# EEA/507

# 2012

Series **C**



# ELECTRICAL ENGINEERING

## Paper III

*Time : **150** Minutes* *Max. Marks : **150***

### INSTRUCTIONS

1. Please check the Test Booklet and ensure that it contains all the questions. If you find any defect in the Test Booklet or Answer Sheet, please get it replaced immediately.

2. The Test Booklet contains **150** questions. Each question carries **one** mark.

3. The Test Booklet is printed in four (4) Series, viz. [A] [B] [C] [D]. The Series, [A] or [B] or [C] or [D] is printed on the right-hand corner of the cover page of the Test Booklet. Mark your Test Booklet Series [A] or [B] or [C] or [D] in Part C on side 1 of the Answer Sheet by darkening the appropriate circle with Blue/Black Ball point pen.

Example to fill up the Booklet Series

If your Test Booklet Series is **A**, please fill as shown below :

● Ⓑ Ⓒ Ⓓ

***If you have not marked the Test Booklet Series at Part C of side 1 of the Answer Sheet or marked in a way that it leads to discrepancy in determining the exact Test Booklet Series, then, in all such cases, your Answer Sheet will be invalidated without any further notice. No correspondence will be entertained in the matter.***

4. Each question is followed by 4 answer choices. Of these, you have to select one correct answer and mark it on the Answer Sheet by darkening the appropriate circle for the question. If more than one circle is darkened, the answer will not be valued at all. Use Blue/Black Ball point pen to make heavy black marks to fill the circle completely. Make **no** other stray marks.

*e.g. :* If the answer for Question No. **1** is Answer choice (2), it should be marked as follows :

| | | | | |
|---|---|---|---|---|
| 1 | ① | ● | ③ | ④ |

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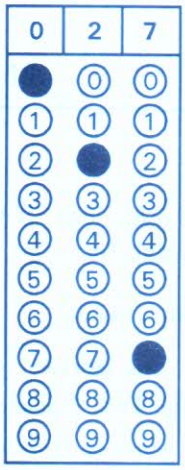
*e.g.* : If the answer for Question No. **1** is Answer choice (2), it should be marked as follows :

1 | ① | ● | ③ | ④ |

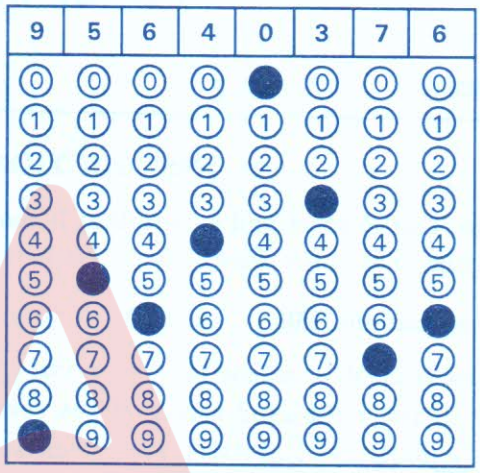
**5.** Mark Paper Code and Roll No. as given in the Hall Ticket with Blue/Black Ball point pen by darkening appropriate circles in Part A of side 1 of the Answer Sheet. Incorrect/not encoding will lead to ***invalidation*** of your Answer Sheet.

***Example :*** If the Paper Code is **027**, and Roll No. is **95640376** fill as shown below :

**Paper Code**




**Roll No.**




**6.** Please get the signature of the Invigilator affixed in the space provided in the Answer Sheet. An Answer Sheet without the signature of the Invigilator is liable for ***invalidation***.

**7.** The candidate should **not** do rough work or write any irrelevant matter in the Answer Sheet. Doing so will lead to ***invalidation***.

**8.** Do **not** mark answer choices on the Test Booklet. Violation of this will be viewed seriously.

**9.** Before leaving the examination hall, the candidate should hand over the original OMR Answer Sheet (top sheet) to the Invigilator and carry the bottom sheet (duplicate) for his/her record, failing which disciplinary action will be taken.

**10.** Use of whitener is prohibited. If used, the answer sheet is liable for invalidation.

1. In hydropower plants
   (1) initial cost is high and operating cost is low
   (2) initial cost as well as operating cost are high
   (3) initial cost is low and operating cost is high
   (4) initial cost as well as operating cost are low

2. Heavy water implies
   (1) $H_2O$
   (2) $B_2O$
   (3) $W_2O$
   (4) $D_2O$

3. The rotor used in alternator for hydroelectric station is
   (1) salient pole rotor
   (2) cylindrical rotor
   (3) non-salient pole rotor
   (4) round rotor with ac excitation

4. Water hammer is developed in
   (1) penstock
   (2) turbine
   (3) surge tank
   (4) alternator

5. Moderator is used to
   (1) absorb neutrons
   (2) reduce the speed of neutrons
   (3) accelerate the speed of neutrons
   (4) stop the chain reaction

6. Coolants used in reactors should have _____ melting point and _____ boiling point.
   (1) low, low
   (2) low, high
   (3) high, low
   (4) high, high

7. Nuclear power plants are used as _____ load plants.
   (1) base
   (2) peak
   (3) fluctuating
   (4) electric traction

8. In a thermal power plant, the overall efficiency is low due to low efficiency of
   (1) boiler
   (2) steam turbine and condenser
   (3) alternator
   (4) non-salient pole motor

9. A positive pressure develops in the penstock if the alternator load is suddenly
   (1) decreased
   (2) increased
   (3) made fluctuating
   (4) short-circuited

10. Nuclear reactors generally employ
   (1) fission
   (2) fusion
   (3) both fission and fusion
   (4) None of the above

11. Which enters the superheater of a boiler in a steam power station ?
(1) Wet steam
(2) Superheated steam
(3) Cold water
(4) Hot water

12. Economiser is used to heat
(1) flue gases
(2) turbine steam
(3) air intake
(4) feed water to boiler

13. Which turbine can be used for low head and high discharge hydel plant ?
(1) Pelton wheel
(2) Jonval turbine
(3) Kaplan turbine
(4) Francis turbine

14. "Spinning reserve" is basically
(1) capacity of the part of the plant that remains under maintenance
(2) reserve generating capacity that is available for service but not in operation
(3) reserve generating capacity that is in operation but not in service
(4) reserve generating capacity that is connected to bus and ready to take the load

15. In pumped storage hydel plants
(1) water is recirculated through turbine
(2) water is stored by pumping to high pressures
(3) power is produced by means of pumps
(4) downstream water is pumped upstream during off load periods

16. Which gas in atmosphere causes green-house effect ?
(1) Nitrogen
(2) Hydrogen
(3) Carbon dioxide
(4) Hydrogen sulphide

17. Most of the generators in thermal power plants run at
(1) 750 RPM
(2) 1000 RPM
(3) 1500 RPM
(4) 3000 RPM

18. The reflectors of a nuclear reactor are made up of
(1) steel
(2) boron
(3) iron
(4) beryllium

19. Fast breeder reactors are best suited in India because
(1) of good efficiency
(2) of large uranium deposits
(3) of large thorium deposits
(4) of large plutonium deposits

20. The draught produced in a chimney is called
(1) natural draught
(2) induced draught
(3) forced draught
(4) balanced draught

21. Burden of a protective relay is the power
(1) developed by the relay circuit
(2) absorbed by the circuit of relay
(3) factor of the relay circuit including tripping coil
(4) required to operate the circuit breaker

22. Directional relays are based on flow of

(1) voltage wave

(2) current

(3) power

(4) polarity of voltage only

23. A distance relay measures

(1) voltage difference

(2) current difference

(3) distance between two CT

(4) impedance

24. Discrimination between main and backup protection is provided by the use of relays which are

(1) slow

(2) fast

(3) sensitive

(4) All of the above

25. A differential relay measures the vector difference between

(1) two powers

(2) two voltages

(3) two currents

(4) two or more similar electrical quantities

26. In a delta/star transformer employing Merz price percentage differential protection the CT's are connected in the primary and secondary windings as

(1) delta-star

(2) star-star

(3) star-delta

(4) delta-delta

27. Large internal faults are protected by

(1) horn gaps and temperature relays

(2) earth fault and positive sequence relays

(3) Merz price percentage differential protection

(4) mho and ohm relays

28. A protective relay is energized through 11 kV/110 V PT and 100/5 CT, then the ratio of secondary impedance to primary impedance $\frac{Z_{SEC}}{Z_{PRI}}$ as shown by relay will be

(1) $\frac{100}{20}$

(2) $\left(\frac{100}{20}\right)^2$

(3) $\left(\frac{20}{100}\right)^2$

(4) $\frac{20}{100}$

29. Back up protection protects against

(1) over current

(2) transient current

(3) both (1) and (2)

(4) short-circuit current

30. If fault occurs near an impedance relay, the $\frac{V}{I}$ ratio is

(1) constant for all the locations of fault

(2) lower than the value if fault occurs away from the relay

(3) higher than the value if fault occurs away from the relay

(4) may be lower or higher than the value if fault occurs away from the relay

**31.** The following data is obtained from a power station :

Fixed cost = ₹ $20 \times 10^5$

Variable cost = ₹ $30 \times 10^5$

Units generated per annum = $175 \times 10^6$ kWh

The cost of generation per unit will be

(1) ₹ 1·00

(2) 28·57 paise

(3) 5 paise

(4) 2·85 paise

**32.** When transmission losses are considered, the criteria of economic operation is given by

(1) $\frac{df_c}{dp} = \lambda$

(2) $\frac{df_c}{dp} \cdot L_i = \lambda$

(3) $\frac{df_c}{dp} \cdot \frac{1}{L_i} = \lambda$

(4) $L_i = \lambda$

where $L_i$ represents penalty factor.

**33.** Optimum fuel economy is achieved, transmission losses being considered, when

(1) summation of incremental fuel cost and penalty factor is same for all plants

(2) penalty factor is neglected

(3) penalty factor is constant

(4) product of incremental fuel cost times penalty factor is constant for all plants

**34.** A cost function for a power station is represented as

$$F_c = \alpha + \beta P_i + \gamma P_i^2$$

Hence, the incremental fuel cost will be given by

(1) IFC = $\alpha + \beta + \gamma$

(2) IFC = $\alpha + \beta P_i + \gamma P_i^2$

(3) IFC = $\beta + \gamma P_i$

(4) IFC = $\alpha + \gamma P_i$

**35.** The constraint equation in computing economic criteria is given by

(1) $\sum_{k=1}^{n} (P_{gi} + P_L + P_D) = \phi$

(2) $\sum_{k=1}^{n} (P_{gi} + P_L - P_D) = \phi$

(3) $\sum_{k=1}^{n} (P_{gi} - P_L + P_D) = \phi$

(4) $\sum_{k=1}^{n} (P_{gi} - P_L - P_D) = \phi$

where $P_{gi}$ represents generation, $P_L$ the load and $P_D$ the load demand and $\phi$ the residual power.

**36.** The incremental costs of two power stations are given as

$$(IC)_A = \beta_A + 2\gamma_A P_A$$

$$(IC)_B = \beta_B + \gamma_B P_A$$

If $\beta_A = \beta_B$ and $\gamma_A = \gamma_B$, for optimal operation,

(1) $P_A = P_B = P_D$

(2) $P_A = P_B = \frac{P_D}{3}$

(3) $P_A = P_B = \frac{P_D}{2}$

(4) $P_A = P_B = 0$

here $P_D$ represents the total load demand.

37. Which of the following plants is used as peak load plant ?

(1) Pumped storage plant

(2) Steam turbine plant

(3) Nuclear power plant

(4) None of the above

38. The choice of number and size of units in a station is governed by best compromise between

(1) plant load factor and plant use factor

(2) plant capacity factor and plant use factor

(3) plant load factor and plant capacity factor

(4) None of the above

39. Plant capacity factor is

(1) actual energy produced / maximum possible energy that could have been produced (based on installed capacity)

(2) actual energy produced / (plant capacity, hours for which the plant has been in operation)

(3) energy generated in a given period (maximum demand is in hours of the given period)

(4) None of the above

40. The product of diversity factor and maximum demand is

(1) average demand

(2) sum of consumers' maximum demand

(3) installed capacity

(4) generated power

41. In optimum generator scheduling of different power plants, the minimum fuel cost is obtained when for each plant same is its

(1) incremental fuel cost

(2) penalty factor

(3) product of (1) and (2)

(4) rate of incremental fuel cost

42. To effectively reduce the cost of generation in a power station, increase its

(1) load factor

(2) diversity factor

(3) both (1) and (2)

(4) power factor and load factor

43. Power plant having maximum demand more than the installed rated capacity will have utilization factor

(1) equal to unity

(2) less than unity

(3) more than unity

(4) None of the above

44. Most efficient plants are normally used as

(1) peak load plants

(2) base load plants

(3) either (1) or (2)

(4) None of the above

45. When a plant resorts to load shedding it can be concluded that

(1) peak demand is more than the installed capacity

(2) daily load factor is unity

(3) diversity factor is zero

(4) plant is under repairs

46. The input to the set under Hopkinson's test is

(1) losses in the generator alone

(2) losses in the motor alone

(3) output of the generator

(4) losses in both the machines

47. In Swinburne's method of testing dc machines, the shunt machine is run as a

(1) motor at full load

(2) generator at full load

(3) motor at no load

(4) generator at no load

48. The moment of inertia of rotating machine (dc motor) can be obtained by calculations from the following test

(1) Swinburne's test

(2) Brake test

(3) Hopkinson's test

(4) Retardation test

49. The complete circle diagram of a 3-phase induction motor can be drawn with the help of

(1) running-light test alone

(2) both running-light and blocked-rotor tests

(3) running-light, blocked-rotor and stator resistance tests

(4) blocked-rotor test alone

50. Ward – Leonard method of speed control is basically a/an

(1) field control method

(2) field diverter method

(3) armature resistance control method

(4) voltage control method

51. Ungrounded neutral transmission system is not recommended because of system

(1) being inadequately protected against ground fault

(2) insulation being overstressed due to over voltages

(3) insulation overstress may lead to failure and subsequent phase to phase faults

(4) All of the above

52. A system is said to be effectively grounded when for the portion under consideration, the ratio of

(1) zero sequence reactance to positive sequence reactance is more than three

(2) zero sequence resistance to positive sequence resistance is less than unity

(3) zero sequence reactance to positive sequence reactance is more than three

(4) both (1) and (2)

**53.** Which of the following motors is best suited for the rolling mills ?

(1) Single-phase motors

(2) dc motors

(3) Squirrel cage induction motors

(4) Slip-ring induction motors

**54.** In a paper mill where constant speed is required

(1) synchronous motors are preferred

(2) ac motors are preferred

(3) individual drive is preferred

(4) group drive is preferred

**55.** _____ has relatively wide range of speed control.

(1) Synchronous motor

(2) Slip-ring induction motor

(3) dc shunt motor

(4) Squirrel cage induction motor

**56.** Which of the following motors is preferred when quick speed reversal is the main consideration ?

(1) Synchronous motor

(2) Squirrel cage induction motor

(3) Wound rotor induction motor

(4) dc motor

**57.** For which of the following applications, motor has to start with high acceleration ?

(1) Oil expeller

(2) Flour mill

(3) Lifts and hoists

(4) Centrifugal pump

**58.** Which of the following machines has heavy fluctuation of load ?

(1) Printing machine

(2) Punching machine

(3) Planer

(4) Lathe

**59.** Which of the following is preferred for automatic drives ?

(1) Synchronous motors

(2) Squirrel cage induction motor

(3) Ward – Leonard controlled dc motors

(4) Any of the above

**60.** In overhead travelling cranes

(1) continuous duty motors are used

(2) slow speed motors are preferred

(3) short time rated motors are preferred

(4) None of the above

**61.** The following is ***not*** an instantaneous relay

(1) induction disc type

(2) hinged armature type

(3) balanced beam type

(4) polarized type

**62.** Protective relays are devices which detect abnormal conditions in electrical circuits by measuring

(1) current during abnormal condition

(2) voltage during abnormal condition

(3) both (1) and (2) simultaneously

(4) constantly the electrical quantities which differ during normal and abnormal conditions

**63.** Fault current is maximum in an impedance relay if the fault has occurred

(1) away from the relay

(2) near the relay

(3) exactly at the middle point of transmission line

(4) fault current is independent of the location of the fault

**64.** Buchholz relay is operated by

(1) eddy currents

(2) electrostatic induction

(3) gas pressure

(4) electromagnetic induction

**65.** The time interval between the instant of occurrence of the fault and the instant of closing of the relay contacts is known as

(1) making time

(2) breaker time

(3) relay time

(4) None of the above

**66.** For which equipment, current rating specification is ***not*** necessary ?

(1) Circuit breakers

(2) Load break switch

(3) Isolators

(4) Circuit breakers and load break switch

**67.** Which relay is used in protection of long transmission lines ?

(1) Reactance relay

(2) Impedance relay

(3) MHO relay

(4) None of the above

**68.** Buchholz relay is

(1) installed inside the breaker

(2) installed at the end of breather pipe

(3) located on the top of the conservator tank

(4) connected in the pipe connecting the main tank of transformer and conservator

**69.** Admittance relay is basically a/an

(1) impedance relay

(2) directional relay

(3) non-directional relay

(4) None of the above

**70.** A MHO relay is a

(1) voltage controlled over current relay

(2) voltage restrained directional relay

(3) directional restrained over voltage relay

(4) directional restrained over current relay

**71.** Which is the circuit breaker (CB) preferred for the interruption of high voltages and low current ?

(1) Oil CB

(2) Air blast CB

(3) Vacuum CB

(4) All are correct

72. Arcing between CB contacts can be reduced by

(1) inserting resistance in the line

(2) inserting a capacitor in parallel with the contacts

(3) inserting a capacitor in series with the contacts

(4) inserting an inductance in parallel to contacts

73. The voltage across the circuit breaker contacts after final current zero is

(1) restriking voltage

(2) recovery voltage

(3) supply voltage

(4) None of the above

74. Resistance switching is normally used in case of

(1) bulk oil circuit breakers

(2) minimum oil circuit breakers

(3) air blast circuit breakers

(4) all types of circuit breakers

75. The symmetrical breaking capacity of a 3-phase circuit breaker is given by

(1) $\sqrt{3}$ × normal voltage × rated symmetrical current

(2) 3 × normal voltage × rated symmetrical current

(3) normal voltage × rated symmetrical current × factor of safety

(4) None of the above

76. The rating of a circuit breaker is generally determined on the basis of

(1) symmetrical fault current

(2) single-line to ground fault current

(3) double-line to ground fault current

(4) line to line fault current

77. Circuit breakers usually operate during

(1) steady state of short circuit current

(2) transient state of short circuit current

(3) sub-transient state of short circuit current

(4) after dc component has ceased

78. Air blast circuit breaker is most suitable for

(1) short duty

(2) repeated duty

(3) intermittent duty

(4) over currents

79. Which of the following circuit breakers is preferred for 400 kV transmission line protection ?

(1) Bulk oil CB

(2) Minimum oil CB

(3) Air break CB

(4) $SF_6$ CB

80. In a circuit breaker, arc will restrike if

(1) RRRV is zero

(2) RRRV is more than the rate of building up of dielectric strength

(3) RRRV is less than the rate of building up of dielectric strength

(4) RRRV is same as rate of building up of dielectric strength

81. Arc in a circuit behaves as

(1) an inductive reactance

(2) a capacitive reactance

(3) a resistance increasing with voltage rise across the arc

(4) a resistance decreasing with voltage rise across the arc

**82.** The time interval from instant of contact separation to time of arc extinction is called

(1) closing time

(2) opening time

(3) arcing time

(4) None of the above

**83.** In which of the following, a circuit breaker must be equipped for remote operation ?

(1) Inverse time trip

(2) Time-delay trip

(3) Shunt trip

(4) None of the above

**84.** Which of the following circuit breakers has high reliability and minimum maintenance ?

(1) Oil circuit breakers

(2) Air blast circuit breakers

(3) Vacuum circuit breakers

(4) $SF_6$ circuit breakers

**85.** Air used in air blast circuit breaker

(1) must have oil mist

(2) must be ionized

(3) must have least $CO_2$

(4) must be free from moisture

**86.** The area under the load curve gives

(1) average demand

(2) average kWh energy consumption during the period

(3) maximum demand

(4) None of the above

**87.** Which plant can never have 100 percent load factor ?

(1) Peak load plant

(2) Base load plant

(3) Nuclear power plant

(4) Hydroelectric plant

**88.** In order to have lower cost of electrical generation

(1) the load factor and diversity factor should be low

(2) the load factor and diversity factor should be high

(3) the load factor should be high but the diversity factor low

(4) the load factor should be low but the diversity factor high

**89.** Plant capacity factor and load factor become identical when

(1) average load is same as peak load

(2) peak load is equal to the capacity of the plant

(3) average load is half the capacity of the plant

(4) group diversity factor is equal to peak diversity factor

**90.** If a plant has low utilization factor, it indicates that

(1) plant is shut off

(2) plant is used for base load only

(3) plant is used for peak load only

(4) plant is used for standby purpose only

**91.** In underground cables, the electrostatic stress is

(1) zero at the conductor as well as on the sheath

(2) minimum at the conductor surface and minimum at the sheath

(3) maximum at the conductor surface and minimum at the sheath

(4) same at the conductor surface and sheath

**92.** The insulation resistance of the cable decreases with

(1) electric stress

(2) the decrease in length of the insulation of the cable

(3) the increase in length of the insulation of the cable

(4) None of the above

**93.** The main utility of intersheaths in cables is/are

(1) to provide better thermal stress distribution

(2) to provide proper stress distribution

(3) upgrading inferior insulation

(4) to provide against voltage and current surges

**94.** In the cables, the location of fault is usually found out by comparing

(1) the resistance of the conductors

(2) the inductance of the conductors

(3) the capacitances of the insulated conductors

(4) all above parameters

**95.** In capacitance grading of cables, we use

(1) porous dielectric

(2) homogeneous dielectric

(3) hygroscopic dielectric of same permittivities

(4) dielectric of varying permittivities

**96.** The advantage of cables over transmission lines

(1) is easy maintenance

(2) is low cost

(3) can be used in high voltage circuits

(4) can be used in congested areas

**97.** Paper used as insulating materials in cables is generally impregnated with oily compounds, because

(1) it is hygroscopic

(2) it has many pores

(3) it is otherwise good conductor

(4) it gets electrostatically charged at high voltage

**98.** The capacitance between any two conductors of a 3-core cable (with sheath earthed) is 4 μF. The capacitance per phase will be

(1) 1·33 μF

(2) 4 μF

(3) 8 μF

(4) None of the above

**99.** Void formation in the dielectric material of the underground cable may be controlled by

(1) using a high permittivity solid dielectric

(2) providing a strong metallic sheath outside the cable

(3) filling oil at high pressure as dielectric

(4) None of the above

**100.** Voltage gradient in a cable is highest at the

(1) centre of the conductor

(2) surface of the conductor

(3) surface of the sheath

(4) in between (2) and (3)

**101.** When a cable is to cross a road, it should

(1) run as an overhead cable

(2) be buried in trenches

(3) be laid in pipes or conduits

(4) be surrounded by saw-dust to absorb vibrations

**102.** If power cable and communication cable are to run parallel, the minimum distance between the two, to avoid interference, should be

(1) 1 cm

(2) 10 cm

(3) 50 cm

(4) 500 cm

**103.** When the diameter of the core and cable is doubled, the value of capacitance

(1) will be reduced to one-fourth

(2) will be reduced to half

(3) will be doubled

(4) will become four times

**104.** In a 3-core cable, the colour of the neutral is

(1) black

(2) red

(3) blue

(4) yellow

**105.** In cables, the charging current

(1) leads the voltage by 90°

(2) leads the voltage by 120°

(3) leads the voltage by any angle between 90° and 120°

(4) leads the voltage by 180°

**106.** Commonest type of 3-phase unsymmetrical fault is

(1) 3-phase

(2) line to line

(3) single line to ground

(4) double line to ground

**107.** Which of the following statements is true ?

(1) $a^4 = -a$

(2) $a^2 = -(1 + a)$

(3) $a = 0{\cdot}5 - j\ 0{\cdot}866$

(4) $a = 0{\cdot}5 + j\ 0{\cdot}866$

**108.** Which sequence component is always more than the negative sequence component in asymmetrical fault ?

(1) Positive sequence

(2) Zero sequence

(3) Both are correct

(4) None of the above

**109.** In a double line to ground fault (LLG) the positive, negative and zero sequence networks are

(1) star connected

(2) delta connected

(3) series connected

(4) parallely connected

**110.** A balanced 3-phase system consists of

(1) zero sequence currents only

(2) positive sequence currents only

(3) negative and zero sequence currents

(4) zero, negative and positive sequence currents

**111.** To reduce short circuit fault currents _____ are used in substations.

(1) resistors

(2) capacitors

(3) reactors

(4) diodes

**112.** In symmetrical component analysis,

(1) $I_{a1} = \frac{1}{3}(I_a + aI_b + a^2I_c)$

(2) $I_{a1} = \frac{1}{3}(aI_a + a^2I_b + I_c)$

(3) $I_{a1} = \frac{1}{3}(I_a + I_b + I_c)$

(4) $I_{a1} = \frac{1}{3}(I_a + a^2I_b + aI_c)$

**113.** Which of the following figures indicate the zero sequence network of alternator whose star point is grounded through an impedance $X_n$ ?

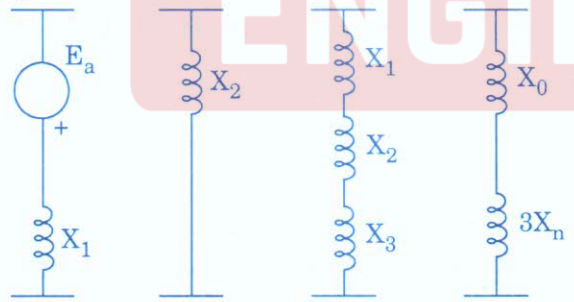



Fig. (a) Fig. (b) Fig. (c) Fig. (d)

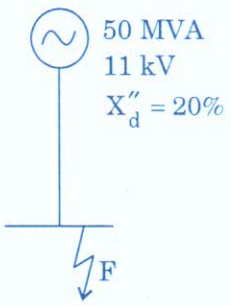
(1) Fig. (a)

(2) Fig. (b)

(3) Fig. (c)

(4) Fig. (d)

**114.** In the adjoining figure, find the fault level at F.




(1) 25 MVA

(2) 250 MVA

(3) 1000 MVA

(4) 1300 MVA

**115.** The _____ sequence network does ***not*** contain any voltage source.

(1) zero

(2) positive

(3) negative

(4) mutual

**116.** While calculating the fault current, the reactances of the machines connected to the power system are taken to be

(1) zero

(2) constant

(3) increasing with load

(4) decreasing with load

**117.** The fault MVA is given by

(1) $\frac{\text{Base MVA}}{\text{p.u. } X_{eq}}$

(2) Base MVA $\times$ p.u. $X_{eq}$

(3) $\frac{\text{Base MVA}}{(\text{p.u. } X_{eq})^2}$

(4) None of the above

where $X_{eq}$ is the fault impedance at the point where fault has occurred.

**118.** Maximum short circuit current occurs due to

(1) dead short circuit

(2) line to line fault

(3) line to ground fault

(4) line to line and ground fault

**119.** From sequence component voltages $E_{R_1}$, $E_{R_2}$ and $E_{R_0}$, the phase voltages of the lines will be (Pick up ***false*** relation)

(1) $E_R = E_{R_1} + E_{R_2} + E_{R_0}$

(2) $E_Y = a^2 E_{R_1} + a E_{R_2} + E_{R_0}$

(3) $E_B = a E_{R_1} + a^2 E_{R_2} + E_{R_0}$

(4) $E_{RY} = a E_{R_1} + a^2 E_{R_2} + 2 E_{R_0}$

**120.** A 11 kV, 10 MVA alternator has p.u. impedance of 0·1 when referred to its ratings as bases. The new value for base as 110 kV, 20 MVA will be

(1) 0·1 p.u.

(2) 0·2 p.u.

(3) 0·02 p.u.

(4) 0·002 p.u.

**121.** In a transmission line having negligible resistance, the surge impedance is

(1) $\sqrt{L+C}$

(2) $\sqrt{\frac{L}{C}}$

(3) $\frac{1}{\sqrt{LC}}$

(4) $\sqrt{LC}$

**122.** Which distribution system is more reliable ?

(1) Tree system

(2) Radial system

(3) Ring main system

(4) All are equally reliable

**123.** Alternating current power is transmitted at high voltage

(1) to safeguard against pilferage

(2) to reduce cost of generation

(3) to make the system reliable

(4) to minimize transmission losses

**124.** Any voltage surge travelling on the transmission line, first enters

(1) lightning arrester

(2) switchgear

(3) over voltage relay

(4) step-down transformer

**125.** As the height of transmission tower is increased, the line capacitance and line inductance respectively

(1) decreases, remains unaltered

(2) decreases, decreases

(3) increases, decreases

(4) increases, remains unaltered

**126.** If the span of a transmission is increased by 10%, the sag of line increases by about

(1) 10%

(2) 15%

(3) 21%

(4) 30%

**127.** Transposition of conductors is done when

(1) the conductors are not spaced equilaterally

(2) the conductors are spaced equilaterally

(3) a telephone line runs parallel to power line

(4) None of the above

**128.** For transmission line span of '2L', horizontal tension at tower supports is 'T' and weight of conductor per unit length is 'w'. The maximum sag equals

(1) $\frac{2\,wL^2}{T}$

(2) $\frac{wL^2}{2T}$

(3) $\frac{wL}{2T}$

(4) $\frac{2\,wL}{T}$

**129.** Surge impedance $Z_c$ may be expressed in terms of ABCD parameters as below :

(1) $Z_c = \sqrt{\frac{AD}{BC}}$

(2) $Z_c = \sqrt{\frac{BA}{CD}}$

(3) $Z_c = \sqrt{AC - BD}$

(4) $Z_c = \sqrt{AB - CD}$

**130.** The following condition relates the line resistance 'R' and the line reactance 'X' for maximum steady state power transmission on a transmission line

(1) $R = X$

(2) $R = \sqrt{3}\ .\ X$

(3) $X = \sqrt{3}\ .\ R$

(4) $X = \frac{R}{\sqrt{2}}$

**131.** Charging current due to capacitance 'C' when a single-phase line is transmitting power at voltage 'V' and angular frequency $\omega$ is

(1) $\frac{1}{j\omega CV}$

(2) $j\omega CV$

(3) $\frac{j\omega V}{C}$

(4) $\frac{V}{j\omega C}$

**132.** A short transmission line has equivalent circuit consisting of

(1) series resistance R and series inductance L

(2) series resistance R and shunt capacitance C

(3) series resistance R and shunt conductance G

(4) series inductance L and shunt capacitance C

**133.** Surge impedance of 400 Ω means

(1) open circuit impedance of 400 Ω

(2) line can be theoretically loaded upto 400 Ω

(3) line can be practically loaded upto 400 Ω

(4) short circuit impedance of 400 Ω

**134.** Guy is attached to a transmission pole to

(1) reduce the sag

(2) hold the telephone lines

(3) strengthen the pole

(4) None of the above

**135.** The capacitance between the two conductors of a single-phase two wire line is 0·5 μF/km. The capacitance of each conductor to the neutral will be

(1) 0·5 μF/km

(2) 0·25 μF/km

(3) 1·0 μF/km

(4) 2·0 μF/km

**136.** The string efficiency of an insulator can be increased by

(1) reducing the number of strings in the insulator

(2) increasing the number of strings in the insulator

(3) correct grading of insulators of various capacities

(4) None of the above

**137.** For high voltage applications, insulators used are of

(1) suspension type

(2) pin type

(3) strain type

(4) None of the above

**138.** On a transmission line, whenever the conductors are dead ended or there is change in the direction of transmission line, the insulators used are

(1) suspension type

(2) pin type

(3) strain type

(4) None of the above

**139.** During rains, the direct capacitance of suspension type insulator

(1) decreases

(2) increases

(3) remains the same

(4) None of the above

**140.** In a string of suspension insulators, maximum potential will appear across the unit

(1) nearest to the conductor

(2) nearest to the cross-arm

(3) at middle of the string

(4) None of the above

**141.** Which insulator can be used either in horizontal or vertical position ?

(1) Strain type

(2) Shackle type

(3) Pin type

(4) Suspension type

**142.** String efficiency being 100 percent means

(1) potential across each disc is zero

(2) one of the insulator discs is shorted

(3) potential across each disc is same

(4) None of the above

**143.** By using a guard ring, string efficiency of suspension insulators will be

(1) decreased

(2) increased

(3) constant

(4) independent of shunt capacitance

**144.** Porcelain insulators are glazed

(1) to improve the appearance

(2) so that water should glide down easily

(3) to prevent absorption of gases and water vapours

(4) due to all the above

**145.** If the voltage across the string of a string insulator assembly is 38 kV, number of insulation discs are 4 and voltage across the lowermost disc is 12 kV, the string efficiency is

(1) 76·5%

(2) 70%

(3) 50%

(4) 100%

**146.** Impurities in the insulator material decreases

(1) dielectric strength

(2) porosity

(3) mechanical strength

(4) toughness of insulator

**147.** Static shielding _____ string efficiency.

(1) increases

(2) decreases

(3) does not affect

(4) minimizes

**148.** Petticoats are provided in the pin type insulators

(1) to improve the appearance of the insulator

(2) to drip off the rain water

(3) to protect the pin of the insulators from the effect of sun and rain

(4) due to all of the above reasons

**149.** Disc type insulators employed as suspension insulators have

(1) discs in vertical plane

(2) discs in horizontal plane

(3) discs at 45° to the horizontal

(4) None of the above

**150.** Seven discs usually suggest that the transmission line voltage is

(1) 11 kV

(2) 33 kV

(3) 66 kV

(4) 132 kV

## SPACE FOR ROUGH WORK