SESSION - 3

Graduate Aptitude Test in Engineering

Notations :

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

Question Paper Name:	EC : ELECTRONICS AND COMMUNICATION ENGINEERING 1st Feb Shift 1
Number of Questions:	65
Total Marks:	100.0

Wrong answer for MCQ will result in negative marks, (-1/3) for 1 mark Questions and (-2/3) for 2 marks Questions.

General Aptitude

Number of Questions:	10
Section Marks:	15.0

Q.1 to Q.5 carry 1 mark each & Q.6 to Q.10 carry 2 marks each.

Question Number : 1 Question Type : MCQ

Choose the most appropriate word from the options given below to complete the following sentence.

If the athlete had wanted to come first in the race, he _____ several hours every day.

(A) should practise
(B) should have practised
(C) practised
(D) should be practising

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 2 Question Type : MCQ

Choose the most suitable one word substitute for the following expression:

Connotation of a road or way

(A) Pertinacious   (B) Viaticum   (C) Clandestine   (D) Ravenous

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 3 Question Type : MCQ

Choose the correct verb to fill in the blank below:

Let us _____.

(A) introvert   (B) alternate   (C) atheist   (D) altruist

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 4   Question Type : MCQ

Find the missing sequence in the letter series below:
A, CD, GHI, ?, UVWXY

(A) LMN   (B) MNO   (C) MNOP   (D) NOPQ

Options :

1. ✖ A

2. ✖ B

3. ✔ C

4. ✖ D

Question Number : 5   Question Type : MCQ

If $x > y > 1$, which of the following <u>must</u> be true?

i. $\ln x > \ln y$ ii. $e^x > e^y$ iii. $y^x > x^y$ iv. $\cos x > \cos y$

(A) (i) and (ii)   (B) (i) and (iii)

(C) (iii) and (iv)   (D) (ii) and (iv)

Options :

1. ✔ A

2. ✖ B

3. ✖ C

4. ✖ D

Question Number : 6   Question Type : MCQ

Ram and Shyam shared a secret and promised to each other that it would remain between them. Ram expressed himself in one of the following ways as given in the choices below. Identify the correct way as per standard English.

(A) It would remain between you and me.
(B) It would remain between I and you.
(C) It would remain between you and I.
(D) It would remain with me.

Options :

1. ✔ A

2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 7 Question Type : MCQ

In the following question, the first and the last sentence of the passage are in order and numbered 1 and 6. The rest of the passage is split into 4 parts and numbered as 2, 3, 4, and 5. These 4 parts are not arranged in proper order. Read the sentences and arrange them in a logical sequence to make a passage and choose the correct sequence from the given options.

1. On Diwali, the family rises early in the morning.
2. The whole family, including the young and the old enjoy doing this.
3. Children let off fireworks later in the night with their friends.
4. At sunset, the lamps are lit and the family performs various rituals.
5. Father, mother, and children visit relatives and exchange gifts and sweets.
6. Houses look so pretty with lighted lamps all around.

(A) 2,5,3,4   (B) 5,2,4,3   (C) 3,5,4,2   (D) 4,5,2,3

Options :

1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Question Number : 8 Question Type : NAT

From a circular sheet of paper of radius 30 cm, a sector of 10% area is removed. If the remaining part is used to make a conical surface, then the ratio of the radius and height of the cone is _____ .

Correct Answer :
1.9 to 2.2

Question Number : 9 Question Type : MCQ

$\log \tan 1° + \log \tan 2° + \ldots\ldots + \log \tan 89°$ is….

(A) 1   (B) $1/\sqrt{2}$ (C) 0   (D) -1

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 10 Question Type : MCQ

Ms. X will be in Bagdogra from 01/05/2014 to 20/05/2014 and from 22/05/2014 to 31/05/2014. On the morning of 21/05/2014, she will reach Kochi via Mumbai.

Which one of the statements below is logically valid and can be inferred from the above sentences?

(A) Ms. X will be in Kochi for one day, only in May.
(B) Ms. X will be in Kochi for only one day in May.
(C) Ms. X will be only in Kochi for one day in May.
(D) Only Ms. X will be in Kochi for one day in May.

Options :
1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Electronics and Communication Engineering

Number of Questions:	55
Section Marks:	85.0

Q.11 to Q.35 carry 1 mark each & Q.36 to Q.65 carry 2 marks each.

Question Number : 11 Question Type : MCQ

For $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, the determinant of $A^T A^{-1}$ is

(A) $\sec^2 x$ (B) $\cos 4x$ (C) 1 (D) 0

Options :
1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 12 Question Type : MCQ

The contour on the x-y plane, where the partial derivative of $x^2 + y^2$ with respect to y is equal to the partial derivative of $6y + 4x$ with respect to x, is

(A) $y = 2$ (B) $x = 2$ (C) $x + y = 4$ (D) $x - y = 0$

Options :
1. ✔ A
2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 13 Question Type : MCQ

If C is a circle of radius r with centre z_0, in the complex z-plane and if n is a non-zero integer, then $\oint_C \frac{dz}{(z-z_0)^{n+1}}$ equals

(A) $2\pi nj$ (B) 0   (C) $\frac{nj}{2\pi}$ (D) $2\pi n$

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 14 Question Type : NAT

Consider the function $g(t) = e^{-t}\sin(2\pi t)u(t)$ where $u(t)$ is the unit step function. The area under $g(t)$ is _____.

Correct Answer :
0.14 to 0.16

Question Number : 15 Question Type : NAT

The value of $\sum\limits_{n=0}^{\infty} n\left(\frac{1}{2}\right)^n$ is _____.

Correct Answer :
2

Question Number : 16 Question Type : NAT

For the circuit shown in the figure, the Thevenin equivalent voltage (in Volts) across terminals a-b is _____.
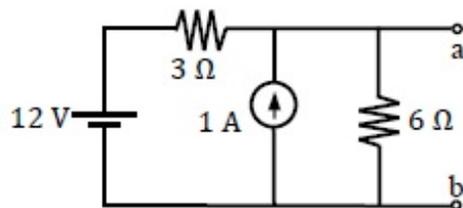
Correct Answer :
10

Question Number : 17 Question Type : NAT
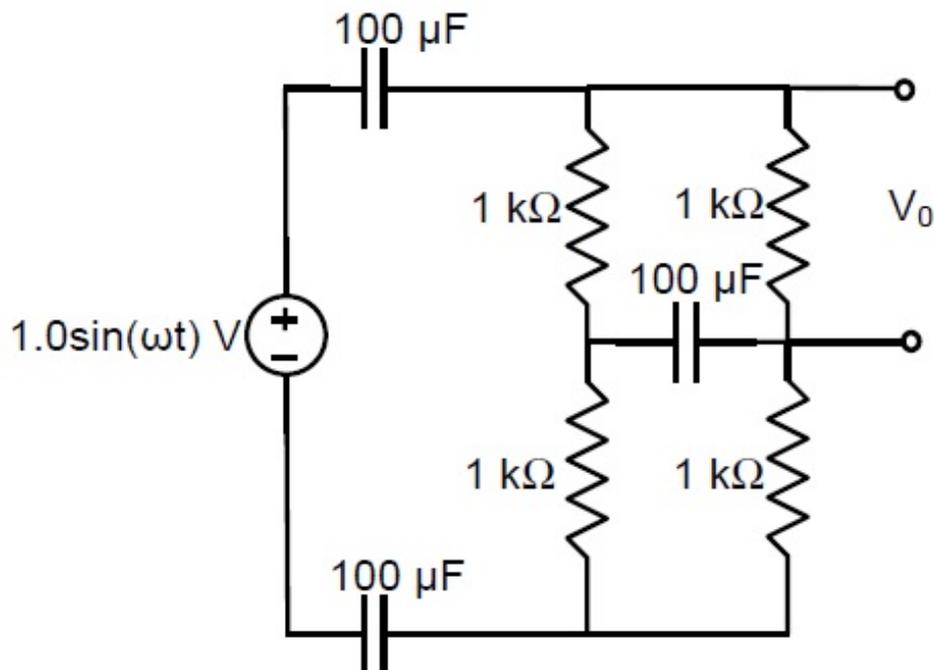
In the circuit shown, the voltage V_X (in Volts) is _____.

0.5 V_X

10 Ω

5 A

V_X 20 Ω   8 Ω   0.25 V_X
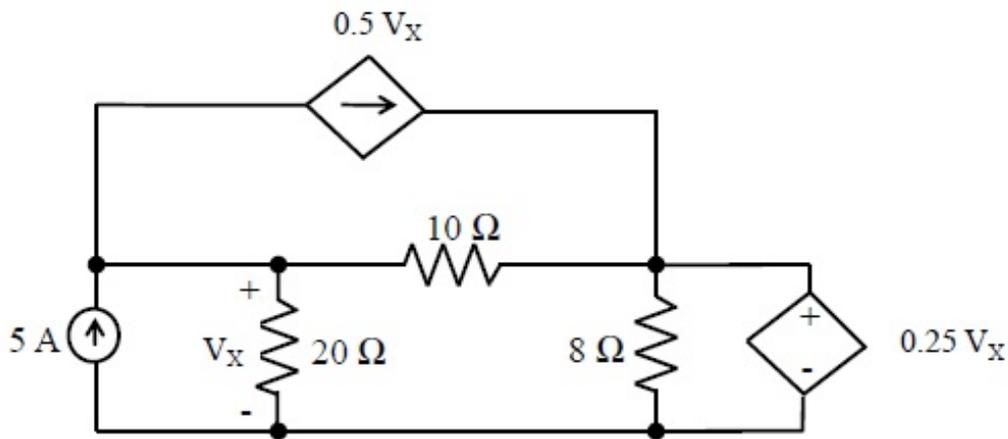
Correct Answer :
7.95 to 8.05

Question Number : 18 Question Type : NAT

At very high frequencies, the peak output voltage V_0 (in Volts) is _____.

100 μF

1 kΩ   1 kΩ V_0

100 μF

1.0sin(ωt) V

1 kΩ   1 kΩ

100 μF

Correct Answer :
0.49 to 0.51

Question Number : 19 Question Type : MCQ

Which one of the following processes is preferred to form the gate dielectric (SiO_2) of MOSFETs ?

(A) Sputtering
(C) Wet oxidation

(B) Molecular beam epitaxy
(D) Dry oxidation

Options :

1. ✗ A

2. ✗ B

3. ✗ C

4. ✔ D

Question Number : 20 Question Type : MCQ

If the base width in a bipolar junction transistor is doubled, which one of the following statements will be TRUE?

(A) Current gain will increase.
(B) Unity gain frequency will increase.
(C) Emitter-base junction capacitance will increase.
(D) Early Voltage will increase.

Options :

1. ✗ A

2. ✗ B

3. ✗ C

4. ✔ D

Question Number : 21 Question Type : NAT

In the circuit shown in the figure, the BJT has a current gain (β) of 50. For an emitter-base voltage $V_{EB} = 600$ mV, the emitter-collector voltage V_{EC} (in Volts) is _____.

3 V

60 kΩ   500 Ω
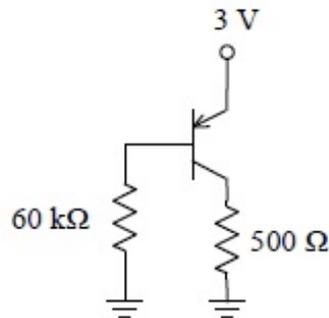
Correct Answer :

2

Question Number : 22 Question Type : NAT

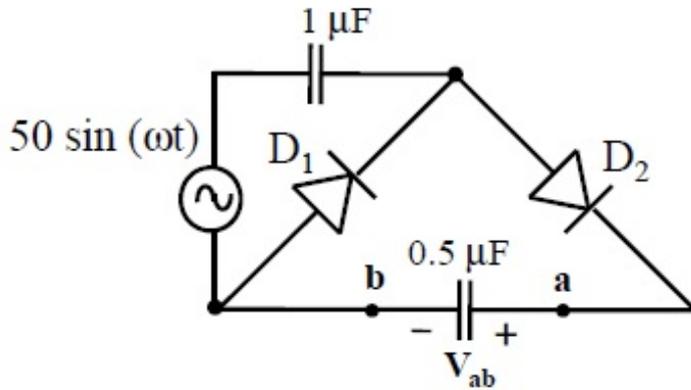In the circuit shown using an ideal opamp, the 3-dB cut-off frequency (in Hz) is _____.

10 kΩ   10 kΩ

v_i

0.1 μF

10 kΩ   10 kΩ

v_o
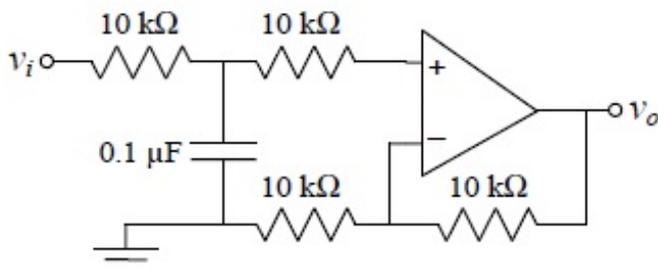
Correct Answer :

159 to 160

Question Number : 23 Question Type : NAT

In the circuit shown, assume that diodes D_1 and D_2 are ideal. In the steady state condition, the average voltage V_{ab} (in Volts) across the 0.5 μF capacitor is _____.
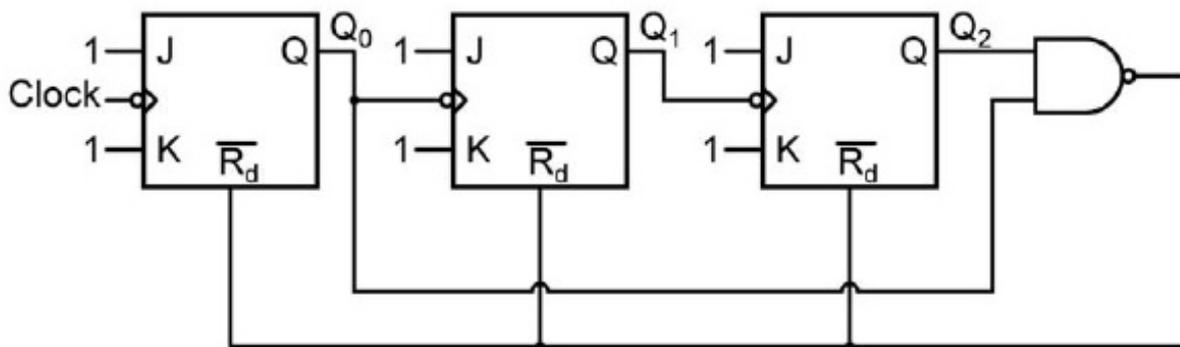

Correct Answer :

100

Question Number : 24 Question Type : MCQ

The circuit shown consists of J-K flip-flops, each with an active low asynchronous reset ($\overline{R_d}$ input). The counter corresponding to this circuit is

(A) a modulo-5 binary up counter   (B) a modulo-6 binary down counter

(C) a modulo-5 binary down counter   (D) a modulo-6 binary up counter
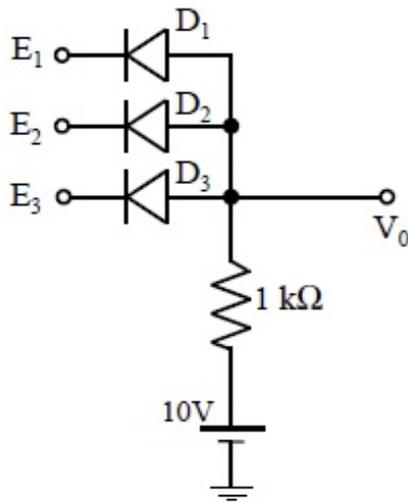
Options :

1. ✔ A

2. ✖ B

3. ✖ C

4. ✖ D

Question Number : 25 Question Type : MCQ

In the circuit shown, diodes D_1, D_2 and D_3 are ideal, and the inputs E_1, E_2 and E_3 are "0 V" for logic '0' and "10 V" for logic '1'. What logic gate does the circuit represent?

(A) 3-input OR gate
(B) 3-input NOR gate
(C) 3-input AND gate
(D) 3-input XOR gate

Options :

1. ✖ A

2. ✖ B

3. ✔ C

4. ✖ D

Question Number : 26 Question Type : MCQ

Which one of the following 8085 microprocessor programs correctly calculates the product of two 8-bit numbers stored in registers B and C?

(A)
```
        MVI A, 00H
        JNZ LOOP
        CMP C
LOOP    DCR B
        HLT
```

(B)
```
        MVI A, 00H
        CMP C
LOOP    DCR B
        JNZ LOOP
        HLT
```

(C)
```
        MVI A, 00H
LOOP    ADD C
        DCR B
        JNZ LOOP
        HLT
```

(D)
```
        MVI A, 00H
        ADD C
        JNZ LOOP
LOOP    INR B
        HLT
```

Options :

1. ✖ A

2. ✖ B

3. ✔ C

4. ✖ D

Question Number : 27 Question Type : MCQ

The impulse response of an LTI system can be obtained by

(A) differentiating the unit ramp response
(B) differentiating the unit step response
(C) integrating the unit ramp response
(D) integrating the unit step response

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 28 Question Type : MCQ

Consider a four-point moving average filter defined by the equation $y[n] = \sum_{i=0}^{3} \alpha_i \, x[n-i]$.
The condition on the filter coefficients that results in a null at zero frequency is

(A) $\alpha_1 = \alpha_2 = 0; \quad \alpha_0 = -\alpha_3$

(B) $\alpha_1 = \alpha_2 = 1; \quad \alpha_0 = -\alpha_3$

(C) $\alpha_0 = \alpha_3 = 0; \quad \alpha_1 = \alpha_2$

(D) $\alpha_1 = \alpha_2 = 0; \quad \alpha_0 = \alpha_3$

Options :

1. ✔ A

2. ✖ B

3. ✖ C

4. ✖ D

Question Number : 29 Question Type : NAT

Consider the Bode plot shown in the figure. Assume that all the poles and zeros are real-valued.
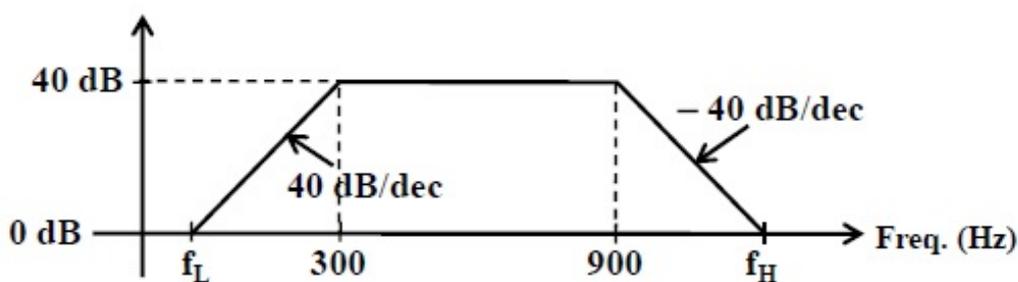
The value of $f_H - f_L$ (in Hz) is _____ .

Correct Answer :

8970

Question Number : 30 Question Type : NAT

The phase margin (in degrees) of the system $G(s) = \dfrac{10}{s(s+10)}$ is _____.

Correct Answer :
84.0 to 84.5

Question Number : 31 Question Type : MCQ

The transfer function of a first-order controller is given as

$$G_C(s) = \frac{K(s + a)}{s + b}$$

where K, a and b are positive real numbers. The condition for this controller to act as a phase lead compensator is

(A) $a < b$ (B) $a > b$ (C) $K < ab$ (D) $K > ab$

Options :

1. ✔ A

2. ✘ B

3. ✘ C

4. ✘ D

Question Number : 32 Question Type : MCQ

The modulation scheme commonly used for transmission from GSM mobile terminals is

(A) 4-QAM
(B) 16-PSK
(C) Walsh-Hadamard orthogonal codes
(D) Gaussian Minimum Shift Keying (GMSK)

Options :

1. ✘ A

2. ✘ B

3. ✘ C

4. ✔ D

Question Number : 33 Question Type : MCQ

A message signal $m(t) = A_m \sin(2\pi f_m t)$ is used to modulate the phase of a carrier $A_c \cos(2\pi f_c t)$ to get the modulated signal $y(t) = A_c \cos(2\pi f_c t + m(t))$. The bandwidth of $y(t)$

(A) depends on A_m but not on f_m
(B) depends on f_m but not on A_m
(C) depends on both A_m and f_m
(D) does not depend on A_m or f_m

Options :

1. ✘ A

2. ✹ B

3. ✔ C

4. ✹ D

Question Number : 34 Question Type : MCQ

The directivity of an antenna array can be increased by adding more antenna elements, as a larger number of elements

(A) improves the radiation efficiency
(B) increases the effective area of the antenna
(C) results in a better impedance matching
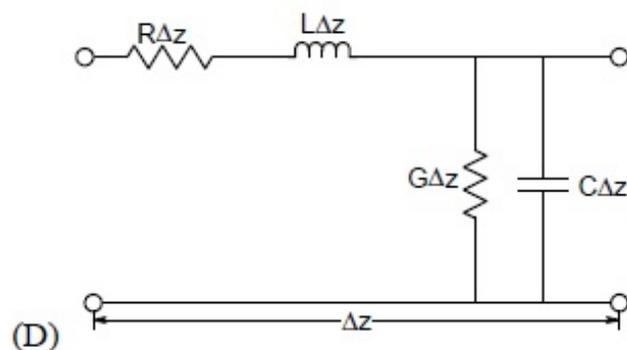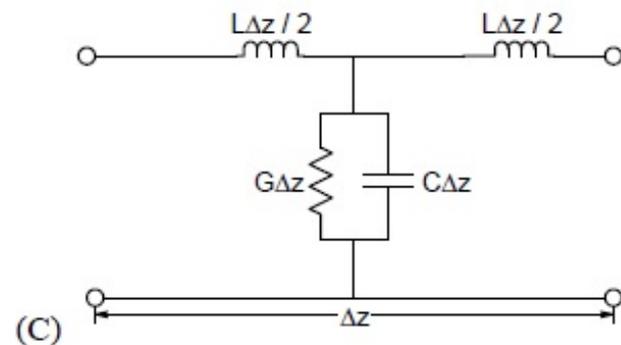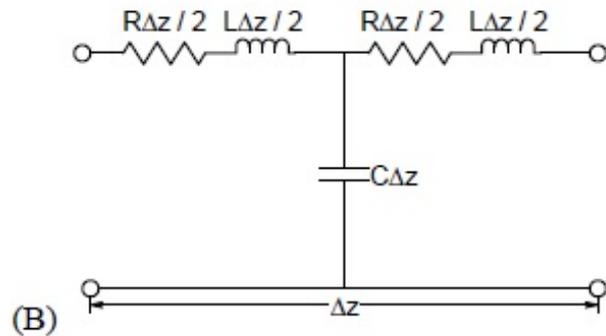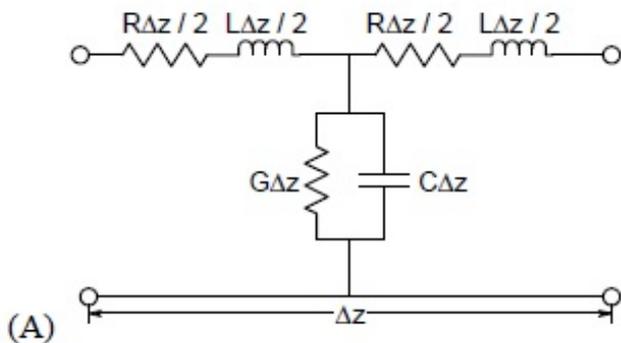(D) allows more power to be transmitted by the antenna

Options :

1. ✹ A

2. ✔ B

3. ✹ C

4. ✹ D

Question Number : 35 Question Type : MCQ

A coaxial cable is made of two brass conductors. The spacing between the conductors is filled with Teflon $(\varepsilon_r' = 2.1,\ \tan \delta = 0)$. Which one of the following circuits can represent the lumped element model of a small piece of this cable having length Δz?

Options :

1. ✹ A

2. ✔ B

3. ✹ C

4. ✹ D

Question Number : 36 Question Type : NAT

The Newton-Raphson method is used to solve the equation $f(x) = x^3 - 5x^2 + 6x - 8 = 0$. Taking the initial guess as $x = 5$, the solution obtained at the end of the first iteration is _____.

Correct Answer :
4.25 to 4.35

Question Number : 37 Question Type : NAT

A fair die with faces $\{1, 2, 3, 4, 5, 6\}$ is thrown repeatedly till '3' is observed for the first time. Let X denote the number of times the die is thrown. The expected value of X is ____.

Correct Answer :
6

Question Number : 38 Question Type : NAT

Consider the differential equation

$$\frac{d^2x(t)}{dt^2} + 3\frac{dx(t)}{dt} + 2x(t) = 0.$$

Given $x(0) = 20$ and $x(1) = 10/e$, where $e = 2.718$, the value of $x(2)$ is _____.

Correct Answer :
0.83 to 0.88
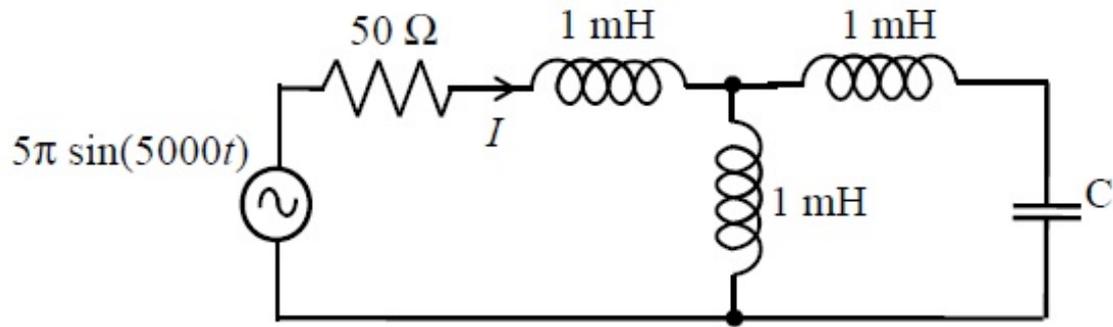
Question Number : 39 Question Type : NAT

A vector field $\mathbf{D} = 2\rho^2 \, \mathbf{a}_\rho + z \, \mathbf{a}_z$ exists inside a cylindrical region enclosed by the surfaces $\rho = 1$, $z = 0$ and $z = 5$. Let S be the surface bounding this cylindrical region. The surface integral of this field on $S \left(\oiint_S \mathbf{D} \cdot \mathbf{ds} \right)$ is _____.

Correct Answer :
78 to 79

Question Number : 40 Question Type : NAT

In the circuit shown, the current I flowing through the 50 Ω resistor will be zero if the value of capacitor C (in μF) is _____ .
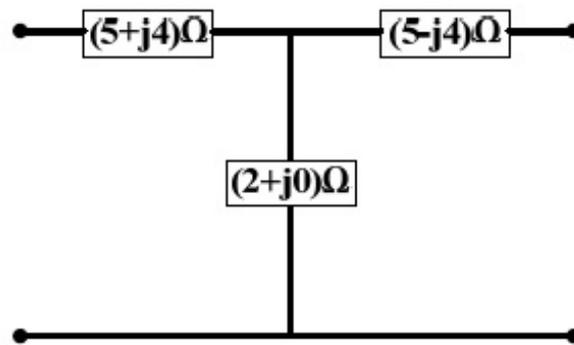

50 Ω   1 mH   1 mH

$5\pi \sin(5000t)$

I

1 mH

C

Correct Answer :
20

Question Number : 41 Question Type : MCQ

The ABCD parameters of the following 2-port network are

(5+j4)Ω   (5-j4)Ω

(2+j0)Ω

(A) $\begin{bmatrix} 3.5+j2 & 20.5 \\ 20.5 & 3.5-j2 \end{bmatrix}$

(B) $\begin{bmatrix} 3.5+j2 & 30.5 \\ 0.5 & 3.5-j2 \end{bmatrix}$

(C) $\begin{bmatrix} 10 & 2+j0 \\ 2+j0 & 10 \end{bmatrix}$

(D) $\begin{bmatrix} 7+j4 & 0.5 \\ 30.5 & 7-j4 \end{bmatrix}$

Options :

1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Question Number : 42 Question Type : MCQ

A network is described by the state model as

$$\dot{x}_1 = 2\,x_1 - x_2 + 3u$$
$$\dot{x}_2 = -4x_2 - u$$
$$y = 3x_1 - 2x_2$$

The transfer function $H(s)\ \left(= \dfrac{Y(s)}{U(s)}\right)$ is

(A) $\dfrac{11s+35}{(s-2)(s+4)}$

(B) $\dfrac{11s-35}{(s-2)(s+4)}$
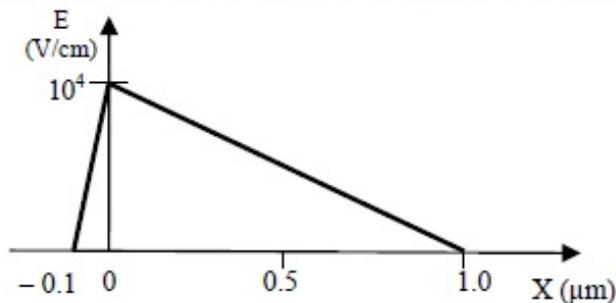
(C) $\dfrac{11s+38}{(s-2)(s+4)}$

(D) $\dfrac{11s-38}{(s-2)(s+4)}$

Options :

1. ✔ A

2. ✖ B

3. ✖ C

4. ✖ D

Question Number : 43 Question Type : MCQ

The electric field profile in the depletion region of a p-n junction in equilibrium is shown in the figure. Which one of the following statements is **NOT TRUE**?

(A) The left side of the junction is n-type and the right side is p-type

(B) Both the n-type and p-type depletion regions are uniformly doped

(C) The potential difference across the depletion region is 700 mV

(D) If the p-type region has a doping concentration of 10^{15} cm^{-3}, then the doping concentration in the n-type region will be 10^{16} cm^{-3}

Options :

1. ✖ A

2. ✖ B

3. ✔ C

4. ✖ D

Question Number : 44 Question Type : NAT

The current in an enhancement mode NMOS transistor biased in saturation mode was measured to be 1 mA at a drain-source voltage of 5 V. When the drain-source voltage was increased to 6 V while keeping gate-source voltage same, the drain current increased to 1.02 mA. Assume that drain to source saturation voltage is much smaller than the applied drain-source voltage. The channel length modulation parameter λ (in V^{-1}) is _____.

Correct Answer :
0.018 to 0.026
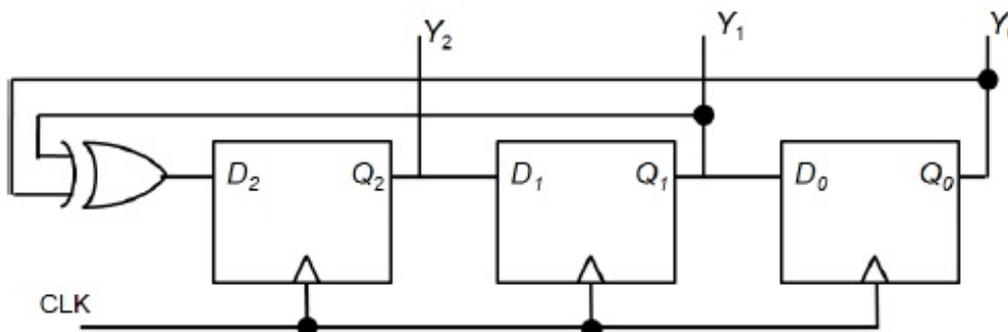
Question Number : 45 Question Type : NAT

An npn BJT having reverse saturation current $I_S = 10^{-15}$ A is biased in the forward active region with $V_{BE} = 700$ mV. The thermal voltage (V_T) is 25 mV and the current gain (β) may vary from 50 to 150 due to manufacturing variations. The maximum emitter current (in μA) is _____.

Correct Answer :
1465 to 1485

Question Number : 46 Question Type : MCQ

A three bit pseudo random number generator is shown. Initially the value of output $Y \equiv Y_2 \, Y_1 \, Y_0$ is set to 111. The value of output Y after three clock cycles is

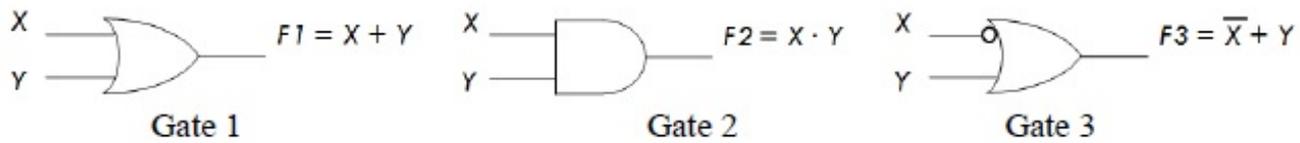(A) 000   (B) 001   (C) 010   (D) 100

Options :
1. ✗ A
2. ✗ B
3. ✗ C
4. ✔ D

Question Number : 47 Question Type : MCQ

A universal logic gate can implement any Boolean function by connecting sufficient number of them appropriately. Three gates are shown.

$F1 = X + Y$ Gate 1

$F2 = X \cdot Y$ Gate 2

$F3 = \overline{X} + Y$ Gate 3

Which one of the following statements is TRUE?

(A) Gate 1 is a universal gate.
(B) Gate 2 is a universal gate.
(C) Gate 3 is a universal gate.
(D) None of the gates shown is a universal gate.

Options :

1. ✖ A

2. ✖ B

3. ✔ C

4. ✖ D

Question Number : 48 Question Type : MCQ

An SR latch is implemented using TTL gates as shown in the figure. The set and reset pulse inputs are provided using the push-button switches. It is observed that the circuit fails to work as desired. The SR latch can be made functional by changing
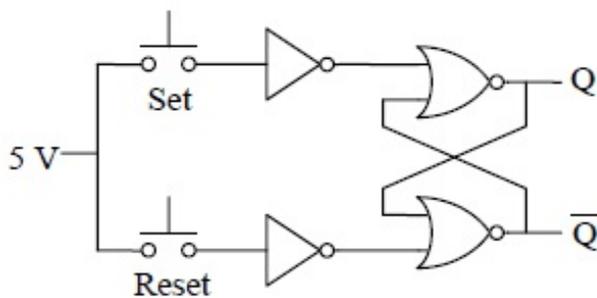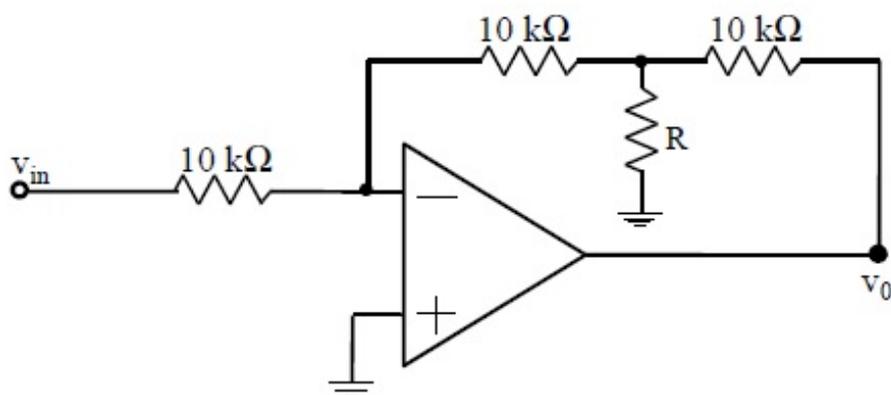

(A) NOR gates to NAND gates

(B) inverters to buffers

(C) NOR gates to NAND gates and inverters to buffers

(D) 5 V to ground

Options :

1. ✖ A

2. ✖ B

3. ✖ C

4. ✔ D

Question Number : 49 Question Type : NAT

In the circuit shown, assume that the opamp is ideal. If the gain (v_o / v_{in}) is −12, the value of R (in kΩ) is _____.
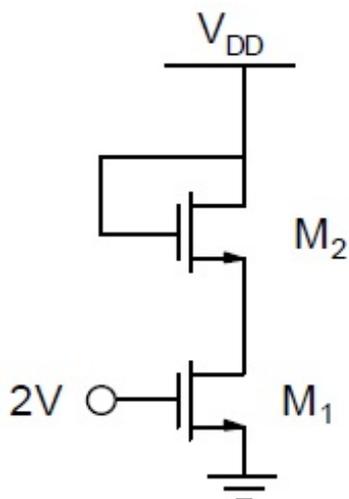

Correct Answer :
1

Question Number : 50 Question Type : NAT

In the circuit shown, both the enhancement mode NMOS transistors have the following characteristics: $k_n = \mu_n C_{ox}(W/L) = 1\,mA/V^2$; $V_{TN} = 1V$. Assume that the channel length modulation parameter λ is zero and body is shorted to source. The minimum supply voltage V_{DD} (in volts) needed to ensure that transistor M_1 operates in saturation mode of operation is _____.
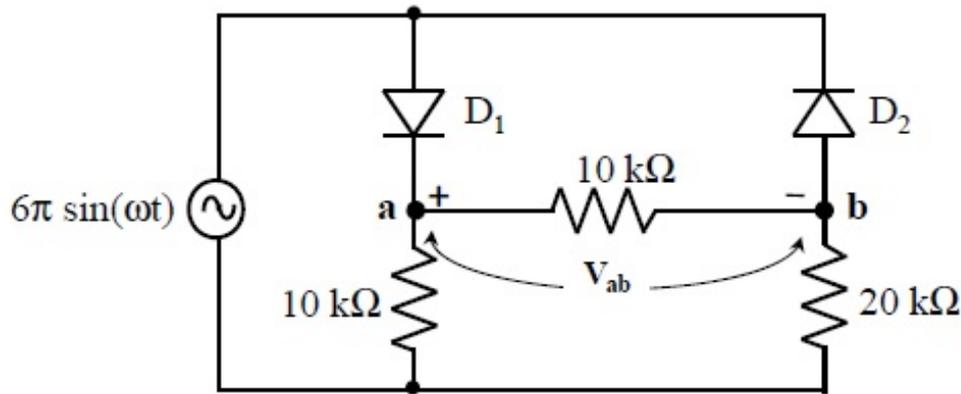

Correct Answer :
2.9 to 3.1

Question Number : 51 Question Type : NAT

In the circuit shown, assume that the diodes D_1 and D_2 are ideal. The average value of voltage V_{ab} (in Volts), across terminals 'a' and 'b' is _____ .

Correct Answer :
4.85 to 5.15

Question Number : 52 Question Type : MCQ

Suppose $x[n]$ is an absolutely summable discrete-time signal. Its z-transform is a rational function with two poles and two zeroes. The poles are at $z = \pm 2j$. Which one of the following statements is TRUE for the signal $x[n]$?
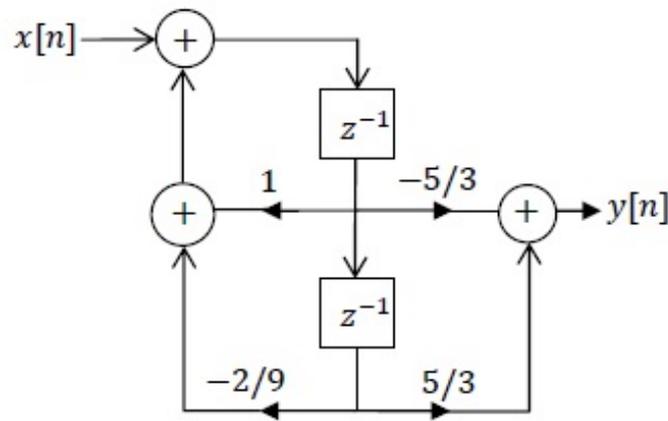
(A) It is a finite duration signal.
(B) It is a causal signal.
(C) It is a non-causal signal.
(D) It is a periodic signal.

Options :
1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 53 Question Type : MCQ

A realization of a stable discrete time system is shown in the figure. If the system is excited by a unit step sequence input $x[n]$, the response $y[n]$ is

(A) $4\left(-\dfrac{1}{3}\right)^{n} u[n] - 5\left(-\dfrac{2}{3}\right)^{n} u[n]$

(B) $5\left(-\dfrac{2}{3}\right)^{n} u[n] - 3\left(-\dfrac{1}{3}\right)^{n} u[n]$

(C) $5\left(\dfrac{1}{3}\right)^{n} u[n] - 5\left(\dfrac{2}{3}\right)^{n} u[n]$

(D) $5\left(\dfrac{2}{3}\right)^{n} u[n] - 5\left(\dfrac{1}{3}\right)^{n} u[n]$

Options :

1. ✖ A

2. ✖ B

3. ✔ C

4. ✖ D

Question Number : 54 Question Type : NAT

Let $\tilde{x}[n] = 1 + \cos\left(\dfrac{\pi n}{8}\right)$ be a periodic signal with period 16. Its DFS coefficients are defined by

$a_k = \dfrac{1}{16} \sum_{n=0}^{15} \tilde{x}[n] \exp\left(-j\dfrac{\pi}{8}kn\right)$ for all k. The value of the coefficient a_{31} is _____.

Correct Answer :
0.48 to 0.52

Question Number : 55 Question Type : NAT

Consider a continuous-time signal defined as

$$x(t) = \left(\dfrac{\sin(\pi t/2)}{(\pi t/2)}\right) * \sum_{n=-\infty}^{\infty} \delta(t - 10n)$$

where '*' denotes the convolution operation and t is in seconds. The Nyquist sampling rate (in samples/sec) for $x(t)$ is _____.

Correct Answer :
0.39 to 0.41

Question Number : 56 Question Type : NAT

The position control of a DC servo-motor is given in the figure. The values of the parameters are $K_T = 1$ N-m/A, $R_a = 1\Omega$, $L_a = 0.1$H, $J = 5$kg-m^2, $B = 1$ N-m/(rad/sec) and $K_b = 1$V/(rad/sec). The steady-state position response (in radians) due to unit impulse disturbance torque T_d is _____.
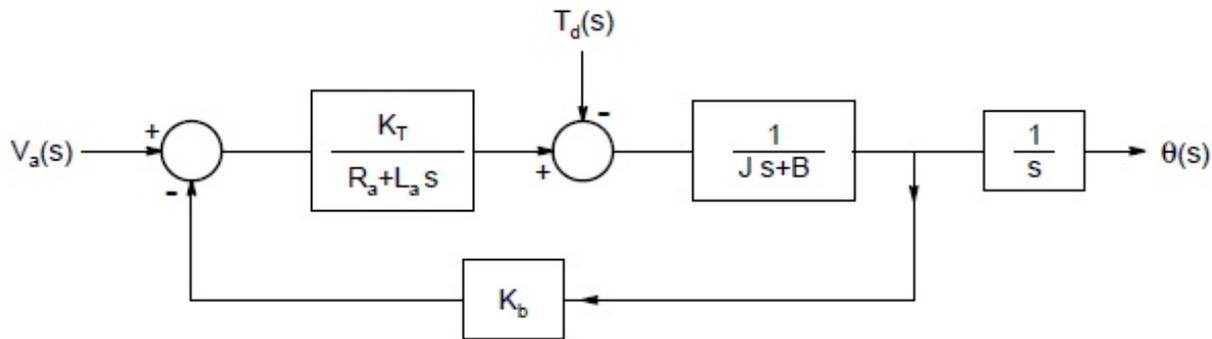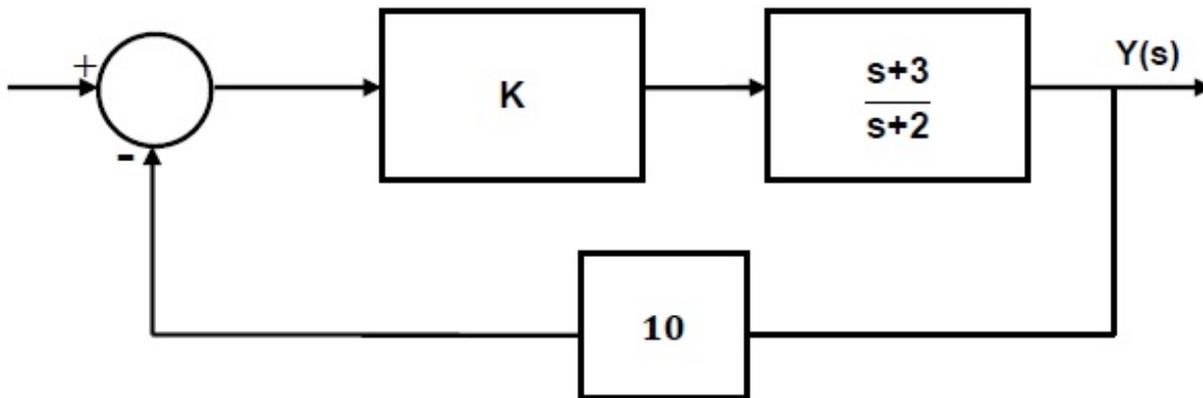

Correct Answer :
-0.51 to -0.49

Question Number : 57 Question Type : NAT

For the system shown in the figure, $s = -2.75$ lies on the root locus if K is _____.

Correct Answer :
0.29 to 0.31

Question Number : 58 Question Type : NAT

The characteristic equation of an LTI system is given by $F(s) = s^5 + 2s^4 + 3s^3 + 6s^2 - 4s - 8 = 0$. The number of roots that lie strictly in the left half s-plane is _____.

Correct Answer :
2

Question Number : 59 Question Type : NAT

Two sequences $x_1[n]$ and $x_2[n]$ have the same energy. Suppose $x_1[n] = \alpha\, 0.5^n\, u[n]$, where α is a positive real number and $u[n]$ is the unit step sequence. Assume

$$x_2[n] = \begin{cases} \sqrt{1.5} & \text{for } n = 0, 1 \\ 0 & \text{otherwise.} \end{cases}$$

Then the value of α is _____ .

Correct Answer :
1.49 to 1.51

Question Number : 60 Question Type : NAT

The variance of the random variable X with probability density function $f(x) = \dfrac{1}{2}|x|\,e^{-|x|}$ is

_____ .

Correct Answer :
6

Question Number : 61 Question Type : MCQ

The complex envelope of the bandpass signal $x(t) = -\sqrt{2}\left(\dfrac{\sin(\pi t/5)}{\pi t/5}\right)\sin\left(\pi t - \dfrac{\pi}{4}\right)$, centered

about $f = \dfrac{1}{2}$ Hz, is

(A) $\left(\dfrac{\sin(\pi t/5)}{\pi t/5}\right)e^{j\frac{\pi}{4}}$

(B) $\left(\dfrac{\sin(\pi t/5)}{\pi t/5}\right)e^{-j\frac{\pi}{4}}$

(C) $\sqrt{2}\left(\dfrac{\sin(\pi t/5)}{\pi t/5}\right)e^{j\frac{\pi}{4}}$

(D) $\sqrt{2}\left(\dfrac{\sin(\pi t/5)}{\pi t/5}\right)e^{-j\frac{\pi}{4}}$

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 62 Question Type : NAT

A random binary wave $y(t)$ is given by

$$y(t) = \sum_{n=-\infty}^{\infty} X_n\, p(t - nT - \phi)$$

where $p(t) = u(t) - u(t - T)$, $u(t)$ is the unit step function and ϕ is an independent random variable with uniform distribution in $[0,T]$. The sequence $\{X_n\}$ consists of independent and identically distributed binary valued random variables with $P\{X_n = +1\} = P\{X_n = -1\} = 0.5$ for each n.
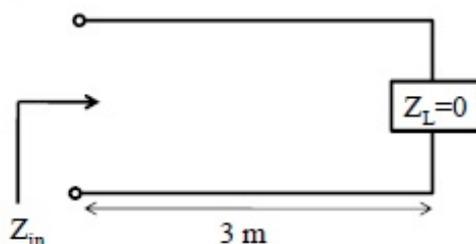
The value of the autocorrelation $R_{yy}\left(\frac{3T}{4}\right) \triangleq E\left[y(t)y\left(t - \frac{3T}{4}\right)\right]$ equals _____.

Question Number : 63 Question Type : MCQ

Consider the 3 m long lossless air-filled transmission line shown in the figure. It has a characteristic impedance of $120\pi\ \Omega$, is terminated by a short circuit, and is excited with a frequency of 37.5 MHz. What is the nature of the input impedance (Z_{in})?

(A) Open   (B) Short   (C) Inductive   (D) Capacitive

**Options :**

1. ✖ A

2. ✖ B

3. ✖ C

4. ✔ D

Question Number : 64 Question Type : NAT

A 200 m long transmission line having parameters shown in the figure is terminated into a load R_L. The line is connected to a 400 V source having source resistance R_S through a switch, which is closed at $t = 0$. The transient response of the circuit at the input of the line ($z = 0$) is also drawn in the figure. The value of R_L (in Ω) is _____.
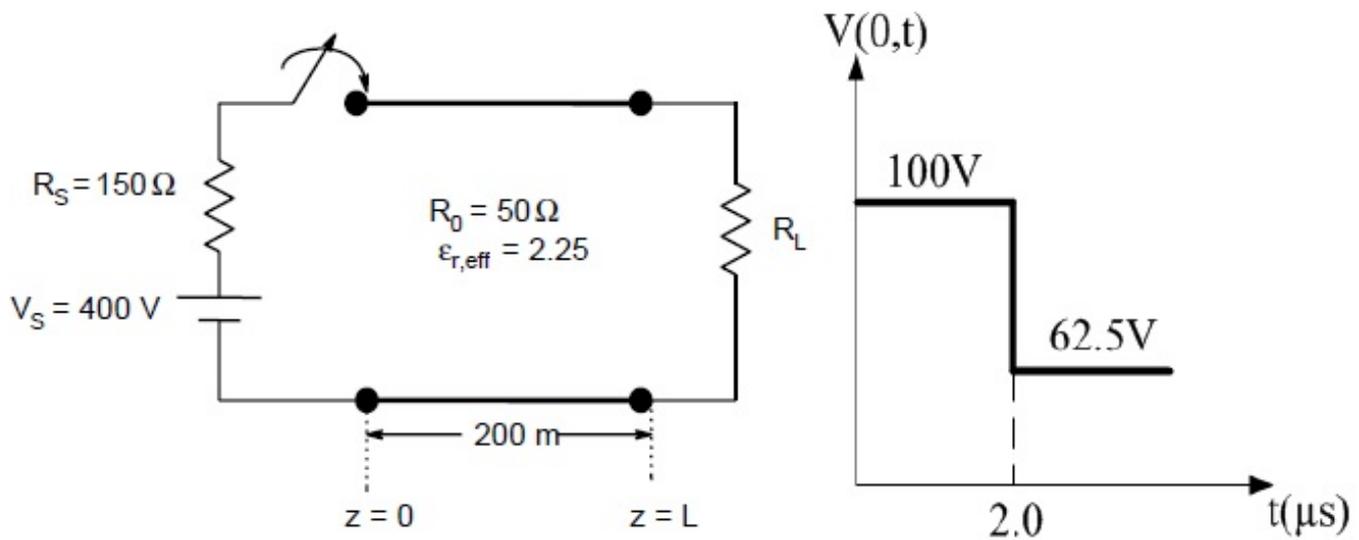
Correct Answer :
29 to 31

Question Number : 65 Question Type : NAT

A coaxial capacitor of inner radius 1 mm and outer radius 5 mm has a capacitance per unit length of 172 pF/m. If the ratio of outer radius to inner radius is doubled, the capacitance per unit length (in pF/m) is _____.

Correct Answer :
120.0 to 120.4