Topic:- DU_J19_MTECH_ME

1) If the capacitance of an abrupt p-n junction varactor diode is 1 nF at zero bias then capacitance at reverse bias potential voltage of 99 V is _____ nF (The built-in potential is 1 V) [Question ID = 24292]

1. 0.01 [Option ID = 37167]
2. 1.1 [Option ID = 37169]
3. 1 [Option ID = 37166]
4. 0.1 [Option ID = 37168]

Correct Answer :-

- 1 [Option ID = 37166]

2) The amplitude of a random signal is uniformly distributed between -5 V and 5 V. If the signal to quantization noise ratio required in uniformly quantizing the signal is 43.5 dB, the step of the quantization is approximately [Question ID = 24302]

1. 0.578 V [Option ID = 37208]
2. 1.1 V [Option ID = 37207]
3. 2.2 V [Option ID = 37209]
4. 0.078 V [Option ID = 37206]

Correct Answer :-

- 0.078 V [Option ID = 37206]

3) If an air filled rectangular waveguide has width 20 mm and height 10 mm, the bandwidth for single mode operation is [Question ID = 24319]

1. 7.5 GHz [Option ID = 37274]
2. 5.0 GHz [Option ID = 37277]
3. 6 GHz [Option ID = 37281]
4. 15 GHz [Option ID = 37279]

Correct Answer :-

- 7.5 GHz [Option ID = 37274]

4) Area bounded by the curve $y=x^2$ and the lines x=4 and y=0 is [Question ID = 24243]

1. ∞ [Option ID = 36970]
2. 21.33 [Option ID = 36971]
3. 42.66 [Option ID = 36972]
4. 10.66 [Option ID = 36973]

Correct Answer :-

- ∞ [Option ID = 36970]

5) In a monolithic IC, resistors are formed from [Question ID = 24280]

1. p-type semiconductors [Option ID = 37120]
2. aluminum ribbons [Option ID = 37118]
3. meta materials [Option ID = 37121]
4. ceramic materials [Option ID = 37119]

Correct Answer :-

- aluminum ribbons [Option ID = 37118]

6) Velocity of light in a medium with relative permittivity of 3 and relative permeability of 2 respectively is [Question ID = 24315]

1. $\sqrt{\frac{3}{2}} \times 10^8 \text{m/s}$ [Option ID = 37258]
2. $\sqrt{2} \times 10^8 \text{m/s}$ [Option ID = 37264]
3. $\frac{\sqrt{3}}{4} \times 10^8 \text{m/s}$ [Option ID = 37262]
4. $\frac{\sqrt{3}}{2} \times 10^8 \text{m/s}$ [Option ID = 37260]

Correct Answer :-

- $\sqrt{\frac{3}{2}} \times 10^8 \text{m/s}$ [Option ID = 37258]

7) Two infinite parallel plates 10mm apart have maintained a potential difference of 100 V between them. The acceleration of an electron placed between them is

[Question ID = 24330]

1. 0.9×10^{12} m/s^2 [Option ID = 37319]
2. 0.56×10^{10} m/s^2 [Option ID = 37320]
3. 1.76×10^{15} m/s^2 [Option ID = 37318]
4. 1.76×10^{18} m/s^2 [Option ID = 37321]

Correct Answer :-

- 1.76×10^{15} m/s^2 [Option ID = 37318]

8) The source in a microwave oven mostly generates power within the range of [Question ID = 24340]

1. 1.5 kW – 15 kW [Option ID = 37360]
2. 1W – 150 W [Option ID = 37361]
3. 15 kW-1 MW [Option ID = 37358]
4. 150W – 1.5 kW [Option ID = 37359]

Correct Answer :-

- 15 kW-1 MW [Option ID = 37358]

9) The Nyquist sampling interval, for the signal sinc(700t) +sinc(500t) is [Question ID = 24311]

1. $\frac{1}{350}$ [Option ID = 37243]
2. $\frac{\Pi}{170}$ [Option ID = 37245]
3. $\frac{\Pi}{350}$ [Option ID = 37242]
4. $\frac{1}{700}$ [Option ID = 37244]

Correct Answer :-

- $\frac{\Pi}{350}$ [Option ID = 37242]

10) The peak-to-peak input to an 8-bit PCM coder is 2 volts. The signal power-to quantization noise power ratio (in dB) for an input of $0.5\cos(\omega_m t)$ is [Question ID = 24306]

1. 49.8 [Option ID = 37224]
2. 18 [Option ID = 37223]
3. 32 [Option ID = 37225]
4. 48 [Option ID = 37222]

Correct Answer :-

- 48 [Option ID = 37222]

11) In a FM system, a carrier of 100 MHz is modulated by a sinusoidal signal of 5 KHz . The bandwidth by Carson's approximation is 1 MHz. If y(t)=(modulated waveform)^3 , then by using Carson's approximation, the bandwidth of y(t) and the spacing of spectral components are respectively.

[Question ID = 24309]

1. 1 MHz, 5 KHz [Option ID = 37234]
2. 1 MHz, 15 KHZ [Option ID = 37236]
3. 3 MHz, 15 KHz [Option ID = 37237]
4. 3 MHz, 5 KHz [Option ID = 37235]

Correct Answer :-

- 1 MHz, 5 KHz [Option ID = 37234]

12) Hexa-decimal equivalent to decimal number 894 is [Question ID = 24277]

1. 37E [Option ID = 37108]
2. 6AD [Option ID = 37109]
3. 35A [Option ID = 37106]
4. 1DF [Option ID = 37107]

Correct Answer :-

- 35A [Option ID = 37106]

13) A JFET amplifier has g_m= 2 mA/V and r_d= 500 kΩ. If the load resistance is 10 kΩ then the voltage gain is _____ [Question ID = 24294]

1. -4.9 [Option ID = 37175]
2. -19.6 [Option ID = 37176]
3. -39.2 [Option ID = 37174]
4. -1.00 [Option ID = 37177]

Correct Answer :-

- -39.2 [Option ID = 37174]

14) The characteristic impedance of a lossless transmission line is 750 Ω and it is terminated by a resistance of 450 Ω. The reflection coefficient is [Question ID = 24329]

1. 1/4 [Option ID = 37316]
2. 1/3 [Option ID = 37315]
3. 1/2 [Option ID = 37314]
4. 1 [Option ID = 37317]

Correct Answer :-

- 1/2 [Option ID = 37314]

15) In a GSM system, 8 channels can co-exist in 200 kHz bandwidth using TDMA. A GSM based cellular operator is allocated 5 MHz bandwidth. Assuming a frequency reuse factor of 1/5 , i.e. a five-cell repeat pattern, the maximum number of simultaneous channels that can exist in one cell is [Question ID = 24303]

1. 5 [Option ID = 37213]
2. 25 [Option ID = 37210]
3. 40 [Option ID = 37212]
4. 200 [Option ID = 37211]

Correct Answer :-

- 25 [Option ID = 37210]

16) A 3 Ω resistance coil has a time constant of 1.8 sec. The current flowing in it one second after 10 V is applied. [Question ID = 24269]

1. 0.5 A [Option ID = 37074]
2. 0.8 A [Option ID = 37075]
3. 1.42 A [Option ID = 37077]
4. 2A [Option ID = 37076]

Correct Answer :-

- 0.5 A [Option ID = 37074]

17) A signal $x(t)=2\cos(\pi 10^4 t)$ volts is applied to an FM modulator with the sensitivity constant of 10 kHz/volt. The modulation index of the FM wave is

[Question ID = 24297]

1. 4 [Option ID = 37189]
2. 2 [Option ID = 37187]
3. $4/\pi$ [Option ID = 37188]
4. $2/\pi$ [Option ID = 37186]

Correct Answer :-

- $2/\pi$ [Option ID = 37186]

18) If a DC current gain (β) of BJT is 45 then base transport factor is _____ (Hint:- emitter injection efficiency is 0.995) [Question ID = 24293]

1. 0.786 [Option ID = 37172]
2. 0.983 [Option ID = 37170]
3. 0.491 [Option ID = 37171]
4. ∞ [Option ID = 37173]

Correct Answer :-

- 0.983 [Option ID = 37170]

19) The area bounded by the curves $y^2=4x$ and $x^2=4y$ is [Question ID = 24240]

1. 8 [Option ID = 36958]
2. 32/3 [Option ID = 36959]
3. 16/3 [Option ID = 36961]
4. 16 [Option ID = 36960]

Correct Answer :-

- 8 [Option ID = 36958]

20) Suppose that the eigen values of matrix A are 1,2,4. The determinant of $(A^{-1})^T$ is _____ [Question ID = 24238]

1. 1.1 [Option ID = 36952]
2. 1 [Option ID = 36950]
3. 0.11 [Option ID = 36951]
4. 0.125 [Option ID = 36953]

Correct Answer :-

- 1 [Option ID = 36950]

21) The Gunn diode is used in [Question ID = 24334]

1. mixer [Option ID = 37334]
2. oscillator [Option ID = 37337]
3. circulator [Option ID = 37336]
4. coupler [Option ID = 37335]

Correct Answer :-

- mixer [Option ID = 37334]

22) A printed circuit board has eight different locations in which a component can be placed. If four different components are to be placed on the board, how many different designs are possible? [Question ID = 24248]

1. 1654 [Option ID = 36993]
2. 980 [Option ID = 36990]
3. 1680 [Option ID = 36991]
4. 1780 [Option ID = 36992]

Correct Answer :-

- 980 [Option ID = 36990]

23) A generator of 50 Ω internal impedance and operating frequency of 3 GHz feeds a 75Ω load via a coaxial line of characteristic impedance Z and length l. The value of Z and l for the maximum power transfer is, respectively

[Question ID = 24324]

1. 62.5 Ω, 10 cm [Option ID = 37294]
2. 62.5 Ω, 10 cm [Option ID = 37297]
3. 61.24 Ω, 2.5 cm [Option ID = 37296]
4. 61.24 Ω, 10 cm [Option ID = 37295]

Correct Answer :-

- 62.5 Ω, 10 cm [Option ID = 37294]

24) The threshold voltage of an n-channel MOSFET can be increased by [Question ID = 24295]

1. reducing the gate-oxide thickness [Option ID = 37179]
2. reducing the channel dopant concentration [Option ID = 37181]
3. reducing the channel length [Option ID = 37180]
4. increasing the channel dopant concentration [Option ID = 37178]

Correct Answer :-

- increasing the channel dopant concentration [Option ID = 37178]

25) If the magnetic field of B=3.0 weber/m^2 is used to accelerate a proton in cyclotron then the frequency of the oscillator connected across the dees is____

[Question ID = 24296]

1. 45.76 MHz [Option ID = 37184]
2. 6.76 MHz [Option ID = 37185]
3. 91.52 MHz [Option ID = 37183]
4. 22.88 MHz [Option ID = 37182]

Correct Answer :-

- 22.88 MHz [Option ID = 37182]

26) If E denotes expectation, the variance of a random variable X is given by [Question ID = 24310]

1. $E[X^2] - E^2[X]$ [Option ID = 37241]
2. $E[X^2] + E^2[X]$ [Option ID = 37238]
3. $E[X^2]$ [Option ID = 37239]
4. $E^2[X]$ [Option ID = 37240]

Correct Answer :-

- $E[X^2] + E^2[X]$ [Option ID = 37238]

27) When the gate-to-source voltage (V_{GS}) of a MOSFET with threshold voltage of 400 mV working in saturation is 900 mV, the drain current is observed to be 1 mA. Neglecting channel length modulation

effect and assuming that the MOSFET is operating at saturation, the drain current for an applied (V_{GS}) of 1400 mV is [Question ID = 24288]

1. 4.0 mA [Option ID = 37153]
2. 2.0 mA [Option ID = 37151]
3. 3.5 mA [Option ID = 37152]
4. 0.5 mA [Option ID = 37150]

Correct Answer :-

- 0.5 mA [Option ID = 37150]

28) For an input power of 1 mW, an attenuator gives an output power of 0.1 mW. If an input of 10 mW power is applied to same attenuator, the output power in mW is [Question ID = 24322]

1. 0 mW [Option ID = 37288]
2. 0.1 mW [Option ID = 37286]
3. 5 mW [Option ID = 37284]
4. 1 mW [Option ID = 37283]

Correct Answer :-

- 1 mW [Option ID = 37283]

29) The relative power in VSWR meter is displayed as 30 dB at the output of attenuator on applying 10 mW input power. The attenuation of this attenuator is [Question ID = 24335]

1. 20 dB [Option ID = 37338]
2. 40 dB [Option ID = 37341]
3. 0 dB [Option ID = 37340]
4. 30 dB [Option ID = 37339]

Correct Answer :-

- 20 dB [Option ID = 37338]

30) In a PCM system, if the code word length is increased from 6 to 8 bits, the signal to quantization noise ratio improves by the factor [Question ID = 24305]

1. 20 [Option ID = 37218]
2. 8 [Option ID = 37219]
3. 16 [Option ID = 37220]
4. 4 [Option ID = 37221]

Correct Answer :-

- 20 [Option ID = 37218]

31) The VSWR can have any value between [Question ID = 24328]

1. 1 and ∞ [Option ID = 37313]
2. -1 and +1 [Option ID = 37311]
3. 0 and ∞ [Option ID = 37312]
4. 0 and 1 [Option ID = 37310]

Correct Answer :-

- 0 and 1 [Option ID = 37310]

32) An 3 dB attenuator has a VSWR of 1.02 at the input port, the percentage ratio of power reflected to power incident at the input of attenuator is

[Question ID = 24323]

1. 0.01% [Option ID = 37291]
2. 0.1% [Option ID = 37290]
3. 1% [Option ID = 37292]
4. 10% [Option ID = 37293]

Correct Answer :-

- 0.1% [Option ID = 37290]

33) Consider the amplitude modulated signal $s(t)=\cos(2000\pi t)+4\cos(2400\pi t)+\cos(2800\pi t)$. The ratio of the power of the message signal to the power of the carrier signal is

[Question ID = 24304]

1. 0.543 [Option ID = 37217]
2. 0.125 [Option ID = 37214]
3. 2 [Option ID = 37215]
4. 0.85 [Option ID = 37216]

Correct Answer :-

- 0.125 [Option ID = 37214]

34) The average power delivered to an impedance $(4-j3)\Omega$ by a current $5\cos(100\pi t+100)A$ is

[Question ID = 24261]

1. 62.5 W [Option ID = 37044]
2. 44.2 W [Option ID = 37043]
3. 125 W [Option ID = 37045]
4. 50 W [Option ID = 37042]

Correct Answer :-

- 50 W [Option ID = 37042]

35) A communication channel with AWGN operating at a signal to noise ratio SNR >> 1 and bandwidth B has capacity C_1. If the SNR is doubled keeping constant bandwidth, the resulting capacity C_2 is given by

[Question ID = 24301]

1. $C_2 \approx C_1+0.3B$ [Option ID = 37205]
2. $C_2 \approx C_1+2B$ [Option ID = 37202]
3. $C_2 \approx C_1+B$ [Option ID = 37204]
4. $C_2 \approx 2C$ [Option ID = 37203]

Correct Answer :-

- $C_2 \approx C_1+2B$ [Option ID = 37202]

36) The Laplacian operator is actually [Question ID = 24257]

1. $\vec{\nabla} \bullet (\vec{\nabla} V)$ [Option ID = 37028]
2. $\vec{\nabla} (\vec{\nabla} \times V)$ [Option ID = 37029]
3. $\vec{\nabla} \times (\vec{\nabla} \bullet V)$ [Option ID = 37027]
4. $\vec{\nabla} (\vec{\nabla} V)$ [Option ID = 37026]

Correct Answer :-

- $\vec{\nabla} (\vec{\nabla} V)$ [Option ID = 37026]

37) The maximum value of the function $f(x)=2x^2-2x+6$ in the interval [0, 2] is [Question ID = 24244]

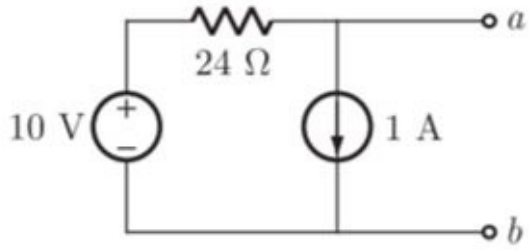
1. 0 [Option ID = 36974]
2. 1 [Option ID = 36976]
3. ∞ [Option ID = 36977]
4. 10 [Option ID = 36975]

Correct Answer :-

- 0 [Option ID = 36974]

38)

For the circuit shown in the figure, The Thevenin voltage and resistance seen from the terminal a-b are respectively



[Question ID = 24263]

1. -14 V, 24 Ω [Option ID = 37051]
2. 10 V, 24 Ω [Option ID = 37052]
3. -18 V, 24 Ω [Option ID = 37050]
4. 11 V, 18 Ω [Option ID = 37053]

Correct Answer :-

- -18 V, 24 Ω [Option ID = 37050]

39) In a medium with $\mu_r = 2$, the electric field is given by

$$\hat{E} = 5\cos(10^9 - 8x)\hat{u}_x + 10\sin(10^9 - 8x)\hat{u}_y \text{ V/m.}$$

The dielectric constant of the medium is

[Question ID = 24337]

1. 2.88 [Option ID = 37349]
2. 3.26 [Option ID = 37348]
3. 4.25 [Option ID = 37347]
4. 5.76 [Option ID = 37346]

Correct Answer :-

- 5.76 [Option ID = 37346]

40)

A distortionless line has $Z_o = 60\ \Omega$, $\alpha = 20 \times 10^{-3}$ Np/m, u =0.6c, where c is the speed of light in vacuum. The value of R at 100 MHz is

[Question ID = 24331]

1. 4 Ω/m [Option ID = 37323]
2. 2.4 Ω/m [Option ID = 37322]
3. 3.6 Ω [Option ID = 37325]
4. 1.2 Ω/m [Option ID = 37324]

Correct Answer :-

- 2.4 Ω/m [Option ID = 37322]

41) Inverse Laplace transform of $\mathcal{L}^{-1}\left\{\frac{15}{s^2+4s+13}\right\}$, is

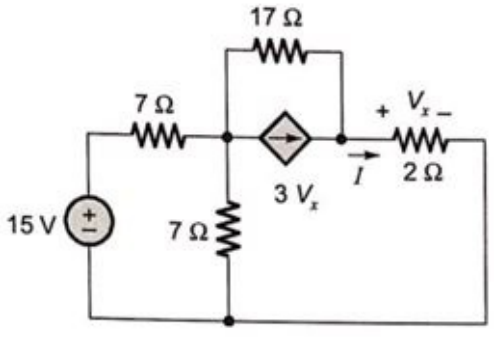
[Question ID = 24249]

1. $15\sin(6t)e^{-5t}$ [Option ID = 36994]
2. $15\sin(4t)e^{-5t}$ [Option ID = 36997]
3. $5\sin(2t)e^{-3t}$ [Option ID = 36996]
4. $5\sin(3t)e^{-2t}$ [Option ID = 36995]

Correct Answer :-

- $15\sin(6t)e^{-5t}$ [Option ID = 36994]

42) In the circuit shown in the figure, the current I through 2 Ω resistor is



[Question ID = 24267]

1. 70.34 mA [Option ID = 37068]
2. 94.34 mA [Option ID = 37069]
3. -70.34 mA [Option ID = 37067]
4. -94.34 mA [Option ID = 37066]

Correct Answer :-

- -94.34 mA [Option ID = 37066]

43)

For a uniform plane wave at frequency 300 MHz traveling along the y-direction in vacuum, the electric field at some instant of time is given by $\vec{E} = 3\hat{i} + 5\hat{k}$. What is the corresponding $\vec{H}$?

[Question ID = 24318]

1. $\vec{H} = \frac{-5\hat{i} + 3\hat{k}}{120\pi}$ [Option ID = 37267]
2. $\vec{H} = \frac{3\hat{i} + 5\hat{k}}{120\pi}$ [Option ID = 37269]
3. $\vec{H} = \frac{5\hat{i} - 3\hat{k}}{120\pi}$ [Option ID = 37271]
4. $\vec{H} = \frac{-5\hat{i} - 3\hat{k}}{120\pi}$ [Option ID = 37273]

Correct Answer :-

- $\vec{H} = \frac{-5\hat{i} + 3\hat{k}}{120\pi}$ [Option ID = 37267]

44)

Given the two points $[a, f(a)], [b, f(b)]$, the linear Lagrange Polynomial $P_1(x)$ that passes through these two points is given by

[Question ID = 24286]

1. $P_1(x) = \frac{x}{a-b} f(a) + \frac{x}{b-a} f(b)$ [Option ID = 37144]
2. $P_1(x) = \frac{x-b}{a-b} f(a) + \frac{x-a}{b-a} f(b)$ [Option ID = 37142]
3. $P_1(x) = \frac{x-b}{a-b} f(a) + \frac{x-a}{a-b} f(b)$ [Option ID = 37143]

4. $P_1(x) = f(a) + \frac{f(b) - f(a)}{b - a} f(b)$ [Option ID = 37145]

Correct Answer :-

- $P_1(x) = \frac{x - b}{a - b} f(a) + \frac{x - a}{b - a} f(b)$ [Option ID = 37142]

45)

A waveguide of characteristic impedance $Z_0 = 50\ \Omega$ is terminated in a load of $Z_L = (100+j50)\Omega$. The maximum impedance for this waveguide is,

[Question ID = 24333]

1. 200 + j100 Ω [Option ID = 37332]
2. 100 + j50 Ω [Option ID = 37331]
3. 150 + j100 Ω [Option ID = 37333]
4. 2 + j Ω [Option ID = 37330]

Correct Answer :-

- 2 + j Ω [Option ID = 37330]

46)

A message signal given by $m(t) = \left(\frac{1}{2}\right)\cos\omega_1 t - \left(\frac{1}{2}\right)\sin\omega_2 t$ amplitude modulated with a carrier frequency ω_c to generator $s(t) = [1 + m(t)]\cos\omega_c t$. What is the power efficiency achieved by this modulation scheme?

[Question ID = 24300]

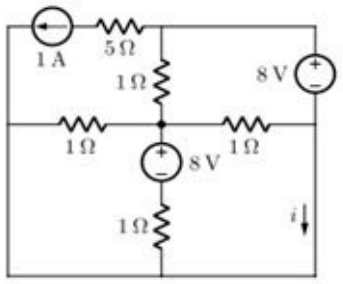
1. 25% [Option ID = 37198]
2. 20% [Option ID = 37201]
3. 11.11% [Option ID = 37200]
4. 8.33% [Option ID = 37199]

Correct Answer :-

- 25% [Option ID = 37198]

47)

In the figure shown, the current i (in ampere) is



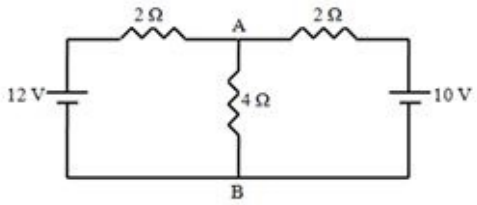
[Question ID = 24264]

1. -1 [Option ID = 37054]
2. -1.5 [Option ID = 37057]
3. 1 [Option ID = 37055]
4. 1.5 [Option ID = 37056]

Correct Answer :-

- -1 [Option ID = 37054]

48) The current through the resistance R = 4 Ω in the network shown in figure is



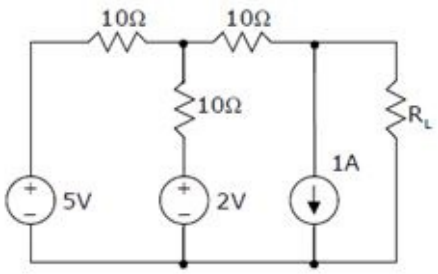
[Question ID = 24268]

1. 1.8 A [Option ID = 37071]
2. 1.1 A [Option ID = 37070]
3. 3.2 A [Option ID = 37073]
4. 2.2 A [Option ID = 37072]

Correct Answer :-

- 1.1 A [Option ID = 37070]

49) In the circuit shown below, the value of R_L such that the power transferred to R_L is maximum is



[Question ID = 24262]

1. 15 Ω [Option ID = 37047]
2. 20 Ω [Option ID = 37046]
3. 5 Ω [Option ID = 37049]
4. 10 Ω [Option ID = 37048]

Correct Answer :-

- 20 Ω [Option ID = 37046]

50)

In the Taylor series expansion of $e^x + \sin(x)$ about the point $x = \pi$, the coefficient of $(x-\pi)^2$ is

[Question ID = 24283]

1. $e^{\pi}+1$ [Option ID = 37130]
2. $e^{\pi}-1$ [Option ID = 37133]
3. $0.5e^{\pi}$ [Option ID = 37132]
4. e^{π} [Option ID = 37131]

Correct Answer :-

- $e^{\pi}+1$ [Option ID = 37130]

51)

The magnetic susceptibility χ_m of the material is 4.5 and the magnetic field intensity is given by, $\hat{H} = 10\,\hat{u}_x + 25\,\hat{u}_y - 40\,\hat{u}_z$ A/m. The relative permeability of the material μ_r is,

[Question ID = 24326]

1. 5.5 [Option ID = 37305]
2. 4.5 [Option ID = 37303]
3. 2.5 [Option ID = 37302]
4. 6.5 [Option ID = 37304]

Correct Answer :-

- 2.5 [Option ID = 37302]

52) The Boolean expression $AB + A\bar{C} + BC$ can be minimize to

[Question ID = 26451]

1. $AB + A\bar{C}$ [Option ID = 45801]
2. $BC + A\bar{C}$ [Option ID = 45799]

3. $AB + A\bar{C} + B$ [Option ID = 45802]
4. $AB + BC$ [Option ID = 45800]

Correct Answer :-

- $BC + A\bar{C}$ [Option ID = 45799]

53)

If $\emptyset(x) = \int_0^{x^2} \sqrt{t}\, dt$ then $\frac{d\emptyset}{dx} =$ _____

[Question ID = 24242]

1. x^2 [Option ID = 36967]
2. $2x^2$ [Option ID = 36969]
3. 0 [Option ID = 36968]
4. 1 [Option ID = 36966]

Correct Answer :-

- 1 [Option ID = 36966]

54)

Let, $A = \begin{bmatrix} 2 & -0.1 \\ 0 & 3 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/3 & a \\ 0 & b \end{bmatrix}$. Then $(a + b) =$

[Question ID = 24247]

1. 31/90 [Option ID = 36988]
2. 23/30 [Option ID = 36986]
3. 19/60 [Option ID = 36989]
4. 11/20 [Option ID = 36987]

Correct Answer :-

- 23/30 [Option ID = 36986]

55)

A silicon pn junction diode under reverse bias has depletion region of width 10 μm. The relative permittivity of silicon $\varepsilon_r = 11.7$ and the permittivity of free space $\varepsilon_o = 8.854 \times 10^{-12}$ F/m. The depletion capacitance of diode per sq meter is

[Question ID = 24289]

1. 100 μF [Option ID = 37155]
2. 20 μF [Option ID = 37157]
3. 10.35 μF [Option ID = 37154]
4. 1 μF [Option ID = 37156]

Correct Answer :-

- 10.35 μF [Option ID = 37154]

56)

The eigen values of the matrix $\begin{bmatrix} -1 & 3 & 5 \\ -3 & -1 & 6 \\ 0 & 0 & 3 \end{bmatrix}$ are

[Question ID = 24246]

1. 3+j, 3-j, 5+j [Option ID = 36984]
2. 3, -1+3j, -1-3j [Option ID = 36985]
3. -6+5j, 3+j, 3-j [Option ID = 36983]
4. 3, 3+5j, 6-j [Option ID = 36982]

Correct Answer :-

- 3, 3+5j, 6-j [Option ID = 36982]

57)

The value of the integral $\int_2^6 x^3 dx$ when evaluated by Simpson's rule with $h = \frac{1}{2}$ is obtained as

[Question ID = 24285]

1. 80 [Option ID = 37141]
2. 56 [Option ID = 37140]
3. 60 [Option ID = 37138]
4. 320 [Option ID = 37139]

Correct Answer :-

- 60 [Option ID = 37138]

58)

An electron is moving with a velocity $\hat{v} = (3\hat{u}_x - 12\hat{u}_y + 4\hat{u}_z) \times 10^5$ m/s at a point in a magnetic field $\hat{B} = \hat{u}_x + 2\hat{u}_y + 3\hat{u}_z$ mWb/m^2. To nullify the magnetic force, the required electric field $\hat{E}$ at that point is

[Question ID = 24325]

1. $4.4\hat{u}_x + 0.5\hat{u}_y + 1.8\hat{u}_z$kV/m [Option ID = 37301]
2. $4.4\hat{u}_x - 0.5\hat{u}_y - 1.8\hat{u}_z$kV/m [Option ID = 37300]
3. $4.4\hat{u}_x + 0.5\hat{u}_y - 1.8\hat{u}_z$kV/m [Option ID = 37299]
4. $-4.4\hat{u}_x + 0.5\hat{u}_y - 1.8\hat{u}_z$kV/m [Option ID = 37298]

Correct Answer :-

- $-4.4\hat{u}_x + 0.5\hat{u}_y - 1.8\hat{u}_z$kV/m [Option ID = 37298]

59) The Laplace transform of $f(t) = t^n e^{\alpha t}$ is given by

[Question ID = 24260]

1. $\frac{(n+1)!}{(s-\alpha)^{n+1}}$ [Option ID = 37039]
2. $\frac{n!}{(s-\alpha)^{n+1}}$ [Option ID = 37038]
3. $\frac{n!}{(s-\alpha)^{n}}$ [Option ID = 37041]
4. $\frac{n!}{(s+\alpha)^{n+1}}$ [Option ID = 37040]

Correct Answer :-

- $\frac{n!}{(s-\alpha)^{n+1}}$ [Option ID = 37038]

60)

Consider two independent random variables X and Y with identical distributions. The variables X and Y take values 0, 1 and 2 with probabilities $\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{4}$ respectively. What is the conditional probability $P(X + Y = 2 | X - Y = 0)$?

[Question ID = 24299]

1. 2/7 [Option ID = 37195]
2. 9/17 [Option ID = 37196]
3. 1/5 [Option ID = 37197]
4. 1/6 [Option ID = 37194]

Correct Answer :-

- 1/6 [Option ID = 37194]

61) $\nabla \times \nabla \times \vec{P} =$

[Question ID = 24245]

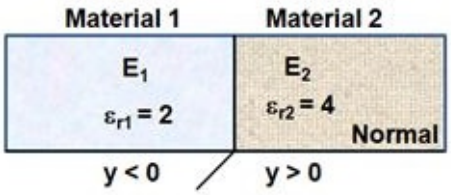
1. $\nabla(\nabla.\vec{P}) - \nabla^2\vec{P}$ [Option ID = 36978]
2. $\nabla^2\vec{P} + \nabla(\nabla.\vec{P})$ [Option ID = 36981]
3. $\nabla(\nabla.\vec{P}) + \nabla^2\vec{P}$ [Option ID = 36979]
4. $\nabla^2\vec{P} - \nabla(\nabla.\vec{P})$ [Option ID = 36980]

Correct Answer :-

- $\nabla(\nabla.\vec{P}) - \nabla^2\vec{P}$ [Option ID = 36978]

62)

The region $y < 0$ contains a dielectric material $\varepsilon_{r1} = 2$ and the region $y > 0$ contains the second dielectric material $\varepsilon_{r2} = 4$. If the electric field intensity in the first material is $\hat{E}_1 = 3\hat{u}_x + 4\hat{u}_y + \hat{u}_z$ V/m, the electric field intensity in the second material is



[Question ID = 24332]

1. $\hat{E}_2 = 3\hat{u}_x + 2\hat{u}_y + \hat{u}_z$ [Option ID = 37329]
2. $\hat{E}_2 = -3\hat{u}_x + 4\hat{u}_y + \hat{u}_z$ [Option ID = 37326]
3. $\hat{E}_2 = 3\hat{u}_x + 4\hat{u}_y + \hat{u}_z$ [Option ID = 37327]
4. $\hat{E}_2 = 3\hat{u}_x + 2\hat{u}_y$ [Option ID = 37328]

Correct Answer :-

- $\hat{E}_2 = -3\hat{u}_x + 4\hat{u}_y + \hat{u}_z$ [Option ID = 37326]

63)

$\int_0^{\pi/4} \frac{1-\tan x}{1+\tan x} dx$ evaluates to

[Question ID = 24239]

1. 0 [Option ID = 36957]
2. 1 [Option ID = 36955]
3. 1/2 In 2 [Option ID = 36954]
4. In 2 [Option ID = 36956]

Correct Answer :-

- 1/2 In 2 [Option ID = 36954]

64)

A current $i(t) = \sin 2\pi t$ is applied to a capacitance of C = 1 μF. The value of $v_c(t)$ at t = ¼ sec

[Question ID = 24272]

1. 12×10^4 V [Option ID = 37086]

2. 15.9×10^4 V [Option ID = 37089]
3. 1.2×10^3 V [Option ID = 37088]
4. 1.5×10^3 V [Option ID = 37087]

Correct Answer :-

- 12×10^4 V [Option ID = 37086]

65) In C language, what is the output of the following code

```
main()
{
  int x = 1;

  do
    printf("%d ", x);
  while(x++<=1);
}
```

[Question ID = 24275]

1. 0 1 [Option ID = 37101]
2. 1 2 [Option ID = 37098]
3. 1 [Option ID = 37099]
4. Error [Option ID = 37100]

Correct Answer :-

- 1 2 [Option ID = 37098]

66)

A certain matched antenna with a radiation resistance (R_r) of 48 Ω radiates when driven with voltage $V_o = 10$ volts. The radiated power from the antenna is

[Question ID = 24336]

1. 1.5 W [Option ID = 37345]
2. 1.04 W [Option ID = 37343]
3. 52.08 W [Option ID = 37344]
4. 2.2 W [Option ID = 37342]

Correct Answer :-

- 2.2 W [Option ID = 37342]

67)

The probability of bit error of BFSK modulation scheme, with transmitted signal energy per bit E_b, in an additive white Gaussian noise channel having one-sided power spectral density N_0, is

[Question ID = 24307]

1. $\frac{1}{2}erfc(\frac{E_b}{N_0})$ [Option ID = 37229]
2. $\frac{1}{2}erfc(\sqrt{\frac{E_b}{2N_0}})$ [Option ID = 37228]
3. $\frac{1}{2}erfc(\frac{E_b}{2N_0})$ [Option ID = 37227]
4. $\frac{1}{2}erfc(\sqrt{\frac{E_b}{N_0}})$ [Option ID = 37226]

Correct Answer :-

- $\frac{1}{2}erfc(\sqrt{\frac{E_b}{N_0}})$ [Option ID = 37226]

68)

The solution of the following differential equation with the boundary condition $y = 1$ at $x = 1$ is given by

$$x\frac{dy}{dx} + y = x^4$$

[Question ID = 24258]

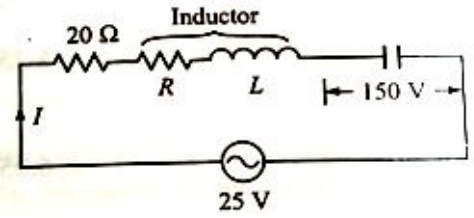
1. $\frac{4x^4}{5} + \frac{1}{5x}$ [Option ID = 37031]
2. $\frac{x^4}{5} + \frac{4x}{5}$ [Option ID = 37030]
3. $5x^4 - 4$ [Option ID = 37033]
4. $\frac{x^4}{5} + \frac{4}{5x}$ [Option ID = 37032]

Correct Answer :-

- $\frac{x^4}{5} + \frac{4x}{5}$ [Option ID = 37030]

69)

A 20 Ω resistor is connected in series with a coil and an energy source. When the frequency is 400 Hz, the current is at its maximum value of 0.5 A and the potential difference across the capacitor is 150 V. What is the value of the capacitor?



[Question ID = 24271]

1. 2.0 μF [Option ID = 37082]
2. 2.5 μF [Option ID = 37085]
3. 1.0 μF [Option ID = 37083]
4. 1.32 μF [Option ID = 37084]

Correct Answer :-

- 2.0 μF [Option ID = 37082]

70) In C language, what is the output of the following code

```
int main()
 {
     enum choice {P, Q, R, S};
   int i = 0;
   for(i = P; i <= S; i++)
   {
      printf("%d ", i);
   }

 }
```

[Question ID = 24274]

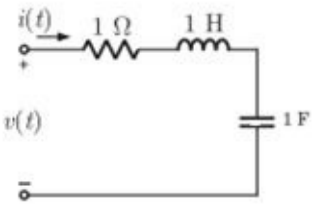
1. 0 1 2 3 [Option ID = 37097]
2. Error [Option ID = 37095]
3. P Q R S [Option ID = 37094]
4. 80 81 82 83 [Option ID = 37096]

Correct Answer :-

- P Q R S [Option ID = 37094]

71)

The circuit shown in the figure has initial current $i_l(0^-) = 1$ A through the inductor and an initial voltage $V_c(0^-) = -1$ V across the capacitor. For input v(t)=u(t), the Laplace transform of the current i(t) for $t \geq 0$ is



[Question ID = 24265]

1. $\frac{s+2}{s^2+s+1}$ [Option ID = 37059]
2. $\frac{s-2}{s^2+s+1}$ [Option ID = 37058]
3. $\frac{s}{s^2+s+1}$ [Option ID = 37060]
4. $\frac{s-2}{s^2+s-1}$ [Option ID = 37061]

Correct Answer :-

- $\frac{s-2}{s^2+s+1}$ [Option ID = 37058]

72) The value of 'c' such that the function $f(x) = \begin{cases} cx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$ is a probability density function.

[Question ID = 24250]

1. 0 [Option ID = 36998]
2. 9/17 [Option ID = 37001]
3. 1/9 [Option ID = 36999]
4. 2/7 [Option ID = 37000]

Correct Answer :-

- 0 [Option ID = 36998]

73)

The recursion relation to solve $x = e^{-x}$ using Newton Raphson method is given by

[Question ID = 24284]

1. $x_{n+1} = \frac{x_n^2 - e^{-x_n}}{x_n + e^{-x_n}}$ [Option ID = 37134]
2. $x_{n+1} = (1 + x_n)\frac{e^{-x_n}}{1 + e^{-x_n}}$ [Option ID = 37136]
3. $x_{n+1} = e^{-x_n}$ [Option ID = 37135]
4. $x_{n+1} = x_n - e^{-x_n}$ [Option ID = 37137]

Correct Answer :-

- $x_{n+1} = \frac{x_n^2 - e^{-x_n}}{x_n + e^{-x_n}}$ [Option ID = 37134]

74)

Let $\hat{i}$ and $\hat{j}$ be the unit vectors in the x and y directions respectively. For the function $F(x,y) = x^3 + y^2$, the gradient of the function, i.e ∇F is given by

[Question ID = 24254]

1. $3y^2\hat{i} + 2x\hat{j}$ [Option ID = 37016]
2. $6x^2y$ [Option ID = 37015]
3. $3x^2\hat{i} - 2y\hat{j}$ [Option ID = 37014]
4. $3x^2\hat{i} + 2y\hat{j}$ [Option ID = 37017]

Correct Answer :-

- $3x^2\hat{i} - 2y\hat{j}$ [Option ID = 37014]

75)

The Fourier transform $F(\omega) = \int_{-\infty}^{\infty} f(t)e^{-j\omega t}\,dt$ of the following function $f(t)$ is given by

$$f(t) = 1.0 \text{ for } |t| < T$$
$$= 0 \text{ for } |t| > T$$

[Question ID = 24259]

1. $\frac{\sin \omega T}{\omega}$ [Option ID = 37034]
2. $2\frac{\sin \omega T}{T}$ [Option ID = 37036]
3. $T\frac{\sin \omega T}{\omega}$ [Option ID = 37037]
4. $2\frac{\sin \omega T}{\omega}$ [Option ID = 37035]

Correct Answer :-

- $\frac{\sin \omega T}{\omega}$ [Option ID = 37034]

---

76) The real part of $6e^{i\frac{\pi}{3}}$, is

[Question ID = 24253]

1. 2 [Option ID = 37012]
2. 1 [Option ID = 37013]
3. 3 [Option ID = 37011]
4. 4 [Option ID = 37010]

Correct Answer :-

- 4 [Option ID = 37010]

---

77) The modulus of the complex number $\left(\frac{3+2i}{1-2i}\right)$ is

[Question ID = 24252]

1. $\sqrt{65}/5$ [Option ID = 37008]
2. $\sqrt{47}/5$ [Option ID = 37009]
3. $\sqrt{6}/5$ [Option ID = 37006]
4. $\sqrt{55}/5$ [Option ID = 37007]

Correct Answer :-

- $\sqrt{6}/5$ [Option ID = 37006]

---

78)

The maximum solid angle Ω_B (steradians) over which a lossless matched antenna can have constant gain $G_o = 40$ dB, is

[Question ID = 24338]

1. $4\pi \times 10^{-4}$ [Option ID = 37350]
2. $4\pi \times 10^{-2}$ [Option ID = 37352]
3. $3\pi \times 10^{-2}$ [Option ID = 37353]
4. $\pi \times 10^{-2}$ [Option ID = 37351]

Correct Answer :-

- $4\pi \times 10^{-4}$ [Option ID = 37350]

79)

If the potential function is given by $V = 20\ln(x) + y$ volts, the electric field at the point (1,1,0) is

[Question ID = 24312]

1. $-\hat{i} - 20\hat{j}$ V/m [Option ID = 37247]
2. $\frac{\hat{i} + \hat{j}}{20}$ V/m [Option ID = 37249]
3. $\hat{i} + \hat{j}$ V/m [Option ID = 37248]
4. $-20\hat{i} - \hat{j}$ V/m [Option ID = 37246]

Correct Answer :-

- $-20\hat{i} - \hat{j}$ V/m [Option ID = 37246]

80)

The rank of the matrix $\begin{bmatrix} -4 & 1 & -1 \\ -1 & -1 & -1 \\ 7 & -3 & 1 \end{bmatrix}$ is

[Question ID = 24237]

1. 2 [Option ID = 36947]
2. 1 [Option ID = 36948]
3. 3 [Option ID = 36949]
4. 4 [Option ID = 36946]

Correct Answer :-

- 4 [Option ID = 36946]

81)

The dielectric region between two concentric right circular cylinders contains a uniform charge density ρ, then potential V is given by

[Question ID = 24314]

1. $\frac{-\rho r^2}{4\varepsilon} + A \ln r + B$ [Option ID = 37253]
2. $\frac{\rho r^2}{4\varepsilon} - A \ln 2 + B$ [Option ID = 37251]
3. $\frac{-\rho r^2}{4\varepsilon} + A \ln 2 + B$ [Option ID = 37256]
4. $\frac{\rho r^2}{4\varepsilon} - A \ln r + B$ [Option ID = 37254]

Correct Answer :-

- $\frac{\rho r^2}{4\varepsilon} - A \ln 2 + B$ [Option ID = 37251]

82) The electron concentration in a sample of uniformly doped n-type silicon at 300K varies linearly from 10^{17} cm^{-3} at x = 0 to 6×10^{16} cm^{-3} at x = 2 μm. Assume that electrons are supplied to keep this concentration gradient constant with time. If diffusion constant, $D_n = 35$ cm^2/sec, the current density in the silicon in absence of electric field is

[Question ID = 24291]

1. -112 A/cm^2 [Option ID = 37165]
2. 112 A/cm^2 [Option ID = 37163]
3. 1120 A/cm^2 [Option ID = 37162]
4. -1120 A/cm^2 [Option ID = 37164]

Correct Answer :-

- 1120 A/cm^2 [Option ID = 37162]

83) For the initial value problem $\frac{dx}{dt} = \sin(t)$. $x(0) = 0$. The value of x at $t = \frac{\pi}{3}$ is

[Question ID = 24255]

1. 0 [Option ID = 37018]
2. 0.5 [Option ID = 37020]
3. 1 [Option ID = 37019]
4. 0.2 [Option ID = 37021]

Correct Answer :-

- 0 [Option ID = 37018]

84)

Consider a two port network with the transmission matrix $T=\begin{bmatrix} A & B \\ C & D \end{bmatrix}$ If the network is reciprocal, then

[Question ID = 24266]

1. $T^2=T$ [Option ID = 37064]
2. $T^{-1}=T$ [Option ID = 37063]
3. Determinant (T)=0 [Option ID = 37062]
4. Determinant (T)=1 [Option ID = 37065]

Correct Answer :-

- Determinant (T)=0 [Option ID = 37062]

85)

The density function of a random variable X is given by $f(x)=\begin{cases} x/2 & 0<x<2 \\ 0 & \text{otherwise} \end{cases}$. The standard deviation σ_X is

[Question ID = 24256]

1. $\sqrt{2}/3$ [Option ID = 37022]
2. $\sqrt{6}/5$ [Option ID = 37023]
3. 2 [Option ID = 37024]
4. $2/5$ [Option ID = 37025]

Correct Answer :-

- $\sqrt{2}/3$ [Option ID = 37022]

86)

If a 75Ω transmission line is terminated in a load impedance of 100Ω, the minimum impedance on the line is

[Question ID = 24341]

1. 56.25 Ω [Option ID = 37365]
2. 0 Ω [Option ID = 37364]
3. 100 Ω [Option ID = 37362]
4. 70 Ω [Option ID = 37363]

Correct Answer :-

- 100 Ω [Option ID = 37362]

87) Consider sinusoidal modulation in an AM system. Assuming no over modulation , the modulation index (μ) when the maximum and minimum values of the envelope, respectively, are 3V and 1V is
[Question ID = 24298]

1. 0.5 [Option ID = 37193]
2. 1 [Option ID = 37192]
3. 0.75 [Option ID = 37190]
4. 0.2 [Option ID = 37191]

Correct Answer :-

- 0.75 [Option ID = 37190]

---

88) Consider a four bit Digital to Analog converter. The analog value corresponding to a digital signals of values 0000 and 0001 are 0 volts and 0.0625 volts respectively. The analog value (in volts) corresponding to the digital signal 1111 is [Question ID = 24273]

1. 0.9375 [Option ID = 37092]
2. 0.0241 [Option ID = 37090]
3. 2.5 [Option ID = 37093]
4. 0.543 [Option ID = 37091]

Correct Answer :-

- 0.0241 [Option ID = 37090]

---

89) A series RLC circuit has a resonance frequency of 1 kHz and a quality factor Q = 100. If each of R, L and C is doubled from its original value, the new Q of the circuit is

[Question ID = 24270]

1. 100 [Option ID = 37080]
2. 200 [Option ID = 37081]
3. 50 [Option ID = 37079]
4. 25 [Option ID = 37078]

Correct Answer :-

- 25 [Option ID = 37078]

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90) Integration of CAD and CAM is known as [Question ID = 24279]

1. CAD alone [Option ID = 37117]
2. CIM [Option ID = 37116]
3. CAM alone [Option ID = 37115]
4. CIE [Option ID = 37114]

Correct Answer :-

- CIE [Option ID = 37114]

---

91) A PCM system uses a uniform quantizer which has a range –V to +V and it is followed by a 7 bit binary encoder. A zero mean signal applied to the quantizer extends over its entire range and has uniform probability density. The ratio of the signal to the quantization noise power at the output of the quantizer is (use $\log_{10} 2=0.3$)

[Question ID = 24308]

1. 42 dB [Option ID = 37231]
2. 14 dB [Option ID = 37230]
3. 28 dB [Option ID = 37233]
4. 56 dB [Option ID = 37232]

Correct Answer :-

- 14 dB [Option ID = 37230]

92) The speed of conversion is maximum in [Question ID = 24282]

1. successive – approximation A/D converter [Option ID = 37127]
2. parallel-comparative A/D converter [Option ID = 37126]
3. counter ramp A/D converter [Option ID = 37128]
4. dual-slop A/D converter [Option ID = 37129]

Correct Answer :-

- parallel-comparative A/D converter [Option ID = 37126]

93) A mixer stage has a noise figure of 20 dB. This mixer stage is preceded by an amplifier which has a noise figure of 10 dB and an available power gain of 20 dB. The overall noise figure at the input is [Question ID = 24339]

1. 15 [Option ID = 37354]
2. 30 [Option ID = 37357]
3. 19.5 [Option ID = 37355]
4. 10.99 [Option ID = 37356]

Correct Answer :-

- 15 [Option ID = 37354]

94) A lossless transmission line of length 50 cm with L = 10 μH/m, C = 40 pF/m is operated at 25 MHz. Its electrical path length is

[Question ID = 24327]

1. 180 degrees [Option ID = 37306]
2. λ meters [Option ID = 37308]
3. 0.5 meters [Option ID = 37309]
4. $\pi/2$ radians [Option ID = 37307]

Correct Answer :-

- 180 degrees [Option ID = 37306]

95) A microprogram is [Question ID = 24281]

1. usually written in high level language [Option ID = 37122]
2. a program for microcomputer [Option ID = 37124]
3. a program written in assembly language [Option ID = 37125]
4. a sequencing program for the control unit of any processor [Option ID = 37123]

Correct Answer :-

- usually written in high level language [Option ID = 37122]

96) It is given that $y''+2y'+y=0$, $y(0)=0$, $y(1)=0$. What is $y(0.5)$? [Question ID = 24241]

1. 0 [Option ID = 36962]
2. 1.13 [Option ID = 36965]
3. 0.62 [Option ID = 36964]

4. 0.37 [Option ID = 36963]

Correct Answer :-

- 0 [Option ID = 36962]

97) Dynamic memory cells are constructed using [Question ID = 24278]

1. Transistors [Option ID = 37110]
2. JFETs [Option ID = 37113]
3. MOSFETs [Option ID = 37111]
4. Flip-flops [Option ID = 37112]

Correct Answer :-

- Transistors [Option ID = 37110]

98) A particular green LED emits light of wavelength 5490 Å. The energy bandgap of the semiconductor material used there is [Question ID = 24287]

1. 2.26 eV [Option ID = 37148]
2. 1.17 eV [Option ID = 37149]
3. 1.98 eV [Option ID = 37146]
4. 0.74 eV [Option ID = 37147]

Correct Answer :-

- 1.98 eV [Option ID = 37146]

99) Three light bulbs are chosen at random from 15 bulbs of which 5 are defective. The probability that exactly one is defective, is [Question ID = 24251]

1. 3/17 [Option ID = 37002]
2. 45/91 [Option ID = 37003]
3. 2/7 [Option ID = 37004]
4. 92/71 [Option ID = 37005]

Correct Answer :-

- 3/17 [Option ID = 37002]

100) A voltage of 6 V is applied across a 2 cm long semiconductor bar. The average drift velocity is 10^4 cm/sec. The electron mobility is [Question ID = 24290]

1. 3333 cm^2/V-s [Option ID = 37159]
2. 4396 cm^2/V-s [Option ID = 37160]
3. 6×10^4 cm^2/V-s [Option ID = 37158]
4. 3×10^4 cm^2/V-s [Option ID = 37161]

Correct Answer :-

- 6×10^4 cm^2/V-s [Option ID = 37158]