National Testing Agency

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Fundamental Concepts of Electricity

Group Number :	1
Group Id :	28860729
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Show Attended Group? :	No
Edit Attended Group? :	No
Break time:	0
Group Marks:	140
Is this Group for Examiner?:	No

Fundamental Concepts of Electricity

Section Id :	28860732
Section Number :	1
Section type :	Online
Mandatory or Optional:	Mandatory
Number of Questions:	70
Number of Questions to be attempted:	70
Section Marks:	140

Sub-Section Number:	1
Sub-Section Id:	28860732
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 2886072601 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Consider a power system consisting of many generators supplying loads though a transmission network. Each generator is equipped with a speed-governing system. Suppose that the load on the system increases and the generators increase their generation as per their governor droop characteristics. If a plant operator feels that a certain generator should take up more load than it has, he should:

A. Increase the speed or load reference of speed-governor of that generator

B. Increase the voltage reference of automatic voltage regulator of that generator

C. Change the topology of the network by tripping a few lines, without forming islands

D. Insert capacitors at appropriate locations in the network.

Options :

28860710394. 1

28860710395. 2

28860710396. 3

28860710397. 4

Question Number : 2 Question Id : 2886072602 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

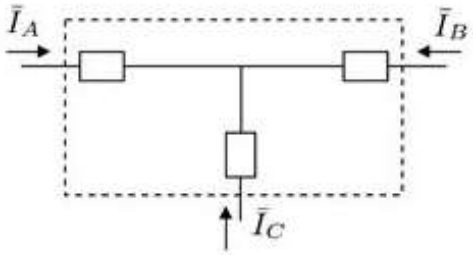
A transmission line is tapped at a point leading to a three terminal network as shown in the figure. The three terminals have to be protected using a protection scheme. Neglecting bias, which of the following equations would be used to detect an internal fault:

A. $\bar{I}_A + \bar{I}_B + \bar{I}_C \neq 0$

B. $\bar{I}_A \neq \bar{I}_B + \bar{I}_C$

C. $\bar{I}_B \neq \bar{I}_A + \bar{I}_C$

D. $\bar{I}_C \neq \bar{I}_A + \bar{I}_B$



Options :

28860710398. 1

28860710399. 2

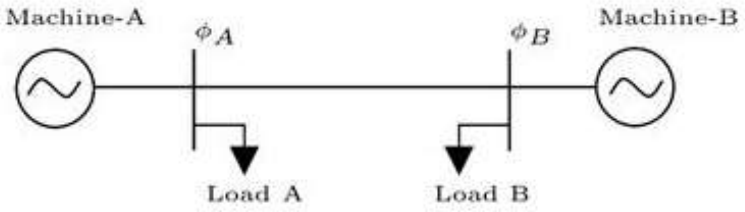
28860710400. 3

28860710401. 4

Question Number : 3 Question Id : 2886072603 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A lossless power system is shown in the figure, with bus voltage angles satisfying $\phi_A - \phi_B = 30°$. In order to reduce this phase angle difference without changing the system frequency,

A. Machine A should increase generation and machine B should reduce generation
B. Machine B should increase generation and no action should be taken by machine A
C. Machine A should reduce generation and machine B should increase generation
D. Machines A and B should both reduce their generation



Options :

28860710402. 1

28860710403. 2

28860710404. 3

28860710405. 4

Question Number : 4 Question Id : 2886072604 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

Which of the following methods may be used to implement an asynchronous link?

A. DC link consisting of back to back connected converters
B. $0° - 10°$ static phase shifter
C. Thyristor controlled series compensator
D. Static VAr Compensator.

Options :

28860710406. 1

28860710407. 2

28860710408. 3

28860710409. 4

Question Number : 5 Question Id : 2886072605 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

Which of the following is TRUE regarding the bundle conductor configuration in extra high voltage (EHV) lines?

A. It is used to reduce corona
B. It is used to increase the net line inductance
C. It is used to decrease the net line capacitance
D. It is used to reduce imbalance in the phases

Options :

28860710410. 1

28860710411. 2

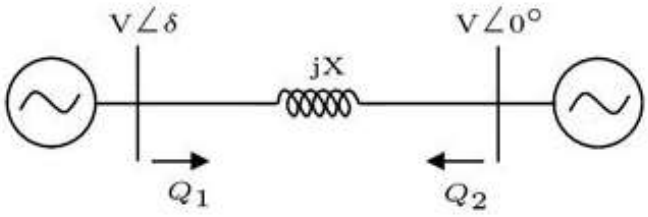
28860710412. 3

28860710413. 4

Question Number : 6 Question Id : 2886072606 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

For the system shown in the figure, which of the following relationships is true?

A. $Q_1 = Q_2$
B. $Q_1 = -Q_2$
C. $Q_1 > Q_2$
D. $Q_1 < Q_2$.



Options :

28860710414. 1

28860710415. 2

28860710416. 3

28860710417. 4

Question Number : 7 Question Id : 2886072607 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Consider a 100 km long, lossless overhead transmission line which is terminated on a 30 km cable as shown in the figure. The overhead transmission line and the cable are rated for the same nominal voltage. The parameters of the system are as follows:

Overhead transmission line: $x_L = 0.488\ \Omega/\text{km}$, $b_c = 3.371\ \mu\text{S/km}$

Cable: $x_L = 0.3388\ \Omega/\text{km}$, $b_c = 245.6\ \mu\text{S/km}$.

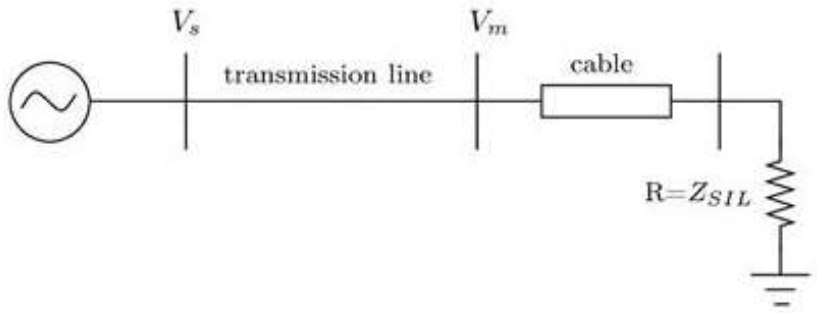
If the cable is terminated by a resistance equal to characteristic impedance of the cable (Z_{SIL}), then the voltage V_m at the junction of the cable and the transmission line when V_s is 230 kV is

A. $V_m < 230$ kV

B. $V_m = 230$ kV

C. $V_m = 0$ kV

D. $V_m > 230$ kV.



Options :

28860710418. 1

28860710419. 2

28860710420. 3

28860710421. 4

Question Number : 8 Question Id : 2886072608 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

Shunt reactors are connected to long EHV (extra high voltage) lines to :

A. Increase the power flow through the line

B. Prevent over-voltages

C. Control the system frequency

D. Improve the power factor of loads.

Options :

28860710422. 1

28860710423. 2

28860710424. 3

28860710425. 4

Question Number : 9 Question Id : 2886072609 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

In a long, lossless transmission line, the sending end is maintained at a voltage V. It is found that the receiving end voltage magnitude is also V. This could happen if:

A. A upf (unity power factor) load equal to SIL (surge impedance loading) is connected at the receiving end
B. A certain leading power factor load with active power less than SIL is connected at receiving end. The amount of lead is dependent on the actual active power value
C. A certain lagging power factor load with active power greater than SIL is connected at receiving end. The amount of lag is dependent on the actual active power value
D. A upf load less than SIL is connected at the receiving end.

Options :

28860710426. 1

28860710427. 2

28860710428. 3

28860710429. 4

Question Number : 10 Question Id : 2886072610 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

In the past, the Southern and Northern regions of our country were asynchronously connected via dc back-to-back links. These regions have now been synchronized by connecting them with large capacity ac lines. Which of the following roles can be played by the dc back-to-back links that are now embedded in the synchronous grid?

A. Regulating the total power exchange between the two regions
B. Regulating the frequency of both regions
C. Regulating the frequency of one region only
D. Controlling the power carried in the parallel ac paths, subject to power flow limits.

Options :

28860710430. 1

28860710431. 2

28860710432. 3

28860710433. 4

Question Number : 11 Question Id : 2886072611 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

It is required to supply power to remote islands (distance > 50 km and having no generation of their own) using under-sea cables. In this situation which of the following technologies cannot be considered?

A. dc transmission using only line commutated converters
B. dc transmission using line commutated rectifier and voltage source inverter
C. ac transmission with shunt connected reactors
D. dc transmission using only voltage source converters.

Options :

28860710434. 1

28860710435. 2

28860710436. 3

28860710437. 4

Question Number : 12 Question Id : 2886072612 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

In a balanced, star-connected three-phase circuit, the phase to neutral voltages are $v_a(t), v_b(t)$ and $v_c(t)$, and the line currents drawn are denoted by $i_a(t), i_b(t)$ and $i_c(t)$. The three-phase instantaneous power is equal to

A. $(v_a(t) - v_b(t)).i_a(t) + (v_c(t) - v_b(t)).i_c(t)$
B. $(v_b(t) - v_a(t)).i_a(t) + (v_c(t) - v_b(t)).i_c(t)$
C. $(v_a(t) + v_b(t)).i_a(t) + (v_c(t) - v_b(t)).i_c(t)$
D. $(v_a(t) - v_c(t)).i_a(t) + (v_c(t) - v_b(t)).i_c(t)$.

Options :

28860710438. 1

28860710439. 2

28860710440. 3

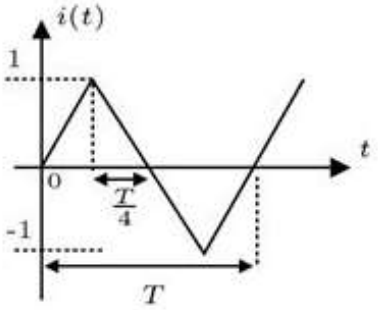
28860710441. 4

Question Number : 13 Question Id : 2886072613 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

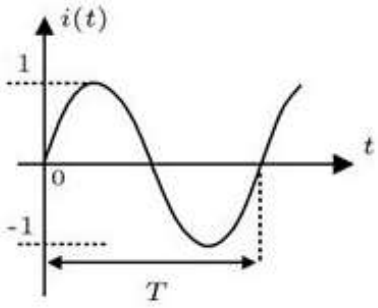
Current is often distorted due to non-linearities. Which of the following currents will result in maximum heating if flowing in a conductor of resistance R? (Fundamental frequency in all cases is 50 Hz)

A. A
B. B
C. C
D. D

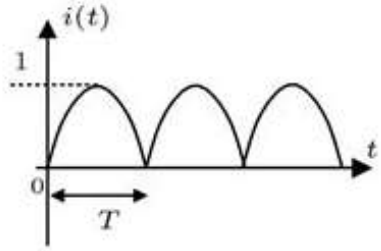
A)



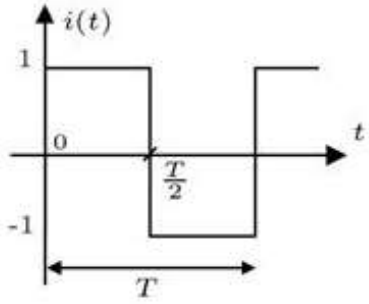
B)



C)



D)



Options :

28860710442. 1

28860710443. 2

28860710444. 3

28860710445. 4

Question Number : 14 Question Id : 2886072614 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

A transformer which is kept on no load becomes warm mainly due to

A. Core loss (eddy currents and hysteresis)
B. Primary side winding losses
C. Secondary side winding losses
D. Both primary and secondary side winding losses.

Options :

28860710446. 1

28860710447. 2

28860710448. 3

28860710449. 4

Question Number : 15 Question Id : 2886072615 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

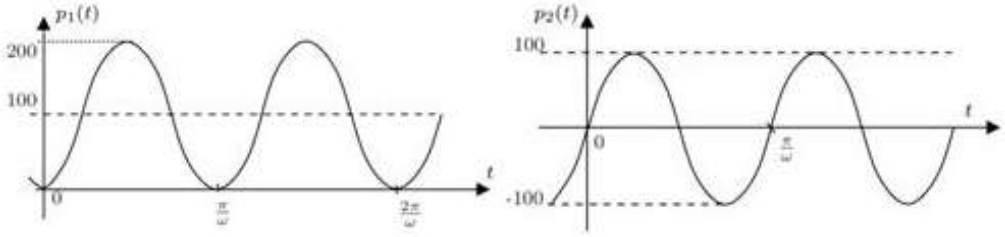
The instantaneous power p flowing into a single phase ac circuit is resolved into two components p_1 and p_2, i.e. $p = p_1 + p_2$. The plots of p_1 and p_2 versus ωt are shown below. The reactive power drawn by the circuit is :

A. $\frac{100}{\sqrt{2}}$

B. 100

C. 200

D. $\frac{200}{\sqrt{2}}$



Options :

28860710450. 1

28860710451. 2

28860710452. 3

28860710453. 4

Question Number : 16 Question Id : 2886072616 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

For a single phase linear circuit at sinusoidal steady state, apparent power in VA, defined as $S = |\bar{V}.\bar{I}^*|$ where $\bar{V}$ is voltage phasor and $\bar{I}$ is current phasor, denotes:

A. The average power drawn over a cycle

B. The instantaneous value of power

C. The peak value of the instantaneous power after removal of the average component

D. The peak value of power over a cycle.

Options :

28860710454. 1

28860710455. 2

28860710456. 3

28860710457. 4

Question Number : 17 Question Id : 2886072617 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

A three phase balanced star connected load is being supplied by a three-phase balanced 50 Hz supply. The expression for the total power drawn by the load is given by $\sqrt{3}V_L.I_L.\cos\phi$, where V_L is the line to line voltage and I_L is the line current, the ϕ is:

A. The angle between V_L and I_L
B. The angle between V_{phase} and I_L
C. Equal to thrice the impedance angle
D. Equal to $\frac{1}{3}$ of the impedance angle.

Options :

28860710458. 1

28860710459. 2

28860710460. 3

28860710461. 4

Question Number : 18 Question Id : 2886072618 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A three phase balanced star connected load is being supplied by a three-phase balanced 50 Hz supply. The total instantaneous three-phase power

A. Is constant
B. Pulsates at twice the supply frequency
C. Pulsates at half the supply frequency
D. Pulsates at the supply frequency.

Options :

28860710462. 1

28860710463. 2

28860710464. 3

28860710465. 4

Question Number : 19 Question Id : 2886072619 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A three phase load consisting of one 100 W bulb in each phase is connected in star across a three phase supply, dissipating a power of 300 W. If the same bulbs are connected in delta across the same supply, then the power dissipated will be:
(Assume that the bulbs have adequate voltage rating so that they can be connected either in star or delta.)

A. 300 W
B. 100 W
C. 900 W
D. $300\sqrt{3}$ W.

Options :

28860710466. 1

28860710467. 2

28860710468. 3

28860710469. 4

Question Number : 20 Question Id : 2886072620 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

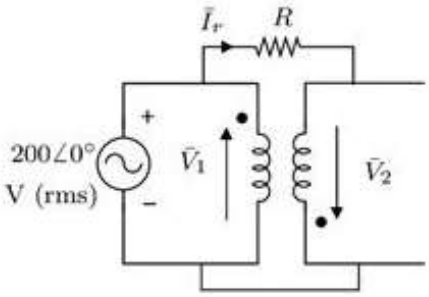
What is the current $\bar{I}_r$ through the resistor R, whose value is 200 Ω, in the circuit shown? Take $\bar{V}_1/\bar{V}_2=\frac{1}{3}$.

A. $4\angle 0°$A

B. $2\angle 0°$A

C. $2\angle 180°$A

D. $4\angle 180°$A.



Options :

28860710470. 1

28860710471. 2

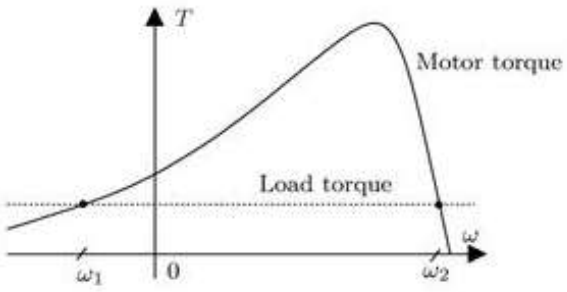
28860710472. 3

28860710473. 4

Question Number : 21 Question Id : 2886072621 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The torque-speed characteristic of an induction motor and its connected load are as shown in the figure. If the motor speed is started from zero, then the motor will settle down to :

A. Zero speed.
B. ω_1
C. ω_2
D. the synchronous speed.



Options :

28860710474. 1

28860710475. 2

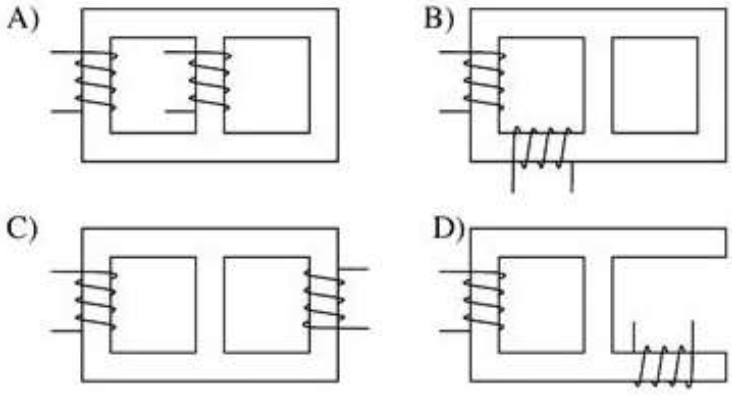
28860710476. 3

28860710477. 4

Question Number : 22 Question Id : 2886072622 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The behavior of which of the following magnetically coupled circuits is closest to an ideal transformer?
(Note: The core material is ferromagnetic.)

A. A
B. B
C. C
D. D.



Options :

28860710478. 1

28860710479. 2

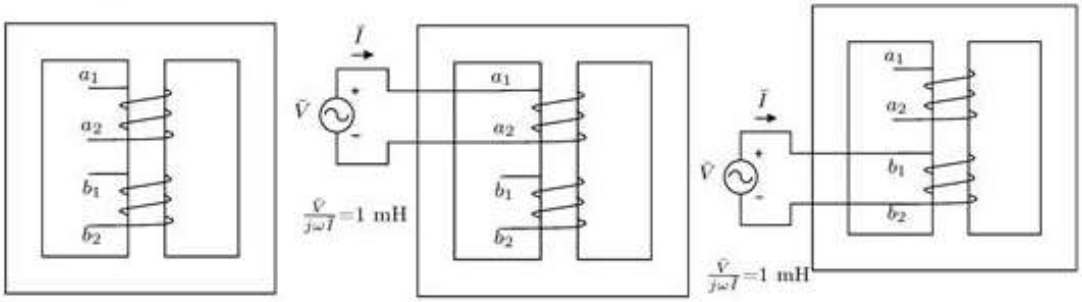
28860710480. 3

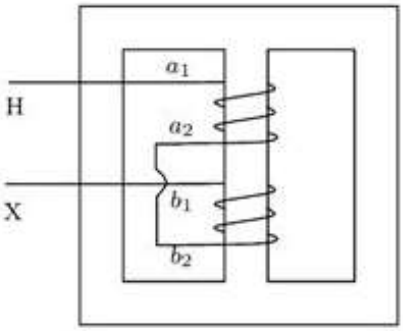
28860710481. 4

Question Number : 23 Question Id : 2886072623 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The inductance of each winding in the figure when excited individually (with the other winding open) is found to be 1 mH. If the leakage flux is negligible, the effective inductance as seen from the terminals HX as indicated in the figure is

A. 0 mH
B. 2 mH
C. 3 mH
D. 4 mH.





Options :

28860710482. 1

28860710483. 2

28860710484. 3

28860710485. 4

Question Number : 24 Question Id : 2886072624 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

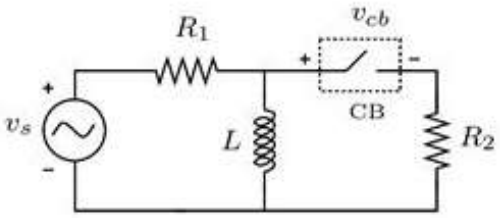
Consider the circuit given below. The circuit breaker (CB) is in open condition and voltage v_{cb} is found to be $10\sin(2\pi 50t)$ V. The circuit breaker is replaced by a sinusoidal source $v_{cb} = 10\sin(2\pi 50t)$V as shown in the next figure. The value of current i_s is:

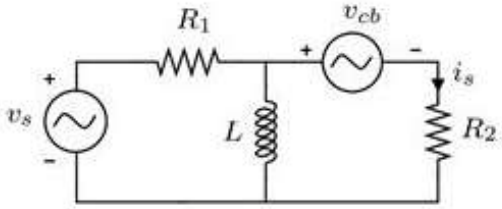
A. $\frac{10}{\sqrt{(\omega L)^2+R_2^2}}\sin\left(2\pi 50t + \operatorname{atan}\frac{\omega L}{R_2}\right)$ A

B. 0 A

C. $\frac{10}{\sqrt{(\omega L)^2+R_2^2}}\sin\left(2\pi 50t - \operatorname{atan}\frac{\omega L}{R_2}\right)$ A

D. $\frac{10}{R_2}\sin(2\pi 50t)$ A.





Options :

28860710486. 1

28860710487. 2

28860710488. 3

28860710489. 4

Question Number : 25 Question Id : 2886072625 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

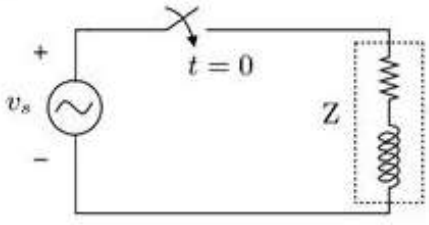
Consider the circuit shown in figure below. The voltage source is $v_s = V_m\sin(\omega t + \phi)$ V, where $\omega = 2\pi 50$ rad/s, and the impedance Z of R-L load at 50 Hz is $10\angle 22°\,\Omega$. The initial current in the circuit is zero. The value of ϕ, such that the closing of switch at t=0 s, does not result in any natural transients in the circuit is:

A. $\phi = 0°$

B. $\phi = -22°$

C. $\phi = 22°$

D. $\phi = 68°$.



Options :

28860710490. 1

28860710491. 2

28860710492. 3

28860710493. 4

Question Number : 26 Question Id : 2886072626 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The following power system transients are to be arranged in the decreasing order of their typical bandwidth (faster to slower):
(P) Rotor relative angle dynamics
(Q) Lightning/Switching transients
(R) Center of inertia (System Frequency) dynamics
(S) Power Electronic Regulator dynamics.

A. (Q)-(S)-(P)-(R)

B. (R)-(P)-(S)-(Q)

C. (Q)-(P)-(S)-(R)

D. (R)-(S)-(P)-(Q).

Options :

28860710494. 1

28860710495. 2

28860710496. 3

28860710497. 4

Question Number : 27 Question Id : 2886072627 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

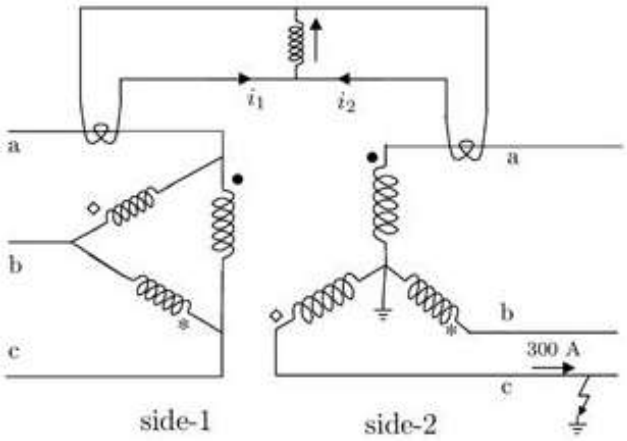
An unloaded three-phase transformer rated for 33 kV/11 kV is connected in delta/star as shown in the figure. The current transformers (CTs) on low and high voltage sides has a ratio of 500/5. The value of currents i_1 and i_2, if the fault current is 300 A as indicated in the figure, is

A. $i_1 = \frac{1}{\sqrt{3}}\ A,\ i_2 = 0\ A$

B. $i_1 = \sqrt{3}\ A,\ i_2 = 0\ A$

C. $i_1 = 0\ A,\ i_2 = \frac{1}{\sqrt{3}}\ A$

D. $i_1 = \frac{1}{\sqrt{3}}\ A,\ i_2 = \frac{1}{\sqrt{3}}\ A.$



Options :

28860710498. 1

28860710499. 2

28860710500. 3

28860710501. 4

Question Number : 28 Question Id : 2886072628 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

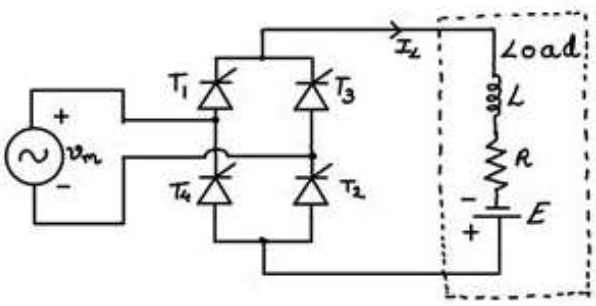
A full-bridge converter supplying an RLE load is shown in figure. The firing angle of the bridge converter is 120°. The supply voltage $v_m(t) = 200\pi \sin(100\pi t)$ V, R = 20 Ω, E = 800 V. The inductor L is large enough to make the output current I_L a smooth dc. Switches are lossless. The real power fed back to the source, is

A. 3 kW

B. 6 kW

C. 9 kW

D. 5 kW.



Options :

28860710502. 1

28860710503. 2

28860710504. 3

28860710505. 4

Question Number : 29 Question Id : 2886072629 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

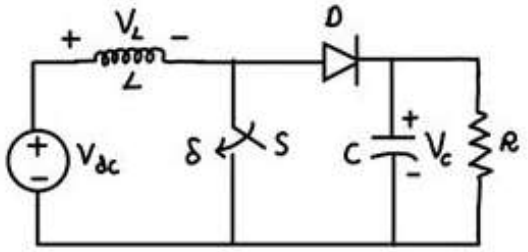
A self-commutating switch S, operated at duty cycle δ is used to control the load voltage as shown in the figure. Under steady-state operating conditions, the average voltage across the inductor and the capacitor respectively, are:

A. $V_L = 0$ and $V_C = \frac{1}{(1-\delta)} V_{dc}$

B. $V_L = \frac{\delta}{2} V_{dc}$ and $V_C = \frac{1}{(1-\delta)} V_{dc}$

C. $V_L = 0$ and $V_C = \frac{\delta}{(1-\delta)} V_{dc}$

D. $V_L = \frac{\delta}{2} V_{dc}$ and $V_C = \frac{\delta}{(1-\delta)} V_{dc}$.



Options :

28860710506. 1

28860710507. 2

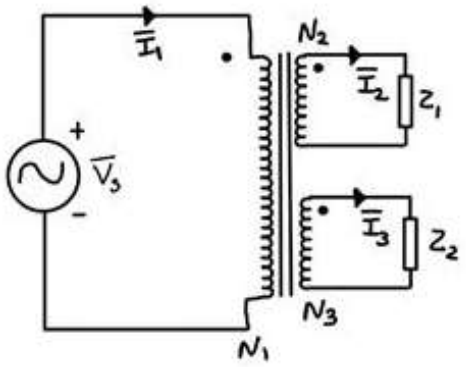
28860710508. 3

28860710509. 4

Question Number : 30 Question Id : 2886072630 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

A three-winding transformer is connected to an ac voltage source as shown in the figure. The numbers of turns are as follows: N_1 =100, $N_2 = 50$ and $N_3 = 50$. If the magnetizing current is neglected, and the currents in two windings are $\overline{I_2} = 2\angle 30°$ A and $\overline{I_3} = 2\angle 150°$ A, then the value of the current $\overline{I_1}$ in ampere is:

A. $1\angle 90°$ A
B. $1\angle 270°$ A
C. $4\angle 90°$ A
D. $4\angle 270°$ A.



Options :

28860710510. 1

28860710511. 2

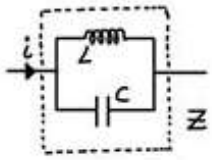
28860710512. 3

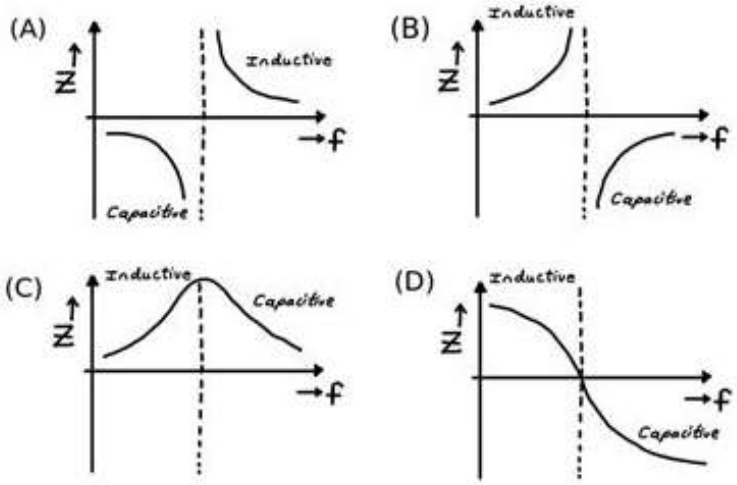
28860710513. 4

Question Number : 31 Question Id : 2886072631 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

An inductor is connected in parallel with a capacitor as shown in the figure. As the frequency of current i is increased, the impedance (Z) of the network varies as

A. A
B. B
C. C
D. D.





Options :

28860710514. 1

28860710515. 2

28860710516. 3

28860710517. 4

Question Number : 32 Question Id : 2886072632 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

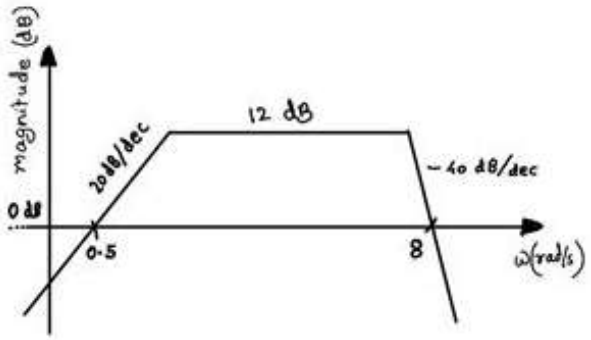
Consider the following asymptotic Bode magnitude plot (ω in rad/s). The transfer functions best describing the Bode magnitude plot is :

A. $\frac{2s}{(1+0.5s)(1+0.25s)^2}$

B. $\frac{4(1+0.5s)}{s(1+0.25s)}$

C. $\frac{2s}{(1+2s)(1+4s)}$

D. $\frac{4s}{(1+2s)(1+4s)^2}$



Options :

28860710518. 1

28860710519. 2

28860710520. 3

28860710521. 4

Question Number : 33 Question Id : 2886072633 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Let $f(x)$ be a real, periodic function of fundamental period T, satisfying $f(T-x) = -f(x)$. The general form of its Fourier series representation would be:

A. $f(x) = a_o + \sum_{k=1}^{\infty} a_k \cos(kx)$

B. $f(x) = \sum_{k=1}^{\infty} b_k \sin(kx)$

C. $f(x) = a_o + \sum_{k=1}^{\infty} a_{2k} \cos(kx)$

D. $f(x) = \sum_{k=0}^{\infty} a_{2k+1} \sin(2k+1)x$

Options :

28860710522. 1

28860710523. 2

28860710524. 3

28860710525. 4

Question Number : 34 Question Id : 2886072634 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Which of the following systems has maximum peak overshoot due to a unit step input?

A. $\frac{100}{s^2+10s+100}$

B. $\frac{100}{s^2+15s+100}$

C. $\frac{100}{s^2+5s+100}$

D. $\frac{100}{s^2+20s+100}$

Options :

28860710526. 1

28860710527. 2

28860710528. 3

28860710529. 4

Question Number : 35 Question Id : 2886072635 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

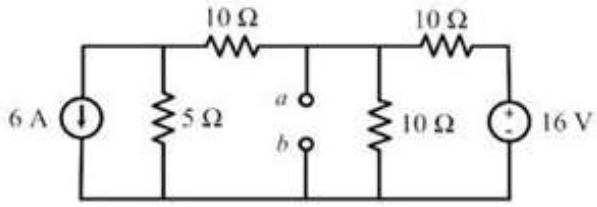
For the network given in figure below, the Thevenin voltage V_{ab} is:

A. -1.5 V

B. -0.5 V

C. 0.5 V

D. 1.5 V.



Options :

28860710530. 1

28860710531. 2

28860710532. 3

28860710533. 4

Question Number : 36 Question Id : 2886072636 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

The transfer function $C(s)$ of a compensator is given below.

$$C(s) = \frac{\left(1+\frac{s}{0.1}\right)\left(1+\frac{s}{100}\right)}{(1+s)\left(1+\frac{s}{10}\right)}$$

The frequency range in which the phase lead introduced by the compensator reaches the maximum is

A. $0.1 < \omega < 1$
B. $1 < \omega < 10$
C. $10 < \omega < 100$
D. $\omega > 100$.

Options :

28860710534. 1

28860710535. 2

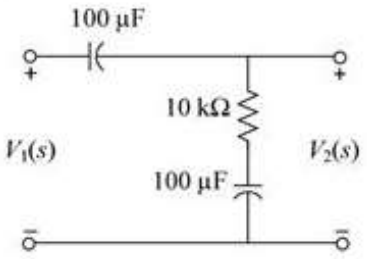
28860710536. 3

28860710537. 4

Question Number : 37 Question Id : 2886072637 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The transfer function $\frac{V_2(s)}{V_1(s)}$ of the circuit shown below is

A. $\frac{0.5s+1}{s+1}$
B. $\frac{3s+6}{s+2}$
C. $\frac{s+2}{s+1}$
D. $\frac{s+1}{s+2}$



Options :

28860710538. 1

28860710539. 2

28860710540. 3

28860710541. 4

Question Number : 38 Question Id : 2886072638 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The magnetic flux density at a point in space is given by $B = 4xa_x + 2kya_y + 8a_z$ Wb/m^2. The value of constant k must be equal to:

A. -2
B. -0.5
C. +0.5
D. +2

Options :

28860710542. 1

28860710543. 2

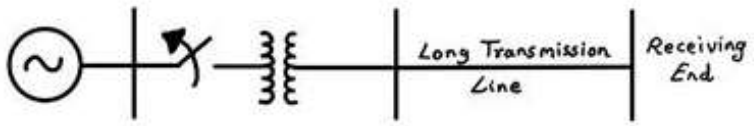
28860710544. 3

28860710545. 4

Question Number : 39 Question Id : 2886072639 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

A 50 Hz synchronous generator is initially connected to a 200 km lossless transmission line which is open circuited at the receiving end as shown in figure. With the field voltage held constant, the generator is disconnected from the transmission line. Which of the following may be said about the steady-state voltage and the field current of the generator?

A. The magnitude of terminal voltage increases, and the field current does not change
B. The magnitude of terminal voltage decreases, and the field current does not change
C. The magnitude of terminal voltage decreases, and the field current increases
D. The magnitude of terminal voltage does not change, and the field current decreases.



Options :

28860710546. 1

28860710547. 2

28860710548. 3

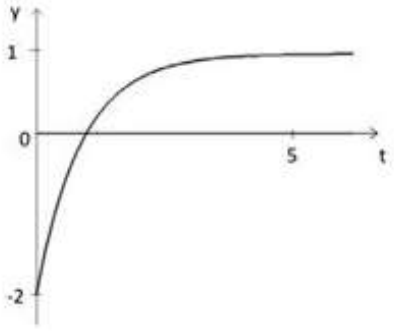
28860710549. 4

Question Number : 40 Question Id : 2886072640 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

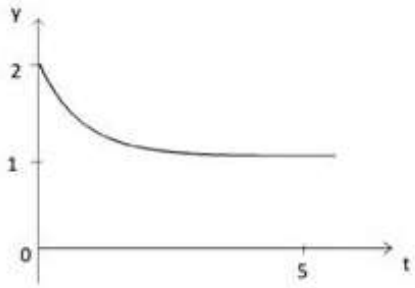
The unit step-response of a system with the transfer function $G(s) = \frac{1-2s}{1+s}$ is given by which one of the following waveforms?

A. A
B. B
C. C
D. D.

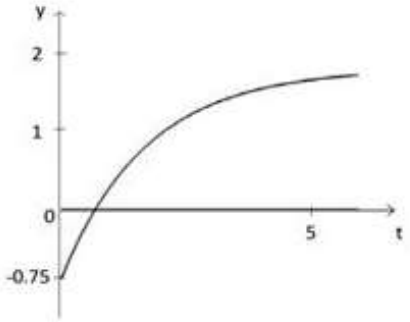
(A)



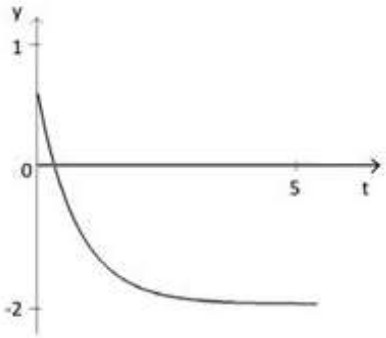
(B)



(C)



(D)



Options :

28860710550. 1

28860710551. 2

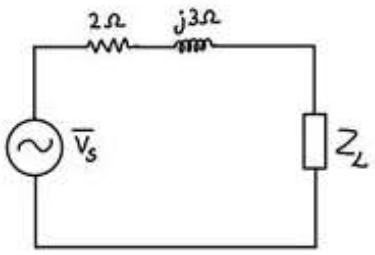
28860710552. 3

28860710553. 4

Question Number : 41 Question Id : 2886072641 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

The load impedance Z_L such that maximum real power is transferred to Z_L from the source, is:

A. $3.6\,\Omega$
B. $-j3\,\Omega$
C. $2+j3\,\Omega$
D. $2-j3\,\Omega$.



Options :

28860710554. 1

28860710555. 2

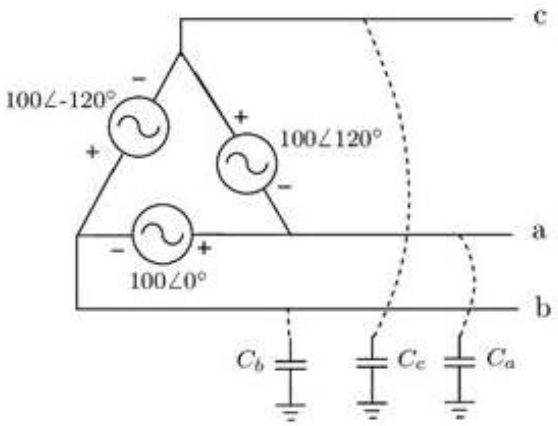
28860710556. 3

28860710557. 4

Question Number : 42 Question Id : 2886072642 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A balanced, delta-connected three-phase voltage source is kept unconnected as shown in the figure. The parasitic capacitances to earth of each phase are given by $C_a = 0.9$ nF, $C_b = 1$ nF and $C_c = 0.9$ nF respectively. The peak of the phase-a voltage is: (The voltages in the figure are shown as rms phasors)

A. 81.65 V
B. 58.8 V
C. 83.15 V
D. 57.75 V.



Options :

28860710558. 1

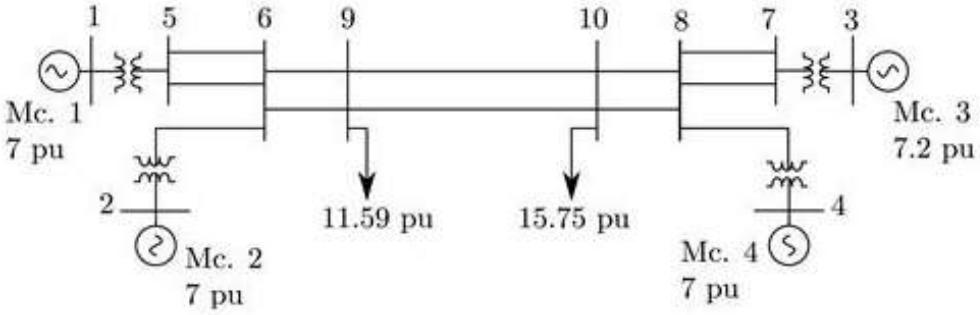
28860710559. 2

28860710560. 3

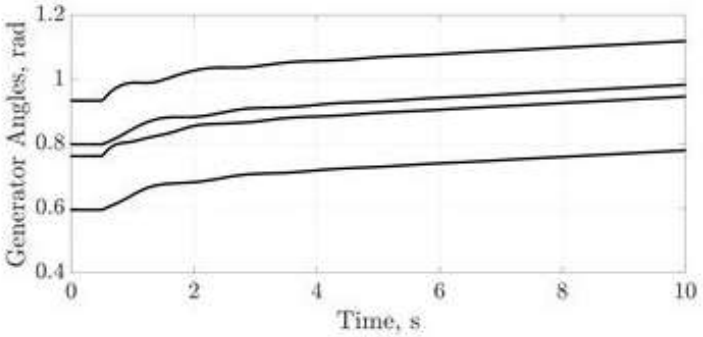
28860710561. 4

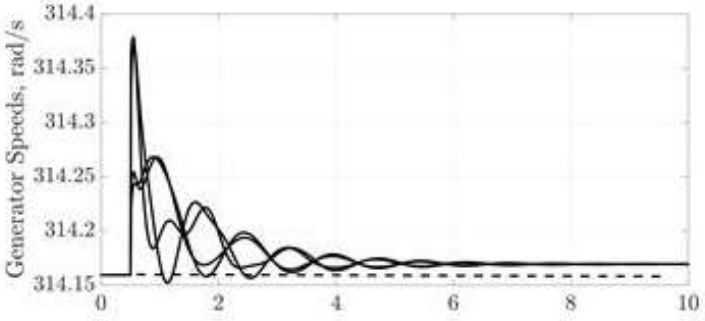
Question Number : 43 Question Id : 2886072643 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The single-line diagram of a two-area four-machine power system has been shown in the figure. The generator active power injections and the load active powers are also indicated in the figure. A disturbance occurs in the system. The plots of the generator speeds and rotor angles (in a 50 Hz frame) are shown in the figures below. Which of the following statements is correct?



A. The generators have lost synchronism
B. The generators are in synchronism
C. The oscillations (swings) are unstable
D. Balance between load and generation is *not* eventually attained





Options :

28860710562. 1

28860710563. 2

28860710564. 3

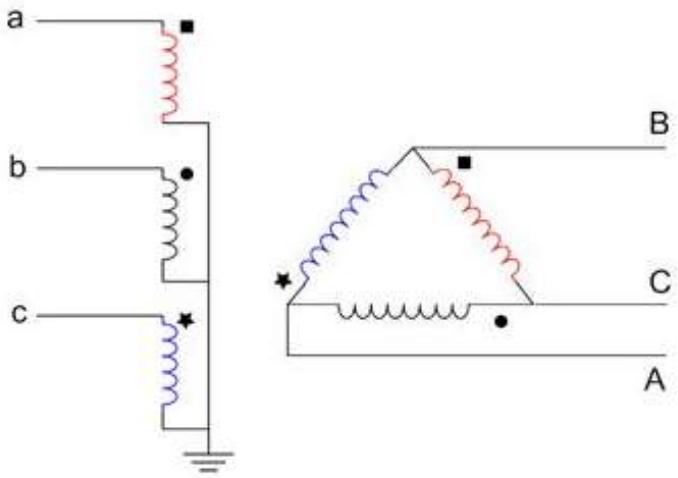
28860710565. 4

Question Number : 44 Question Id : 2886072644 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

For the three-phase transformer as connected in the figure, the line voltage of the primary side (V_{ab}) leads that of the secondary side (V_{AB}) by

Note: Phase sequence is a-b-c

A. 90^{o}
B. -90^{o}
C. 30^{o}
D. -30^{o}



Options :

28860710566. 1

28860710567. 2

28860710568. 3

28860710569. 4

Question Number : 45 Question Id : 2886072645 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

Consider an HVdc link connecting System 1 and System 2 using thyristor based line-commutated converters. Let Q_1 and Q_2 denote the reactive power absorbed by the converters from System 1 and System 2 respectively. The firing angle delay of the thyristor converters with respect to the corresponding AC voltages are α_1 and α_2 respectively. If the direction of power flow is from system-2 to system-1, then which one of the following is correct?

A. $\alpha_1 < 90°, \alpha_2 > 90°, Q_1 < 0, Q_2 > 0$
B. $\alpha_1 < 90°, \alpha_2 > 90°, Q_1 > 0, Q_2 > 0$
C. $\alpha_1 > 90°, \alpha_2 < 90°, Q_1 > 0, Q_2 > 0$
D. $\alpha_1 < 90°, \alpha_2 > 90°, Q_1 > 0, Q_2 < 0$

Options :

28860710570. 1

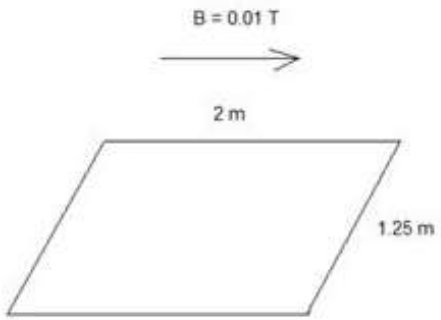
28860710571. 2

28860710572. 3

28860710573. 4

Question Number : 46 Question Id : 2886072646 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

In the figure below the uniform magnetic field B is parallel to the plane of the rectangle. What is the magnetic flux through the rectangle?



A. 0.025 Wb
B. 0 Wb
C. 250 Wb
D. 2.5 Wb

Options :

28860710574. 1

28860710575. 2

28860710576. 3

28860710577. 4

Question Number : 47 Question Id : 2886072647 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A 50 MVA, 20 kV synchronous generator is supplying the rated load and it has been found that the terminal voltage V_t of the machine is at 19.8 kV. The field excitation E_{fd} required to achieve this in steady state is 100 V. If the field voltage is regulated using the following control strategy,

$$E_{fd}(s) = \frac{0.2}{s}(V_{ref}(s) - V_t(s))$$

then the terminal voltage set point V_{ref} is

A. 20.3 kV
B. 69.8 kV
C. 19.3 kV
D. 19.8 kV

Options :

28860710578. 1

28860710579. 2

28860710580. 3

28860710581. 4

Question Number : 48 Question Id : 2886072648 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

An industrial area is fed through a distribution sub-station which has an on-load tap changer enabled on the distribution side which attempts to regulate the voltage to a desired value. An industrial motor is turned on suddenly by direct connection to the supply. If we assume that the tap steps are small, tap limits are not hit and the motor starts up normally, then incandescent lamps in the area supplied from the same transformer will

A. transiently glow brighter and will again return to the original intensity
B. transiently glow dimmer and will again return to the original intensity
C. permanently glow brighter
D. permanently glow darker

Options :

28860710582. 1

28860710583. 2

28860710584. 3

28860710585. 4

Question Number : 49 Question Id : 2886072649 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

An inter-connected AC system consists of two synchronous generators and passive loads which are supplied through transmission lines. Initially, the generation is set such that there is no generation-load mismatch. Both the generators are equipped with droop based governors. The load in the system is increased by 1%. Assuming that the system reaches an acceptable equilibrium, at steady state

A. Generator 1 will provide the extra load and generator 2 output will be unchanged
B. Generator 1 output will be unchanged and generator 2 will provide the extra load
C. Generator 1 and generator 2 will partially share the load and both will increase their outputs
D. None of the generator outputs will change.

Options :

28860710586. 1

28860710587. 2

28860710588. 3

28860710589. 4

Question Number : 50 Question Id : 2886072650 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

Which of the following statements regarding the laws describing the behaviour of electric and magnetic fields is TRUE?

A. $\oint \vec{E} . d\vec{L} = 0$ is applicable only for static magnetic field conditions
B. $\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$ is applicable only for static electric and magnetic field conditions
C. $\nabla . \vec{B} = 0$ is applicable only for static magnetic fields
D. $\nabla \times \vec{H} = \vec{J}$ is applicable for dynamic electric and magnetic fields.

Options :

28860710590. 1

28860710591. 2

28860710592. 3

28860710593. 4

Question Number : 51 Question Id : 2886072651 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

For an ideal transformer, which of the following is TRUE

A. Electromotive force (EMF) per turn in the high-voltage winding is more than the EMF per-turn in the low-voltage winding
B. EMF per turn in the high-voltage winding is less than the EMF per-turn in the low-voltage winding
C. EMF per turn in both windings are equal
D. EMF per turn depends on the core geometry.

Options :

28860710594. 1

28860710595. 2

28860710596. 3

28860710597. 4

Question Number : 52 Question Id : 2886072652 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

A three phase induction machine (IM) running at 1560 rpm is connected to a 400 V, 50 Hz three phase supply. Which one of the following statement is correct?

A. IM is running as a generator and it has 4 poles
B. IM is running as a motor and it has 4 poles
C. IM is running as a generator and it has 2 poles
D. IM is running as a motor and it has 2 poles

Options :

28860710598. 1

28860710599. 2

28860710600. 3

28860710601. 4

Question Number : 53 Question Id : 2886072653 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The time constant for an R-L circuit is defined as the time taken by the current (for zero initial conditions) to become ___ % of the final value, when the circuit is excited by a step voltage.

A. 100%
B. 50%
C. 63.2%
D. 36.8%

Options :

28860710602. 1

28860710603. 2

28860710604. 3

28860710605. 4

Question Number : 54 Question Id : 2886072654 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A series R-L-C circuit below resonant frequency is

A. Resistive
B. Inductive
C. Capacitive
D. May be inductive or capacitive depending on the value of R

Options :

28860710606. 1

28860710607. 2

28860710608. 3

28860710609. 4

Question Number : 55 Question Id : 2886072655 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A lossless radial transmission line with surge impedance loading

A. Takes in negative VAr (reactive power) at sending end and zero VAr at receiving end
B. Takes in positive VAr at sending end and zero VAr at receiving end
C. Has a flat voltage profile and unity power factor at the sending end
D. Has the sending end voltage higher than the receiving end voltage and unity power factor at sending end

Options :

28860710610. 1

28860710611. 2

28860710612. 3

28860710613. 4

Question Number : 56 Question Id : 2886072656 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The alternating current (ac) though the body which can lead to possible fatality (as per Dalziel electrocution formula, where t is time in s)

A. $I = \frac{0.165}{\sqrt{t}}$ A

B. $I = 0.165 \times \sqrt{t}$ A

C. $I = 16.5 \times \sqrt{t}$ A

D. $I = \frac{16.5}{\sqrt{t}}$ A

Options :

28860710614. 1

28860710615. 2

28860710616. 3

28860710617. 4

Question Number : 57 Question Id : 2886072657 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

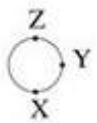
A single wire runs at a height h above the earth as shown in the figure below. The potential of the wire with respect to earth is V. Assuming that the earth is a conducting plane, at which one of the points (X, Y, Z, W) is the electric field intensity maximum?

A. Point W

B. Point X

C. Point Y

D. Point Z





Options :

28860710618. 1

28860710619. 2

28860710620. 3

28860710621. 4

Question Number : 58 Question Id : 2886072658 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

In the circuit shown below, the output of a single phase inverter is connected to an R-L load. The inverter switches are switched such that the inverter output voltage $v_{AB}(t)$ is as shown below.

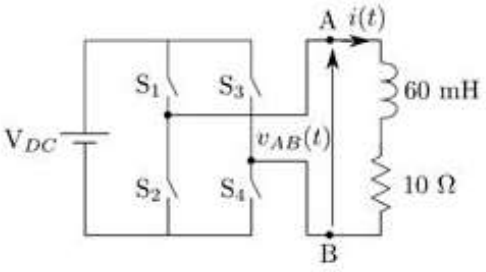
The rms value of the third harmonic component of the load current $i(t)$ in steady-state is

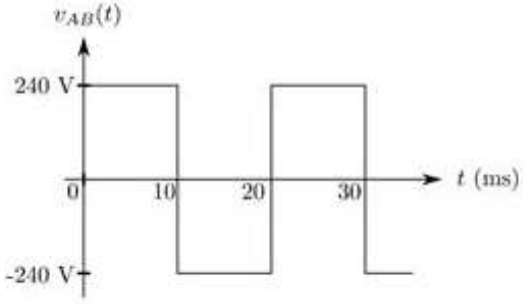
A. 3.762 A

B. 21.618 A

C. 1.254 A

D. 7.206 A





Options :

28860710622. 1

28860710623. 2

28860710624. 3

28860710625. 4

Question Number : 59 Question Id : 2886072659 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The simplest representation that can accurately capture the sinusoidal steady state behavior of a 30 km cable at 50 Hz, under various loading conditions is

A. a lumped parameter series R-L model

B. a lumped parameter π connected R-L and C model

C. distributed parameter R-L and C model

D. a lumped parameter series resistive model

Options :

28860710626. 1

28860710627. 2

28860710628. 3

28860710629. 4

Question Number : 60 Question Id : 2886072660 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A potential transformer is used as a part of a voltage measurement device. It is connected in parallel with an ac power circuit and can step down voltages to measurable levels, besides providing isolation to the measurement circuits. Which of the following is TRUE?

A. The load impedance on the measurement circuit side of the winding should be very large.
B. The potential transformer should practically be a short circuit on the measurement circuit side
C. Open circuiting the winding on the measurement side will damage the power circuit and the potential transformer
D. The resistance and leakage reactance of the potential transformer are designed to be very large as compared to a power transformer.

Options :

28860710630. 1

28860710631. 2

28860710632. 3

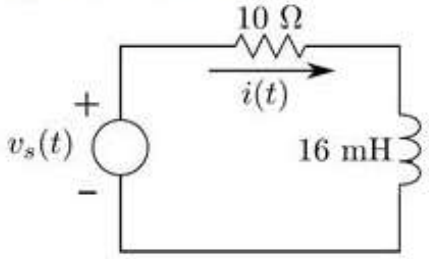
28860710633. 4

Question Number : 61 Question Id : 2886072661 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

For the circuit shown in the figure, the voltage source $v_s(t)$ is given by

$$v_s(t) = 5 + 10\sin(2\pi 50\, t + 30^\circ) + 3\sin(2\pi 150t - 60^\circ) + 0.5\sin(2\pi 300t)\ \text{V},$$

the rms value of the current $i(t)$ in steady state is



A. 0.632 A
B. 0.814 A
C. 0.893 A
D. 0.707 A

Options :

28860710634. 1

28860710635. 2

28860710636. 3

28860710637. 4

Question Number : 62 Question Id : 2886072662 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

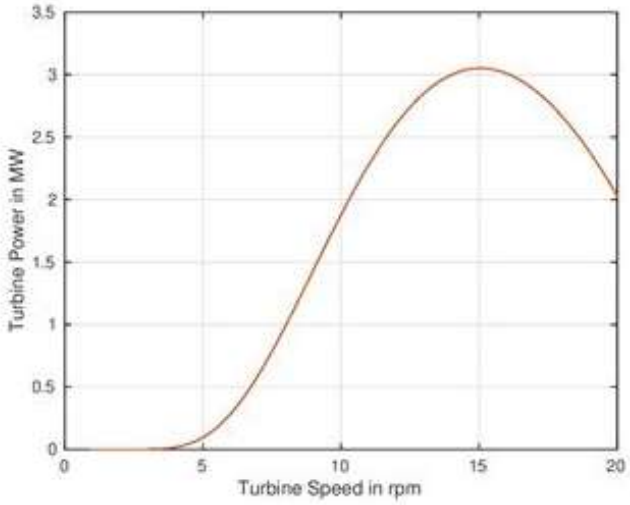
A wind turbine-generator system consists of a wind turbine whose characteristic for certain wind speed is shown in the figure. The turbine is coupled to a four-pole, 50 Hz squirrel cage induction generator through a gearbox. If the induction generator is connected to a 50 Hz AC grid, it is found that maximum power is extracted from the wind. The approximate gear ratio of the gearbox is:

A. 1:20

B. 1:80

C. 1:100

D. 1:150



Options :

28860710638. 1

28860710639. 2

28860710640. 3

28860710641. 4

Question Number : 63 Question Id : 2886072663 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

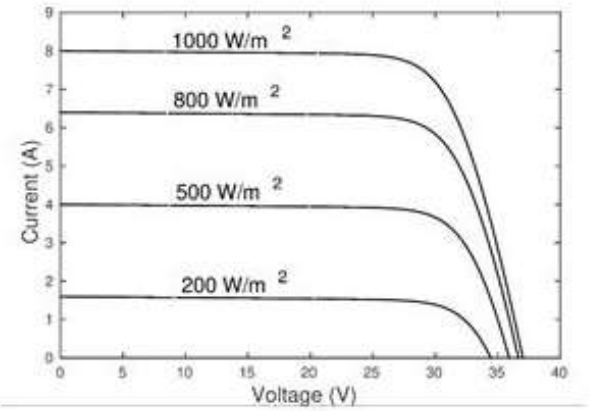
The given figure shows the I-V characteristic of a solar PV module for different irradiance levels. If maximum power is extracted from this module, then the effective load resistance R connected to the module at an irradiance level of 500 W/m^2 is (approximately)

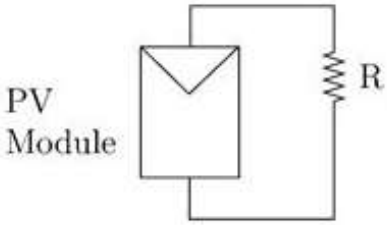
A. 2 Ω

B. 4 Ω

C. 8 Ω

D. 10 Ω





Options :

28860710642. 1

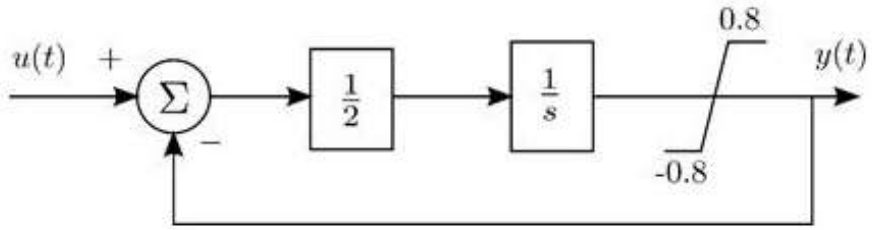
28860710643. 2

28860710644. 3

28860710645. 4

Question Number : 64 Question Id : 2886072664 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A system is shown in the figure. If the integrator is equipped with a soft limiter (non-windup type), the output $y(t)$ for a pulse input $u(t)$ is

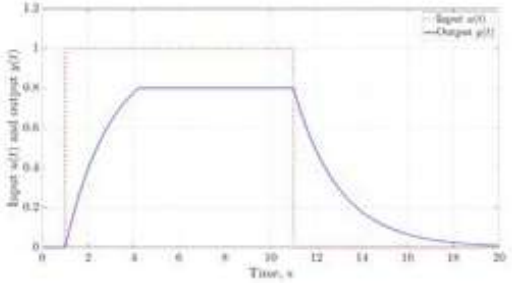


A. (I)

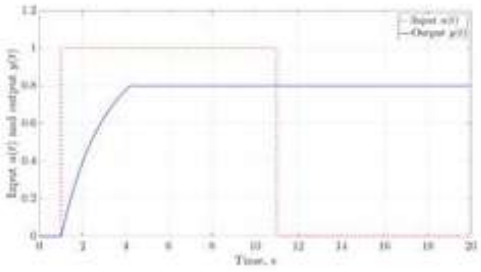
B. (II)

C. (III)

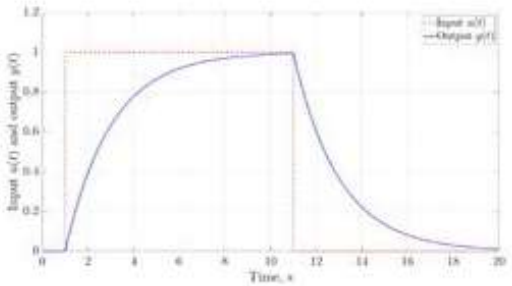
D. (IV)



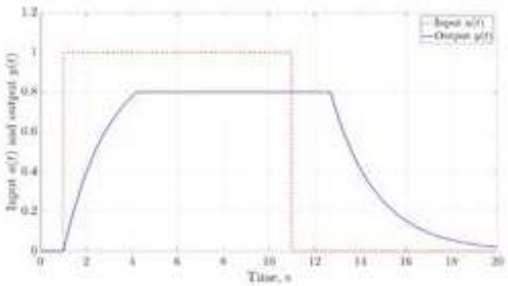
(I)



(II)



(III)



(IV)

Options :

28860710646. 1

28860710647. 2

28860710648. 3

28860710649. 4

Question Number : 65 Question Id : 2886072665 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Which of the following connections is best suited for ensuring service continuity following a single line to ground fault?

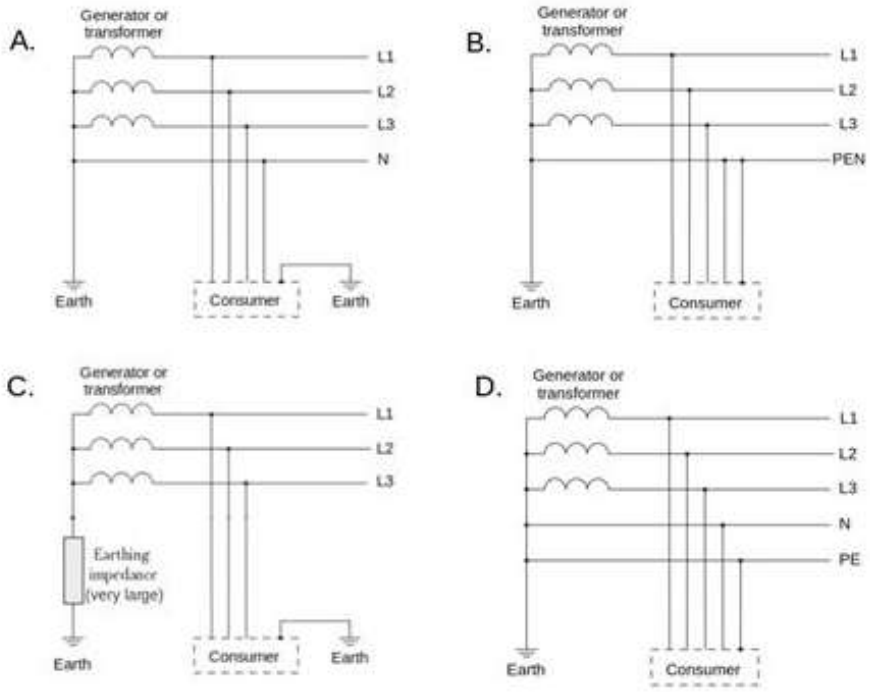
A. A

B. B

C. C

D. D

(PE: protective earth, N: neutral)



Options :

28860710650. 1

28860710651. 2

28860710652. 3

28860710653. 4

Question Number : 66 Question Id : 2886072666 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

Phasor Measurement Units (PMU) are installed in the Indian grid to provide synchronized phasor measurements to the control centre. If the PMUs send voltage and current phasor measurements at the rate of one sample every 20 ms (i.e., 50 Hz), which of the following transients can be analyzed using PMU measurements?

A. Lightning transients

B. Switching overvoltage transients

C. Electromechanical transients (inter-generator rotor oscillations)

D. Turbine blade vibrations

Options :

28860710654. 1

28860710655. 2

28860710656. 3

28860710657. 4

Question Number : 67 Question Id : 2886072667 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Consider an interconnected power system consisting of Area-1 and Area-2. A total generation of 2 MW and a total load of 3 MW is present in Area-1 and it imports 1 MW from Area-2. Due to the presence of governors, the total generation in Area-1 has a frequency dependence given by

$P_g = 2\,(1 - 10\,\frac{f-f_o}{f_o})$ MW and the total load in Area-1 has a frequency dependence given by

$P_l = 3\,(1 + 5\,\frac{f-f_o}{f_o})$ MW. The system is initially operating at a nominal frequency $f_o = 50$ Hz.

Due to some disturbance, Area-2 gets disconnected from Area-1. The frequency of Area-1 will approximately settle to

A. 51.5 Hz

B. 49 Hz

C. 51 Hz

D. 48.5 Hz

Options :

28860710658. 1

28860710659. 2

28860710660. 3

28860710661. 4

Question Number : 68 Question Id : 2886072668 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

A three-phase delta connected capacitor bank is connected in parallel to a lagging power factor load to make the overall power factor unity. The total VA rating of the capacitor bank is $Q = 3\omega CV^2$, where ω is the supply voltage frequency, C is the capacitance and V is the rms line to line voltage. The required total VA rating of a star connected capacitor bank which is to be connected instead of the delta connected bank and maintaining unity power factor is

A. Greater than Q

B. Equal to Q

C. Lesser than Q

D. Depends on the power factor of the load

Options :

28860710662. 1

28860710663. 2

28860710664. 3

28860710665. 4

Question Number : 69 Question Id : 2886072669 Question Type : MCQ Option Shuffling : No Correct Marks : 2 Wrong Marks : 0

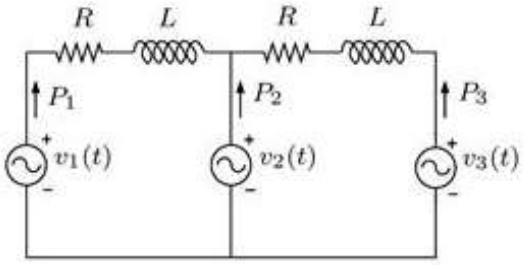
In the figure, the voltages are $v_1(t) = 100\cos(\omega t)$ V, $v_2(t) = 100\cos\left(\omega t + \frac{\pi}{18}\right)$ V and $v_3(t) = 100\cos\left(\omega t + \frac{\pi}{36}\right)$ V. The circuit is in sinusoidal steady-state, and $R \ll \omega L$. P_1, P_2 and P_3 are the average power outputs. Which of the following statements is TRUE?

A. $P_1 = P_2 = P_3 = 0$

B. $P_1 < 0, P_2 > 0, P_3 < 0$

C. $P_1 < 0, P_2 > 0, P_3 > 0$

D. $P_1 > 0, P_2 < 0, P_3 > 0$



Options :

28860710666. 1

28860710667. 2

28860710668. 3

28860710669. 4

Question Number : 70 Question Id : 2886072670 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

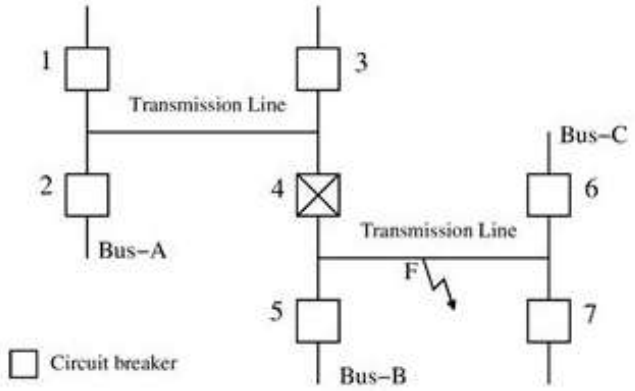
Consider the protection system shown in the figure below. The circuit breakers numbered from 1 to 7 are of identical type. A single line to ground fault with zero fault impedance occurs at the midpoint of the line (at point F), but circuit breaker 4 fails to operate. If the relays are coordinated correctly, a valid sequence of circuit breaker operation is

A. 1, 2, 6, 7, 3, 5

B. 1, 2, 5, 6, 7, 3

C. 5, 1, 2, 3, 6, 7

D. 5, 6, 7, 3, 1, 2



Options :

28860710670. 1

28860710671. 2

28860710672. 3

28860710673. 4