermal overload relays

161. Load frequency control can be achieved by properly matching the individual machines ‘
- (a) reactive powers
  - (b) generated voltages
  - (c) turbine inputs
  - (d) turbine and generator ratings
162. Bundled conductors are used to
- (a) reduce inductance of the line
  - (b) reduce both inductance and capacitance
  - (c) reduce corona loss
  - (d) reduce corona loss and the line inductance
163. Z-Bus matrix is normally a
- (a) null matrix
  - (b) sparse matrix
  - (c) full matrix
  - (d) unity matrix
164. Load flow study gives the information on
- (a) magnitude and phase angles of load bus voltages
  - (b) reactive powers at generator buses
  - (c) real and reactive power flow on transmission lines
  - (d) all of these
165. Skin effect
- (a) increases the resistance and effective internal resistance
  - (b) decreases the effective resistance and effective resistance
  - (c) decreases the effective resistance and effective internal reactance
  - (d) increases the effective internal reactance
166. Earthing of transformer neutral through reactance will improve its
- (a) steady-state stability
  - (b) transient stability
  - (c) both
  - (d) neither
167. In MHD generator, there are two types of e.m.f. induced, one is known as motionally induced e.m.f. and the other is known as
- (a) stationary e.m.f.
  - (b) transformer action e.m.f.
  - (c) static e.m.f.
  - (d) Hall e.m.f.
168. Maximum power transfer will take place between stations through the interconnector if the angle between the station voltages is
- (a)  $0^\circ$
  - (b)  $60^\circ$
  - (c)  $90^\circ$
  - (d)  $180^\circ$
169. As the frequency increases, the capacity of the static condenser required for phase advancement
- (a) increases
  - (b) decreases
  - (c) remains constant
  - (d) may increase or decrease
170. The power factor improving equipment is installed at the consumer premises to relieve
- (a) the generator from overload
  - (b) the transmission line from overload
  - (c) both (a) and (b)
  - (d) none of the above
171. The charging current of a transmission line is more at
- (a) sending end
  - (b) receiving end
  - (c) the mid-point of the transmission line
  - (d) none of these

43. In control systems, excessive bandwidth should be avoided because
- (a) noise is proportional to bandwidth
  - (b) it leads to low relative stability
  - (c) it leads to slow speed of response
  - (d) none of these
44. For under-damped second-order system, the poles are
- (a) negative and real
  - (b) imaginary and complex
  - (c) complex conjugates with negative real parts
  - (d) positive and real
45. The transfer function of an integral controller is of the type
- (a)  $K_c$
  - (b)  $T_s$
  - (c)  $\frac{1}{T_s}$
  - (d)  $\frac{1}{T_s + 1}$
46. A lag network for a compensator normally consists of
- (a) R element only
  - (b) R and C elements
  - (c) R and L elements
  - (d) R, L and C elements
47. 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
48. The loop gain that makes the damping ratio equal to 0.5 is
- (a) 3
  - (b) 4
  - (c) 5
  - (d) 6
49. Excessive noise in control system can cause
- (a) reduction in band-width
  - (b) reduction in gain
  - (c) saturation in amplifying stages
  - (d) high-level oscillations
50. Which of the following is not a correct statement about the state-space model of a physical system?
- (a) State space model can be obtained only for a linear system
  - (b) Eigen values of the system represent the roots of the characteristic equation
  - (c)  $\dot{x} = Ax + Bu$  represents linear state-space model of a physical system
  - (d)  $x(t)$  represents the state vector of the system
51. The terms in the first column of Routh’s array of a certain system are 5, 2, -4, 6 and 3. The number of roots of characteristic equation in the right half of the s-plane is equal to
- (a) 2
  - (b) 1
  - (c) none
  - (d) 3
52. Microprocessor-based control system can be classified as
- (a) continuous data based systems
  - (b) learning control systems
  - (c) sampled data control systems
  - (d) stochastic control systems
53. The frequency at which the Nyquist diagram cuts (-1, 0) circle is known as
- (a) gain crossover frequency
  - (b) phase crossover frequency
  - (c) damping frequency
  - (d) natural frequency

54. Signal flow graph is used to obtain  
(a) stability of a system (b) transfer function of a system  
(c) controllability of a system (d) absorbability of a system
55. Traffic lights on roads are examples of  
(a) closed-loop system (b) open-loop system  
(c) both open-loop and closed-loop (d) open-loop but can be made closed-loop
56. For a stable system  
(a) the gain crossover occurs earlier than phase crossover  
(b) the phase crossover occurs earlier than gain crossover  
(c) the gain crossover and phase crossover frequencies are very near to each other  
(d) the gain crossover and phase crossover frequencies are coincident
57. The frequency and time domain are related through  
(a) Laplace transform (b) Fourier integral  
(c) Laplace transform of Fourier integral (d) Laplace transform and Fourier integral
58. The output of the controller in a control system is given to  
(a) the sensor (b) the comparator  
(c) the amplifier (d) the final control element
59. Adding of poles in the transfer function causes  
(a) lag-compensation (b) lead compensation  
(c) lead-lag compensation (d) none of these
60. Adding of zeros in the transfer function causes  
(a) lag-compensation (b) lead compensation  
(c) lead-lag compensation (d) none of these
61. Oil in transformer is used for  
(a) lubrication purpose (b) insulation  
(c) cooling (d) both (b) and (c)
62. The open circuit test on a transformer is mainly carried out to determine  
(a) copper loss (b) core loss  
(c) total loss (d) insulation resistance
63. Transformer cores are laminated to reduce  
(a) eddy current loss (b) hysteresis loss  
(c) both eddy current and hysteresis loss (d) copper loss
64. A 200KVA transformer has an iron loss of 1KW and a full-load Cu loss of 2KW. Its load KVA corresponding to maximum efficiency is  
(a) 100KVA (b) 141.4KVA  
(c) 50KVA (d) 200KVA

149. High voltage transmission lines use  
(a) pin insulators (b) suspension insulators  
(c) shackle insulators (d) none of these
150. Ground wire should be  
(a) electrically very good conductor (b) bad conductor but mechanically strong  
(c) good conductor and mechanically strong (d) none of the above
151. The transmission lines are said to be long if length of lines exceeds  
(a) 200 kms (b) 80 kms  
(c) 350 kms (d) 100 kms
152. A relay performs the function of  
(a) fault isolation (b) fault detection  
(c) fault prevention (d) all of these
153. Earth fault relays are  
(a) directional relays (b) non-directional relays  
(c) short-operate time relays (d) none of these
154. Grounding wires are made of  
(a) copper (b) aluminium  
(c) iron (d) galvanized stranded steel
155. Buchloz'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 the above
156. HRC fuse provides best protection against  
(a) open circuits (b) short circuits  
(c) over load (d) reverse current
157. Merze-Price protection is used to protect  
(a) transmission line and transformers (b) motors only  
(c) transformers and generators (d) transformers only
158. The lightning arrester is connected  
(a) in series with the line (b) between line and earth  
(c) to a pole near the line (d) none of these
159. The advantage of transmitting power at high voltage is  
(a) magnitude of current will be small (b) it will reduce the voltage drop in the line  
(c) power loss will be less (d) all of these
160. An HVDC transmission system has  
(a) charging current but no skin effect (b) no charging current but skin effect  
(c) neither charging current nor skin effect (d) both charging current and skin effect

139. Peak load plants are normally designed such that they should supply power at  
(a) low capital cost and high operating cost  
(b) high capital cost and low operating cost  
(c) high capital cost and high operating cost  
(d) low capital cost and low operating cost
140. For the same capacity, the running expenses are maximum in case of  
(a) thermal plant (b) hydel plant  
(c) nuclear plant (d) diesel plant
141. The generators kept for spinning reserve are  
(a) kept running on loads (b) kept running on light loads  
(c) not in operation (d) none of these
142. Plant capacity factor of a generating plant is defined as  
(a)  $\frac{\text{Average demand}}{\text{installed capacity}}$  (b)  $\frac{\text{Total Kwh consumed per day}}{\text{Installed capacity} \times 24}$   
(c)  $\frac{\text{Annual energy consumed}}{\text{Installed capacity} \times 8760}$  (d) All of the above
143. A consumer will have to pay lesser fixed charges in  
(a) flat rate tariff (b) two-part tariff  
(c) maximum demand tariff (d) fixed charges are same in all
144. In two part tariff, the fixed charges are  
(a) dependent upon the maximum demand of the consumer  
(b) dependent upon the number of units consumed by the consumer  
(c) both (a) and (b)  
(d) none of the above
145. Which of the following circuit breakers takes minimum time for installation?  
(a) Air blast (b) Minimum oil  
(c) Bulk oil (d) SF<sub>6</sub>
146. If a voltage-controlled bus is treated as load bus, then which of the following limits would be violated?  
(a) Voltage (b) Active power  
(c) Reactive power (d) Phase angle
147. ACSR stands for  
(a) all copper standard reinforced (b) aluminum copper steel reinforced  
(c) aluminum conductor steel reinforced (d) all copper steel reinforced
148. The frequency used in power system in India is  
(a) 50 Hz (b) 60 Hz  
(c) 40 Hz (d) 66 Hz

65. In the previous problem, the copper loss corresponding to maximum efficiency is  
(a) 1KW (b) 2KW  
(c) 500W (d) cannot be determined
66. Differential protection is generally applied to transformers having ratings of  
(a) 5 MVA and above (b) 1 MVA and above  
(c) 100 KVA and above (d) 500 KVA and above
67. Distribution transformers preferably should be  
(a) Delta-Delta (b) Delta-Star  
(c) Star-Delta (d) Star-Star
68. Which of the following d.c. generators is most suitable as a booster?  
(a) shunt generator (b) series generator  
(c) long shunt compound generator (d) short shunt compound generator
69. 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
70. 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
71. For traction, which motor is used  
(a) d.c. series (b) d.c. shunt  
(c) induction (d) synchronous
72. 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
73. The emf in the stator of a 3-phase induction motor has a frequency of 50 Hz, and that in the rotor 1.5 Hz. The slip of the motor is  
(a) 33.33% (b) 3%  
(c) 7.5% (d) none of these
74. In which of the following motors can speed be controlled from rotor side?  
(a) D.C. shunt motor (b) 3-phase squirrel cage induction motor  
(c) A.C. series motor (d) 3-phase slip-ring induction motor
75. Circle diagram is used to find the performance of  
(a) synchronous motor (b) induction motor  
(c) alternator (d) 3-phase transformer

76. In double cage induction motor, the outer cage has  
(a) high resistance and high reactance (b) low resistance and low reactance  
(c) high resistance and low reactance (d) low resistance and high reactance
77. Which of the following motors is generally used in a ceiling fan?  
(a) synchronous motor (b) D.C. shunt motor  
(c) 3-phase induction motor (d) 1-phase induction motor
78. For high starting torque, the most suited induction motor is  
(a) squirrel cage type (b) double cage type  
(c) deep bar type (d) slip-ring type
79. A star-delta starter is equivalent to an auto-transformer starter with tapping of  
(a) 86.6% (b) 57.7%  
(c) 66.67% (d) 33.33%
80. The maximum speed with which an alternator can be driven to generate an e.m.f. of 50 Hz. is  
(a) 6000 RPM (b) 3000 RPM  
(c) infinity (d) depends on motor parameters
81. Synchronous condenser is nothing but a synchronous motor which is  
(a) under-excited (b) over-excited  
(c) not excited at all (d) normally excited
82. The speed of d.c. motor can be controlled by changing  
(a) its flux (b) armature circuit resistance  
(c) applied voltage (d) all of the above
83. A single-phase, 230/2300V transformer takes 5A at no-load at a p.f. of 0.25 lagging. The core losses are  
(a) 300.2W (b) 192.5W  
(c) 287.5W (d) 212.6W
84. 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
85. When an induction motor is at standstill, the slip is  
(a) zero (b) one  
(c) infinity (d) none of these
86. Changing the electrical connection to reverse the direction of rotation of a motor at full speed is called  
(a) slugging (b) plugging  
(c) dynamic braking (d) brush shifting
87. The leakage flux in a transformer depends on  
(a) the applied voltage (b) the frequency  
(c) the load current (d) the mutual flux

130. If the load on a synchronous motor increases while the field excitation remains constant, then  
(a) power factor will increase and power angle will decrease  
(b) power factor will decrease and power angle will increase  
(c) both power factor and power angle will increase  
(d) both power factor and power angle will decrease
131. 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
132. For thermal power stations of large capacities using coal as the fuel, the type of boiler employed is  
(a) water tube boilers (b) simple vertical boilers  
(c) Babcock and Wilcox boiler (d) none of these
133. The function of the condenser in steam power plant is to  
(a) reduce the back pressure at the turbine exhaust  
(b) increase the back pressure at the turbine exhaust  
(c) keep the back pressure constant at the turbine exhaust  
(d) none of the above
134. Which of the following isotopes of uranium is useful for fission reaction?  
(a)  $U^{233}$  (b)  $U^{234}$   
(c)  $U^{238}$  (d)  $U^{239}$
135. In fast breeder reactors, the coolant used is  
(a) heavy water (b) sodium  
(c) air (d) none of these
136. Gross head of a hydro-electric power station is  
(a) the height of the water level in the reservoir behind the dam  
(b) the height of the water level in the river where the tail race is located  
(c) the difference between the height of the water level in the reservoir behind the dam and the height of the water level in the river where the tail race is located  
(d) none of these
137. Water hammer is developed in  
(a) surge tank (b) turbine  
(c) penstock (d) dam
138. Base load plants are normally designed such that they should supply power at  
(a) low capital cost and high operating cost  
(b) high capital cost and low operating cost  
(c) high capital cost and high operating cost  
(d) low capital cost and low operating cost



119. It is economical to use auto-transformer when the transformation ratio is  
(a) low (b) high  
(c) neither too high nor too low (d) near unity
120. If the field of a synchronous motor is over excited, its power factor will be  
(a) more than unity (b) leading  
(c) lagging (d) unity
121. A 3-phase, 50 Hz, 8-pole, squirrel-cage induction motor will run at a speed of  
(a) less than 750 RPM (b) greater than 750 RPM  
(c) 750 RPM (d) 1500 RPM
122. The rotor of a 3-phase induction motor always runs at  
(a) synchronous speed (b) less than synchronous speed  
(c) greater than synchronous speed (d) any speed
123. When two transformers of different KVA ratings are connected in parallel, they divide the total load in proportion to their KVA ratings only when their  
(a) voltage ratios are equal (b) efficiencies are equal  
(c) per unit impedances are equal (d) equivalent impedances are equal
124. In the short-circuit test of transformers, the iron loss is negligible because  
(a) the entire input is just sufficient to meet copper losses only  
(b) the flux is very small as the voltage applied is a small fraction of the rated voltage  
(c) iron core becomes fully saturated  
(d) supply frequency remains constant
125. The type of core used for high frequency transformers is  
(a) open iron core (b) closed iron core  
(c) shell type iron core (d) air core
126. Salient pole type rotors are generally used with prime movers of  
(a) high speed (b) low speed  
(c) medium speed (d) medium and high speed
127. The frequency of the emf generated by a 6-pole alternator running at 1200 RPM is  
(a) 100 Hz (b) 50 Hz  
(c) 60 Hz (d) cannot be determined
128. In a d.c. motor, starter is required to  
(a) limit the voltage to a safe value (b) limit the starting current to a safe value  
(c) avoid sparking at the armature terminals (d) all of these
129. If the centrifugal switch of a split-phase motor fails to open,  
(a) the motor will stop running  
(b) the main winding will get overheated  
(c) the auxiliary winding will get overheated  
(d) none of these

88. The speed of a d.c. shunt motor can be increased above its normal speed by  
(a) increasing the field current (b) decreasing the field current  
(c) decreasing the terminal voltage (d) increasing the armature resistance
89. When two identical transformers are available, the best method to find their efficiency under load condition is  
(a) short-circuit test (b) back to back test  
(c) open-circuit test (d) phase sequence test
90. Hysteresis loss of a transformer depends upon the  
(a) applied voltage (b) type of core material  
(c) number of laminations (d) reactance of the winding
91. In any transformer, the voltage per turn in primary and secondary remains  
(a) always same (b) always in ratio of k  
(c) always different (d) sometimes same
92. The reactance per phase as compared to the resistance per phase of an induction motor is  
(a) quite high (b) slightly large  
(c) almost same (d) very small
93. An increase in the value of air gap flux density in an induction motor  
(a) increases iron loss (b) increases efficiency  
(c) decreases efficiency (d) both (a) and (c)
94. Scott connections are used for  
(a) single phase to three phase transformation (b) three phase to single phase transformation  
(c) three phase to two phase transformation (d) any of the above
95. In the transformer circuit model, the core loss is represented as a  
(a) series resistance (b) series inductance  
(c) shunt resistance (d) shunt inductance
96. The dummy coils in a d.c. machine are used to  
(a) increase the efficiency  
(b) improve the commutation  
(c) reduce the cost of the machine  
(d) maintain mechanical balance of the armature
97. In a capacitor start single phase induction motor, the capacitor is connected  
(a) in series with the main winding (b) in parallel with the auxiliary winding  
(c) in series with the auxiliary winding (d) none of the above
98. A 3-phase, 400-V, 50Hz, 4-pole induction motor is fed from 3-phase, 400-V, supply and runs of 1425 RPM. The frequency of the rotor e.m.f. is  
(a) 2.5 Hz (b) 50 Hz  
(c) 48 Hz (d) zero

99. 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
100. Synchronous capacitor is  
(a) an ordinary static capacitor bank  
(b) an over-excited synchronous motor driving mechanical load  
(c) an over excited synchronous motor without mechanical load  
(d) none of these
101. Damper winding is used in a synchronous motor for  
(a) power factor improvement (b) efficiency improvement  
(c) eliminating hunting of the motor (d) minimizing temperature rise
102. The path of the magnetic flux in a transformer should have  
(a) low reluctance (b) low resistance  
(c) high reluctance (d) high resistance
103. If an induction machine is run at a speed above the synchronous speed, it acts as a  
(a) a synchronous motor (b) an induction motor  
(c) an induction generator (d) a synchronous generator
104. During hunting of synchronous motor  
(a) negative phase sequence currents are generated  
(b) harmonics are developed in the armature circuit  
(c) damper bar develops torque  
(d) field excitation increases
105. The purpose of interpoles in a d.c. machine is to nullify  
(a) the demagnetizing effect of armature mmf  
(b) the cross-magnetising effect of armature mmf  
(c) the reactance voltage  
(d) all of the above
106. Which of the following motors is used for rolling mills?  
(a) D.C. shunt motors (b) D.C. cumulative compound motors  
(c) D.C. series motors (d) D.C. differential compound motors
107. A 50Hz induction motor has a rated speed of 715 RPM. How many poles does its rotating magnetic field have?  
(a) 2 (b) 4  
(c) 6 (d) 8
108. The rotor copper loss of an induction motor is 600W and the slip is 3%. The rotor input is  
(a) 200W (b) 18KW  
(c) 5.4KW (d) 20KW

109. The speed of a three-phase induction motor depends on  
(a) frequency of the supply only  
(b) number of poles only  
(c) number of poles and the frequency of supply  
(d) input voltage
110. Which of the following motors does not use a centrifugal switch?  
(a) Split-phase motor (b) Capacitor start capacitor run motor  
(c) Shaded pole motor (d) none of these
111. Armature reaction in d.c. machine is attributed to  
(a) the effect of magnetic field set up by the armature current  
(b) the effect of magnetic field set up by the field current  
(c) copper losses in the armature  
(d) the effect of magnetic field set up by back e.m.f.
112. Which of the following d.c. motors is suitable for high starting torque?  
(a) Shunt motor (b) Cumulative compound motor  
(c) Series motor (d) differentially compound
113. In d.c. machines, the armature windings are placed on the rotor (and not on the stator) to facilitate  
(a) electro-mechanical energy conversion (b) generation of voltage  
(c) commutation (d) development of torque
114. The resistance of the starter of a 220V, 5 h.p., d.c. shunt motor is of the order of  
(a) 0.1 ohm (b) 1 ohm  
(c) 10 ohms (d) 0.01 ohm
115. Two transformers when operating in parallel will share the load depending upon their  
(a) magnetizing current (b) per unit impedance  
(c) leakage reactance (d) efficiency
116. An auto-transformer having a transformation ratio of 0.8 supplies a load of 3KW. The power transferred conductively from primary to secondary is  
(a) 0.6KW (b) 2.4KW  
(c) 1.5KW (d) 0.27KW
117. If the full-load copper loss of a transformer is 1600W, its copper loss at 75% full-load would be  
(a) 900W (b) 1200W  
(c) 1600W (d) none of these
118. A transformer has a percentage resistance of 1% and a percentage reactance of 4%. Its regulation at power factors of 0.8 lagging and 0.8 leading are respectively  
(a) 3.2% and -1.6% (b) 6% and -4%  
(c) 4.8% and -3.2% (d) none of these