PU Ph D Electronics and Communication Engineering

1 of 100
211 PU_2015_138
The bandgap of Indium Phosphide (InP) at 300 K is:-

- 1.12 eV
- 1.35 eV
- 1.42 eV
- 0.66 eV

2 of 100
170 PU_2015_138
The radiation resistance of an antenna is 63 Ω and loss resistance 7 Ω . If antenna has power gain of 16, then directivity is:-

- 24.7 dB
- 48.26 dB
- 38.96 dB
- 12.5 dB

3 of 100
175 PU_2015_138
Consider the following statements, S_1 and S_2:-

S_1: At the resonant frequency, the impedance of a series *RLC* circuit is zero
S_2: In a parallel *GLC* circuit, increasing the conductance *G* results in an increase in its Q-factor. Which of the following is correct?

- S_1 is TRUE and S_2 is FALSE
- S_1 is FALSE and S_2 is FALSE
- S_1 is TRUE and S_2 is TRUE
- S_1 is FALSE and S_2 is TRUE

4 of 100
108 PU_2015_138

The signal $\cos \omega_c t - 0.5 \cos \omega_m t \sin \omega_c t$ is:-

- FM only
- AM only
- both AM and FM
- neither AM or FM

5 of 100

137 PU_2015_138

If *XY*=0 then $X \oplus Y$ is equal to:-

- $\overline{X}\,\overline{Y}$
- XY
- $\overline{X} + \overline{Y}$
- *X* + *Y*

6 of 100

135 PU_2015_138

The simplified form of a logic function $Y = A\left(B + C\overline{(AB + AC)}\right)$ is:-

- $A\overline{B}$
- $\overline{A}\,\overline{B}$
- *AB*
- $\overline{A}B$

7 of 100

172 PU_2015_138

A capacitor is charged by a constant current of 2 mA and results in a voltage increase of 12 V in a 10 sec interval. The value of capacitance is:-

- 1.33 mF
- 0.6 mF
- 1.67 mF
- 0.75 mF

8 of 100

130 PU_2015_138

A linear system is equivalently represented by two sets of state equations

$X = AX + BU$ and $W = CW + DU.$

The Eigen values of the representations are also computed as lamda and {μ}. Which of the following statements are true?

- $[\lambda] = [\mu]$ and $X = W$
- $[\lambda] \neq [\mu]$ and $X = W$
- $[\lambda] \neq [\mu]$ and $X \neq W$

- $[\lambda]=[\mu]$ and $X \neq W$

9 of 100

198 PU_2015_138

For a signal $x(t)$, the Fourier transform is $X(f)$. Then the inverse Fourier transform of $X(3f+2)$ is given by:-

- $3x(3t)e^{-j4\pi t}$
- $\frac{1}{3}x\left(\frac{t}{3}\right)e^{-j4\pi t/3}$
- $\frac{1}{2}x\left(\frac{t}{2}\right)e^{j3\pi t}$
- $x(3t+2)$

10 of 100

173 PU_2015_138

The frame duration of D-AMPS system:-

- 40 ms
- 10 ms
- 20 ms
- 30 ms

11 of 100

194 PU_2015_138

The input and output of a continuous time system are denoted by x(t) and y(t), respectively. Which of the following descriptions correspond to a casual system?

- $y(t)=x(t-2)+x(t+4)$
- $y(t)=(t+5)x(t+5)$
- $y(t)=(t+4)x(t-1)$
- $y(t)=(t-4)x(t+1)$

12 of 100

151 PU_2015_138

A *npn* junction diode is operating in reverse bias region. The applied reverse voltage, at which the ideal reverse current reaches 90% of its reverse saturation current, is:-

- 42.3 mV
- 59.6 mV
- 4.8 mV
- 2.7 mV

13 of 100
193 PU_2015_138
The second order LTI discrete time system behaves as:-

- high pass filter
- all pass filter
- low pass filte
- resonant filter

14 of 100
191 PU_2015_138
Determine the time signal x(t) corresponding to given X(s)

$$X(s)=\frac{s+3}{s^2+3s+2}$$

- $\left(2e^{-2t}-e^{-t}\right)u(t)$
- $\left(2e^{-2t}+e^{-t}\right)u(t)$
- $\left(2e^{-t}+e^{-2t}\right)u(t)$
- $\left(2e^{-t}-e^{-2t}\right)u(t)$

15 of 100
136 PU_2015_138

If $X\overline{Y}+\overline{X}Y=Z$ then $X\overline{Z}+\overline{X}Z$ is equal to:-

- $\overline{Y}$
- 0
- Y
- 1

16 of 100
174 PU_2015_138

An independent voltage source in series with an independence $Z_s=R_s+jX_s$ delivers a maximum average power to a load impedance Z_L when

- $Z_L=R_s+jX_s$
- $Z_L=R_s$
- $Z_L=jX_s$
- $Z_L=R_s-jX_s$

17 of 100

124 PU_2015_138

In case of phase–lag compensation used system, gain crossover frequency, band width and undamped frequency are respectively:-

- increased, decreased, decreased
- increased, increased, increased
- decreased, decreased, decreased
- increased, increased, decreased

18 of 100

104 PU_2015_138

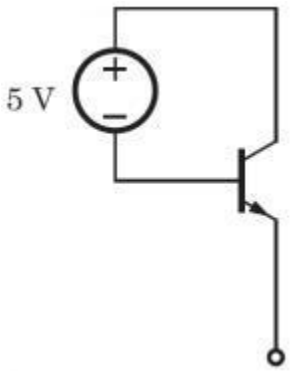
Air craft of Jet Airways at Puducherry airport arrive according to a Poisson process at a rate of 12 per hour. All aircraft are handled by one air traffic controller. If the controller takes a 2 minutes coffee break, what is the probability that he will miss one or more arriving aircraft?

- 0.44
- 0.66
- 0.33
- 0.55

19 of 100

154 PU_2015_138

For the transistor shown in Figure, $I_S = 10^{-15}$ A, $\beta_F = 100$, $\beta_R = 1$The current ICBO is:-



- 2×10^{-14} A
- 1.01×10^{-15} A
- 1.01×10^{-14} A
- 2×10^{-15} A

20 of 100

152 PU_2015_138

A GaAs laser has a threshold density of 500 A/cm^2. The laser has dimensions of 10 μm 200 μ m. The active region is $d_{Las} = 100\ \text{A}^0$. The electron-hole recombination time at threshold is 1.5 ns. The current

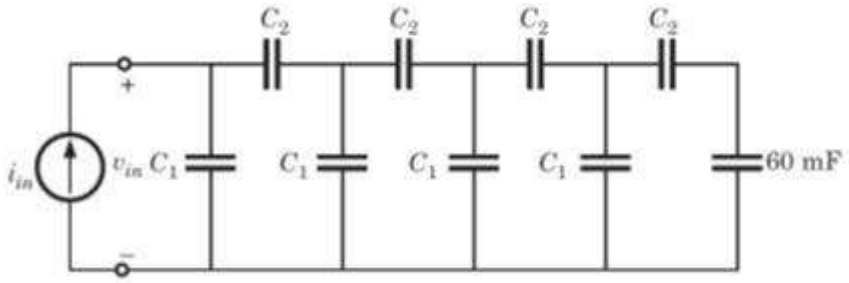
density of 5 J_{th} is injected into the laser. The optical power emitted, if emitted photons have an energy of 1.43 eV, is:-

- 143 mW
- 71.5 mW
- 124.6 mW
- 62.3 mW

21 of 100

176 PU_2015_138

In the circuit shown in Figure, $i_{in}(t) = 300\sin 20t$ mA, for $t \geq 0$. Let $C_1 = 40$ μF and $C_2 = 30$ μF. All capacitors are initially uncharged. The $v_{in}(t)$ would be



- 0.25 cos20*t* V
- -0.25 cos20*t* V
- 36 cos20*t* mV
- -36 cos20*t* mV

22 of 100

157 PU_2015_138

An op amp having a 106-dB gain at dc and a single-pole frequency response of 2 MHz is used to design a noninverting amplifier with nominal dc gain of 100. The 3-dB frequency of the closed-loop gain equal to:-

- 40 kHz
- 10 kHz
- 20 kHz
- 15 kHz

23 of 100

106 PU_2015_138

A CDMA system is designed based on DS spread spectrum with a processing gain of 1000 and BPSK modulation scheme. If user has equal power and the desired level of performance of an error probability of 10^{-6} the number of user will be:-

- 89
- 216
- 147
- 117

24 of 100

153 PU_2015_138

A uniformly doped silicon *npn* bipolar transistor is to be biased in the forward active mode with the B - C junction reverse biased by 3 V. The transistor doping are $NE = 10^{17}$ cm^{-3}, $NB = 10^{16}$ cm^{-3} and $N_c = 10^{15}$ cm^{-3}. The BE voltage, at which the minority carrier electron concentration at x =0 is 10% of the majority carrier hole concentration, is:-

- 0.64 V
- 0.48 V
- 0.94 V
- 0.24 V

25 of 100

192 PU_2015_138

In the state equation of a continuous time system, $\dot{Q}(t) = AQ(t) + BX(t)$ the input matrix is:-

- *B*
- *A*
- *Q*(*t*)
- *X*(*t*)

26 of 100

134 PU_2015_138

A computer has the following negative numbers stored in binary form as shown. The wrongly stored number is:-

- -89 as 1010 0111
- -48 as 1110 1000
- -32 as 1110 0000
- -37 as 1101 1011

27 of 100

177 PU_2015_138

A graph of an electrical network has 4 nodes and 7 branches. The number of links *l*, with respect to the chosen tree, would be:-

- 4
- 5
- 3
- 2

28 of 100

196 PU_2015_138

The power in the signal $s(t)=8\cos\left(20\pi t-\frac{\pi}{2}\right)+4\sin(15\pi t)$ is:-

- 41
- 82
- 45
- 40

29 of 100

105 PU_2015_138

A stationary random process X(t) is applied to the input of a system for which $h(t)=3u(t)t^2e^{-8t}$. If $E\left[X(t)\right]=2$, the mean value of the system's response $Y(t)$ is

- $\frac{3}{128}$
- $\frac{1}{128}$
- $\frac{3}{64}$
- $\frac{1}{64}$

30 of 100

156 PU_2015_138

An amplifier operating from a single 15-V supply provides a 12-V peak-to-peak sine-wave signal to a 1-kΩ load and draws negligible input current from the signal source. The dc current drawn from the 15-V supply is 8 mA. The power dissipated in the amplifier equal to:-

- 100 mW
- 100 W
- 101 mW
- 102 mW

31 of 100

178 PU_2015_138

A network has 8 nodes and 5 independent loops. The number of branches in the network is:-

- 6
- 8
- 12
- 11

32 of 100

109 PU_2015_138

Modal dispersion is comparatively less in graded index fibres than step index fibres due to:-

- Reduced relative refractive index difference
- Reduced path length differences by self-focusing action
- Increased value of core radius
- Reduced value of core refractive index

33 of 100

129 PU_2015_138

Consider the system $\frac{dx}{dt} = Ax + Bu \text{ with } A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} p \\ q \end{bmatrix},$ where p and q are arbitrary real numbers. Which of the following statements about the controllability of the system is true?

- We cannot conclude about controllability from the given data
- The system is completely state controllable for any non-zero values of *p* and *q*
- Only *p*=0 and *q*=0 result in controllability
- The system is uncontrollable for all values of *p* and *q*

34 of 100

102 PU_2015_138

A random process is defined by X(t) + A where A is continuous random variable uniformly distributed on (0,1). The auto correlation function and mean of the process is:-

- 1/2 & 1/3
- 1 & 1/2
- 1/3 & ½
- 1/2 & 1

35 of 100

120 PU_2015_138

Despite the presence of negative feedback, control systems still have problems of instability because the:-

- mathematical analysis involves approximations
- system has a large negative phase angle at high frequencies
- dynamic equations of the subsystems are not known exactly
- components used have non-linearities

36 of 100

126 PU_2015_138

A PD controller is used to compensate a system. Compared to the uncompensated system, the compensated system has:-

- reduced damping
- a higher type number
- higher noise amplification
- larger transient overshoot

37 of 100

103 PU_2015_138

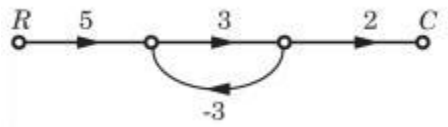
A random process consists of three samples function $X(t,s_1)=2, X(t,s_2)=2\cos t_1$ and $X(t,s_3)=3\sin(t)$ each occurring with equal probability. The process is:-

- Wide-sense stationary
- Not stationary in any sense
- Second order stationary
- First order stationary

38 of 100

121 PU_2015_138

In the signal flow graph shown in Figure, the transfer function is:-



- -3
- 3.75
- 3
- 3.75

39 of 100

132 PU_2015_138

If $(211)_x = (152)_8$, then the value of base x is:-

- 5
- 7
- 6
- 9

40 of 100

195 PU_2015_138

A system with input x[n] and output y[n] is given as $y[n]=\left(\sin\frac{5}{6}\pi n\right)x[n]$. The system is:-

- linear, stable and invertible
- non-linear, stable and non-invertible
- linear, unstable and invertible
- linear, stable and non-invertible

41 of 100

190 PU_2015_138

The Laplace transform of signal $x(t)=e^{2t}u(-t+2)$ is:-

- $\frac{e^{2(s-2)}-1}{s-2}$
- $\frac{1-e^{-2(s-2)}}{s-2}$
- $\frac{e^{-2s}}{s-2}$
- $\frac{e^{-2s}}{s+2}$

42 of 100

155 PU_2015_138

Consider an amplifier operating from ± 10-V power supplies. It is fed with a sinusoidal voltage having 1 V peak and delivers a sinusoidal voltage output of 9 V peak to a 1-kΩ load. The amplifier draws a current of 9.5 mA from each of its two power supplies. The input current of the amplifier is found to be sinusoidal with 0.1 mA peak. The amplifier efficiency is equal to:-

- 20 %
- 40 %
- 42.6 %
- 21.3 %

43 of 100
213 PU_2015_138

For what value of $x\left(0 \le x \le \frac{\pi}{2}\right)$, the function $y = \frac{x}{(1+\tan x)}$ has a maximum?

- 0
- cot x
- tan x
- cos x

44 of 100
127 PU_2015_138
The term 'reset control' refers to:-

- Proportional control
- Derivative control
- Integral control
- None of the above

45 of 100
171 PU_2015_138
Twelve 6 Ω resistances are used as edge to form a cube. The resistance between two diagonally opposite corner of the cube is:-

- $\frac{5}{16}$
- 5
- $\frac{1}{4}$
- $\frac{3}{16}$

46 of 100
133 PU_2015_138
A signed integer has been stored in a byte using 2's complement format. We wish to store the same integer in 16-bit word. We should copy the original byte to the less significant byte of the word and fill the more significant byte with:-

- equal to the MSB of the original byte
- 1
- complement of the MSB of the original byte
- 0

47 of 100

107 PU_2015_138

Diversity technique is a method for improving which of the following message signal by utilizing two or more communication channels with different characteristics?

- Reliability
- Coverage ability
- Error correction capability
- Error detection capability

48 of 100

122 PU_2015_138

The number of open right half plane poles of $G(s)=\frac{10}{s^5+2s^4+3s^3+6s^2+5s+3}$ is:-

- 0
- 2
- 1
- 4

49 of 100

212 PU_2015_138

Consider the Assertion (A) and Reason (R) given below:

Assertion (A): If $u=xyf\left(\frac{y}{x}\right)$, then $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2u$

Reason (R): Given function u is homogeneous of degree 2 in x and y.

Of these statements

- Both A and R are true and R is not a correct explanation of A
- Both A and R are true and R is the correct explanation of A
- A is true but R is false
- A is false but R is true

50 of 100

210 PU_2015_138

If an error of 1% is made in measuring the major and minor axes of an ellipse, then the percentage error in the area is approximately equal to:-

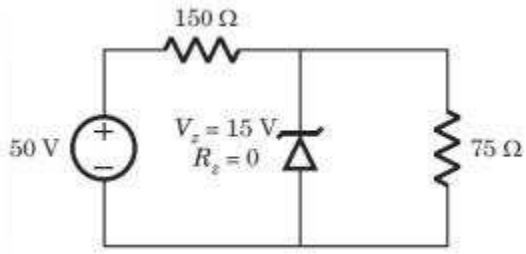
- 2%

- 1.75%
- 1.5%
- 1%

51 of 100

158 PU_2015_138

In the voltage regulator shown in the figure, the power dissipation in the Zener diode is:-

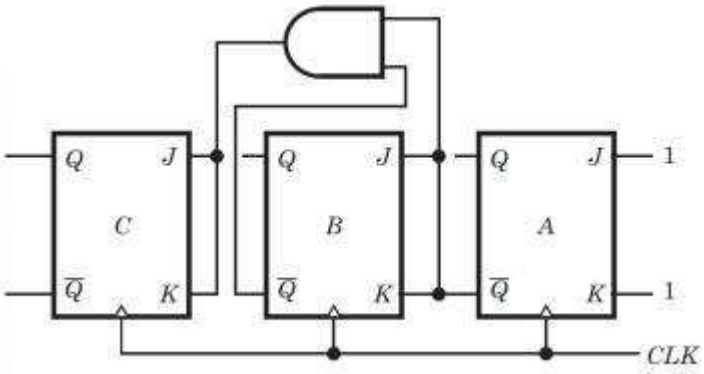


- 2.5 W
- 1.5 W
- 2 W
- 0.5 W

52 of 100

138 PU_2015_138

The counter shown in Figure is a:-



- MOD–8 up counter
- MOD–6 up counter
- MOD–6 down counter
- MOD–8 down counter

53 of 100

123 PU_2015_138

A lag compensation network:-

(a) increases the gain of the original network without affecting stability
(b) reduces the steady state error
(c) reduces the speed of response
(d) permits the increase of gain of phase margin is acceptable
(d) permits the increase of gain of phase margin is acceptable

In the above statements, which are correct?

- b and c
- a, b, c and d
- b, c, and d
- a and b

54 of 100

100 PU_2015_138

A joint sample space for two random variables X and Y has four elements (1, 1), (2, 2), (3, 3) and (4, 4). Probabilities of these elements are 0.1, 0.35, 0.05 and 0.5 respectively.The probability of the event $\{X \leq 2.5, Y \leq 6\}$ is:-

- 0.45
- 0.50
- 0.60
- 0.55

55 of 100

101 PU_2015_138

The density function of two random variables X and Y is $f_{X,Y}(x,y) = \frac{e^{-\left(\frac{x^2+y^2}{2\sigma^2}\right)}}{2\pi\sigma^2}$ with σ^2 a constant. The mean value of the function $g(X,Y) = X^2 + Y^2$ is

- σ^2
- 2σ
- σ
- $2\sigma^2$

56 of 100

131 PU_2015_138

Which one of the following diodes contains a metal-semiconductor junction?

- Gunn Diode
- Tunnel Diode
- Schottky Diode

- Zener Diode

57 of 100

125 PU_2015_138

A system has poles at 0.01 Hz, 1 Hz and 180 Hz; zeros at 5 Hz, 100 Hz and 200 Hz. The approximate phase of the system response at 20 Hz is:-

- -90°
- 90°
- 0°
- -180°

58 of 100

197 PU_2015_138

The Fourier transform of $y[2n]$ is:-

- $e^{-j\omega}\left[\cos 2\omega + 2\cos\omega + 2\right]$
- $\left[\cos 2\omega + 2\cos\omega + 2\right]$
- $e^{-j2\omega}\left[\cos 4\omega + 2\cos 2\omega + 2\right]$
- $e^{-j2\omega}\left[\cos 2\omega + 2\cos\omega + 2\right]$

59 of 100

128 PU_2015_138

The correct sequence of steps needed to improve system stability is:-

- use negative feedback, reduce gain, insert derivative action
- reduce gain, use negative feedback, insert derivative action
- reduce gain, insert derivative action, use negative feedback
- insert derivative action, use negative feedback,reduce gain

60 of 100

150 PU_2015_138

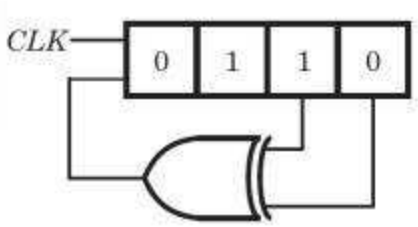
Two p^+ n silicon junction is reverse biased at V_R = 5 V. The impurity doping concentration in junction A are $N_a = 10^{18}$ cm^{-3} and $N_d = 10^{-15}$ cm^{-3}, and those in junction B are $N_a = 10^{18}$ cm^{-3} and Nd = 1016 cm 3. The ratio of the space charge width is:-

- 9.8
- 4.36
- 3.13
- 19

61 of 100

237 PU_2015_138

The initial contents of the 4-bit serial-in-parallel-out right-shift, register shown in Figure is 0 1 1 0. After three clock pulses are applied, the contents of the shift register will be

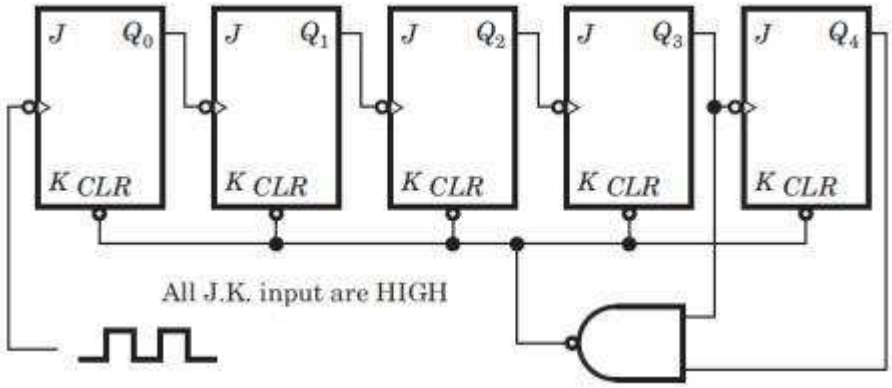


- 1 0 1 0
- 1 1 1 1
- 0 0 0 0
- 0 1 0 1

62 of 100

235 PU_2015_138

The mod-number of the asynchronous counter shown in Figure is



- 25
- 48
- 36
- 24

63 of 100

248 PU_2015_138

The amplitude of a wave travelling through a lossy nonmagnetic medium reduces by 18% every meter. The wave operates at 10 MHz and the electric field leads the magnetic field by 24° . The skin depth is:-

- 4.23 m
- 2.52 m
- 5.05 m
- 8.46 m

64 of 100

221 PU_2015_138

A modulating signal is amplified by 80% efficiency amplifier before being combined with a 20 kW carrier to generate an AM signal. The required DC input power to the amplifier, for the system to operate at 100% modulation, would be:-

- 12.5 kW
- 6.25 kW
- 5 kW
- 8.46 kW

65 of 100

240 PU_2015_138

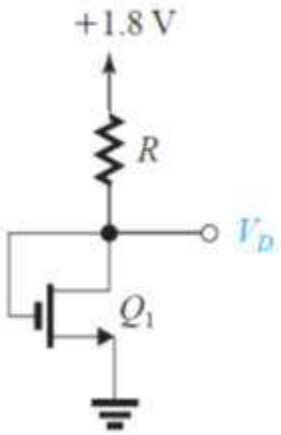
Three analog signals, having bandwidths 1200 Hz, 600 Hz and 600 Hz are sampled at their respective Nyquist rates, encodes with 12 bit words and time division multiplexed. The bit rate for the multiplexed signal is:-

- 28.8 kbps
- 57.6 kbps
- 115.2 kbps
- 38.4 kbps

66 of 100

243 PU_2015_138

For the circuit in Figure, find the value of R that results in $V_D = 0.8\text{V}$. The MOSFET has $V_{tn} = 0.5\text{ V}, \mu_n C_{ox} = 0.4\text{ mA/V}^2, W/L = \dfrac{0.72\,\mu\text{m}}{0.18\,\mu\text{m}}$, and $\lambda = 0$.



- 14.1 kΩ

- 11.3 kΩ
- 12.6 kΩ
- 13.9 kΩ

67 of 100

232 PU_2015_138

Consider a unity gain feedback control system whose open loop transfer function is $G(s)=\frac{as+1}{s^2}$. The value of a so that the system has a phase-margin equal to $\frac{\pi}{4}$ is approximately equal to

- 2.40
- 1.40
- 0.84
- 0.74

68 of 100

241 PU_2015_138

An analog signal is band-limited to 4 kHz .Sampled at the Nyquist rate and the samples are quantized into 4 levels. The quantized levels are assumed to be independent and equally probable.

- 2 bits/sec
- 3 bits/sec
- 4 bits/sec
- 1 bit/sec

69 of 100

244 PU_2015_138

A CG amplifier is required to match a signal source with R_{sig} = 100 Ω . At what I_D current should the MOSFET be biased if it is operated at an overdrive voltage of 0.20 V?

- 1 mA
- 2 mA
- 2.5 mA
- 0.5 mA

70 of 100

234 PU_2015_138

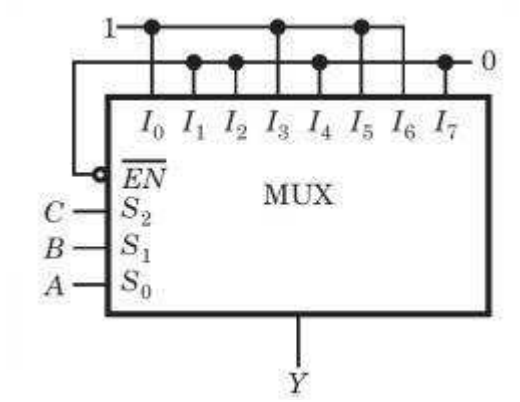
The gain margin and the phase margin of a feedback system with $G(s)H(s)=\frac{s}{s+100^3}$ are:-

- ∞, ∞
- 88.5 dB, 0°
- ∞,0°
- 88.5 dB, ∞

71 of 100

238 PU_2015_138

For the logic circuit shown in Figure, the output Y is:-



- $A \oplus B$
- $A \oplus B \oplus C$
- $\overline{A \oplus B}$
- $\overline{A \oplus B \oplus C}$

72 of 100

220 PU_2015_138

A mixer stage has a noise figure of 20 dB. This mixer stage is preceded by an amplifier which has a noise figure of 9 dB and an available power gain of 15 dB. The overall noise figure referred to the input is:-

- 97.38 dB
- 18.23 dB
- 56.48 dB
- 11.07 dB

73 of 100

226 PU_2015_138

The number of modes of an optical fibre having diameter of 50 μm, n_1=1.48, n_2=1.46 and λ =0.82 μm is:-

- 883
- 1004

- 1083
- 998

74 of 100

227 PU_2015_138

Assuming a Gaussian frequency response, the 3dB optical bandwidth for an LED corresponding to a 3 dB electrical bandwidth of 50 MHz will be:-

- 70.7 MHz
- 50 MHz
- 25 MHz
- 100 MHz

75 of 100

242 PU_2015_138

Consider a peak rectifier fed by a 60-Hz sinusoid having a peak value V_p = 100 V. Let the load resistance R = 10 kΩ . Find the value of the capacitance C that will result in a peak-to-peak ripple of 2 V.

- 42.2 μF
- 112.11 μF
- 11.1 μF
- 83.3 μF

76 of 100

233 PU_2015_138

A causal system having the transfer function $H(s)=\frac{1}{s+2}$ is excited with $10u(t)$. The time at which the output reaches 99% of its steady state value is

- 2.5 sec
- 2.7 sec
- 2.3 sec
- 2.1 sec

77 of 100

231 PU_2015_138

A ramp input applied to a unity feedback system results in 5% steady state error. The type number and zero frequency gain of the system are, respectively,

- 0 and 20
- 1 and 1/20
- 1 and 20

- 0 and 1/20

78 of 100

222 PU_2015_138

A 1 MHz sinusoidal carrier is amplitude modulated by a symmetrical square wave of period 100 μ sec. Which of the following frequency will be present in the modulated signal?

- 980 kHz
- 1020 kHz
- 1030 kHz
- 1010 kHz

79 of 100

223 PU_2015_138

A super heterodyne receiver uses an IF frequency of 455 kHz. The receiver is tuned to a transmitter having a carrier frequency of 2400 kHz. High-side tuning is to be used. The image frequency will be:-

- 3310 kHz
- 1490 kHz
- 1845 kHz
- 2855 kHz

80 of 100

230 PU_2015_138

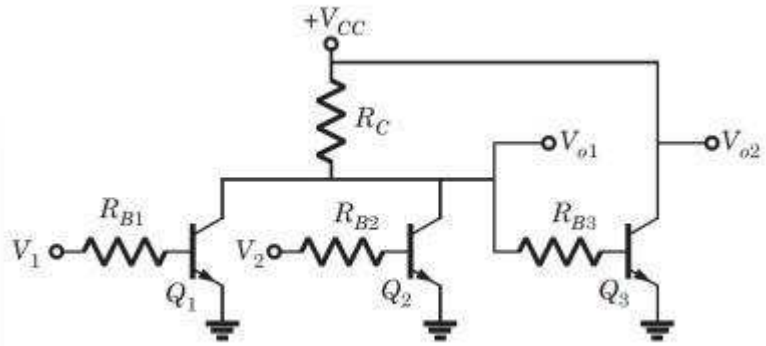
The block having transfer function $G_1(s)=\frac{1}{s+2}, G_2(s)=\frac{1}{s+5}, G_3(s)=\frac{s+1}{s+3}$ are cascaded. The equivalent transfer function is:-

- $\frac{(s^3+10s^2+37s+31)}{(s+2)(s+3)(s+5)}$
- $\frac{(s+1)}{(s+2)(s+3)(s+5)}$
- $\frac{-(s^3+10s^2+37s+31)}{(s+2)(s+3)(s+5)}$
- $\frac{-(s+1)}{(s+2)(s+3)(s+5)}$

81 of 100

281 PU_2015_138

Consider the RTL circuit shown in Figure. If V_{o2} is taken as output, then circuit is a:-

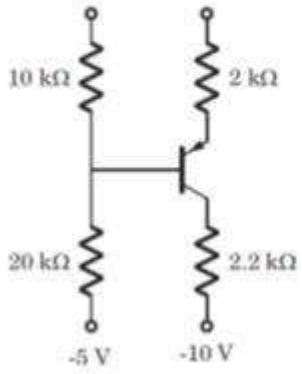


- NOR
- AND
- NAND
- OR

82 of 100

284 PU_2015_138

For the circuit shown in Figure, let $\beta = 60$. The value of V_{ECQ} is



- 5.69 V
- 3.73 V
- 4.94 V
- 2.68 V

83 of 100

262 PU_2015_138

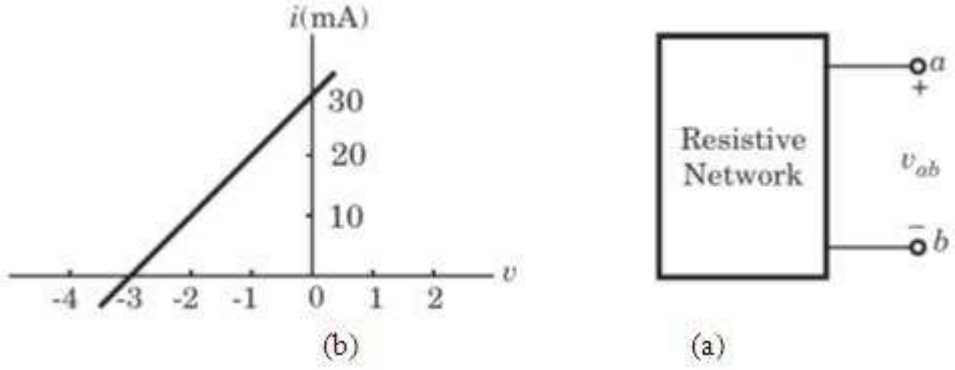
A diode detector has a load of 1 kΩ shunted by a 10000 pF capacitor. The diode has a forward resistance of 1Ω . The maximum permissible depth of modulation, so as to avoid diagonal clipping, with modulating signal frequency f_o 10 kHz will be:-

- 0.934
- 0.543
- 0.628
- 0.847

84 of 100

289 PU_2015_138

Measurement made on terminal *ab* of a circuit shown in Figure (a) yields the current-voltage characteristics shown in Figure (b). The Thevenin resistance is:-



- 100 Ω
- -300 Ω
- -100 Ω
- 300 Ω

85 of 100

280 PU_2015_138

The diffusion constant and mobility for electrons in a semiconductor material at a given temperature are 20cm^2/s and 1600 cm^{2}V-s respectively. The thermal voltage V_T for a diode made of this material at the same temperature is:-

- 32 mV
- 125 mV
- 12.5 mV
- 3.2 mV

86 of 100

263 PU_2015_138

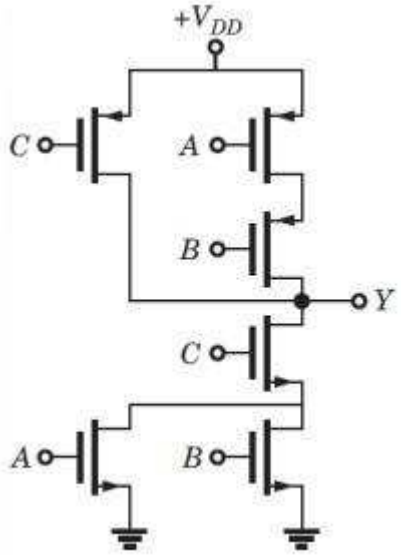
In a broadcast transmitter, the RF output is represented as $e(t) = 50\left[1+0.89\cos 5000t + 0.30\sin 9000t\right]\cos\left(6\times10^6 t\right)$ V What are the sidebands of the signals in radians?

- 4×10^{3} and 1.4×10^{4}
- 5.991×10^{6} ,5.995×10^{6} , 6.005×10^{6} and 6.009×10^{6}
- 1×10^{6} ,1.1×10^{7} , 3×10^{6} and 1.5×10^{7}
- 5×10^{3} and 9×10^{3}

87 of 100

282 PU_2015_138

Consider the CMOS circuit shown in Figure. The output Y is:-



- $\overline{(A+C)B}$
- $AB+\overline{C}$
- $AB+C$
- $\overline{(A+B)C}$

88 of 100

269 PU_2015_138

A direct sequence spread binary phase-shift keying system uses a feedback shift register of length 19 for the generation of PN sequence. The system is required to have an average probability of symbol error due to externally generated interfering signals that does not exceed 10^{-5}. The Anti-jam margin is:-

- 93.8 dB
- 47.5 dB
- 12.6 dB
- 86.9 dB

89 of 100

285 PU_2015_138

In a MOS capacitor with n-type silicon substrate, the Fermi potential ϕ_F = -0.1V and the flat band voltage V_{FB}=0 V. The value of threshold voltage V_T is:-

- 0.41 V
- 0.82 V
- -0.41 V
- -0.82 V

90 of 100

265 PU_2015_138

The American Standard Code for Information Interchange has 128 characters, which are binary coded. If a certain computer generates 1,000,000 character per second, the minimum bandwidth required to transmit this signal will be:-

- 0.7 M bits/sec
- 7 M bits/sec
- 1.4 M bits/sec
- 14 M bits/sec

91 of 100

266 PU_2015_138

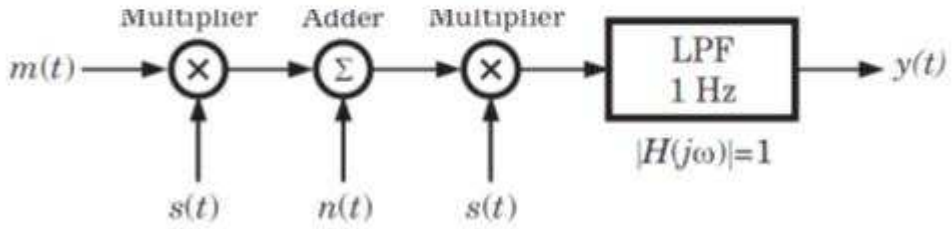
A PCM system uses a uniform quantizer followed by a 8-bit encoder. The bit rate of the system is equal to 108 bits/s. The maximum message bandwidth for which the system operates satisfactorily is:-

- 12.5 MHz
- 25 MHz
- 50 MHz
- 6.25 MHz

92 of 100

264 PU_2015_138

From the following Figure, find the output $y(t)$ for $m(t)=\frac{2\sin 2\pi t}{t}$, $s(t)=\cos 200\pi t$ and $n(t)=\frac{\sin 199\pi t}{t}$



- $\frac{\sin 2\pi t}{t}+\frac{\sin 0.5\pi t}{t}\cos 1.5\pi t$
- $\frac{\sin 2\pi t}{t}$
- $\frac{\sin 2\pi t}{t}+\frac{\sin \pi t}{t}\cos 0.75\pi t$
- $\frac{\sin 2\pi t}{t}+\frac{\sin \pi t}{t}\cos 3\pi t$

93 of 100

287 PU_2015_138

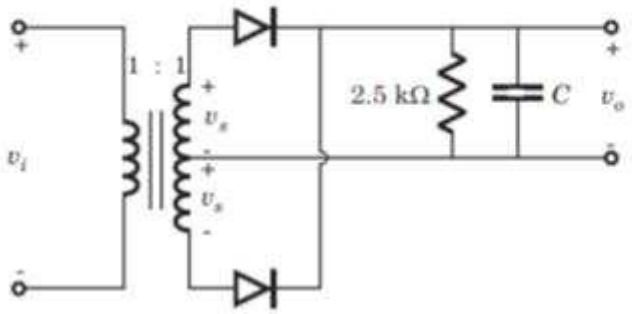
A rectangular waveguide is filled with a polyethylene $(\varepsilon_r = 2.25)$ and operates at 24 GHz. The cut off frequency of a certain mode is 16 GHz. The intrinsic impedance of this mode is:-

- 2248 Ω
- 632.2 Ω
- 421.4 Ω
- 337.2 Ω

94 of 100

283 PU_2015_138

The input to full-wave rectifier shown in Figure is $v_i = 120 \sin 2\pi 60t$ V. The diode cut in voltage is 0.7 V. If the output voltage cannot drop below 100 V, the required value of the capacitor is



- 20.6 μF
- 30.6 μF
- 41.2 μF
- 61.2 μF

95 of 100

261 PU_2015_138

A receiver is operated at a temperature of 300 K. The transistor used in the receiver has an average output resistance of 1 kΩ . The Johnson noise voltage for a receiver with a bandwidth of 200 kHz is:-

- 12.6 μV
- 4.3 μV
- 1.8 μV
- 0.8 μV

96 of 100

286 PU_2015_138

Consider a 150 m long air-filled hollow rectangular waveguide with cut off frequency 6.5 GHz. If a short pulse of 7.2 GHz is introduced into the input end of the guide, the time taken by the pulse to return the input end is:-

- 460 ns
- 430 ns
- 230 ns
- 920 ns

97 of 100

267 PU_2015_138

Twenty-four voice signals are sampled uniformly at a rate of 8 kHz and then time-division multiplexed. The sampling process uses flat-top samples with 1 μs duration. The multiplexing operating includes

provision for synchronization by adding and extra pulse of 1 μs duration. The spacing between successive pulses of the multiplexed signal is:-

- 7.2 μs
- 6 μs
- 8.4 μs
- 4 μs

98 of 100

288 PU_2015_138

Two identical rectangular waveguide are joined end to end where a =2b. One guide is air filled and other is filled with a lossless dielectric of ε_r . It is found that up to a certain frequency single mode operation can be simultaneously ensured in both guide. For this frequency range, the maximum allowable value of ε_r is:-

- 6
- 2
- 4
- 1

99 of 100

268 PU_2015_138

In a CD player, the sampling rate is 44.1 kHz and the samples are quantized using a 16-bit/sample quantizer. The resulting number of bits for a piece of music with a duration of 50 minutes is:-

- 12.23×10^9
- 1.39×10^9
- 4.23×10^9
- 8.46×10^9

100 of 100

260 PU_2015_138

White noise with power density $\frac{N_0}{2}$ is applied to a low pass network for which $|H(0)| = 2$. It has a noise bandwidth of 2 MHz. If the average output noise power is 0.1 W in a 1 Ω resistor, the value of N_0 is

- 25 nW/Hz
- 12.5 μW/Hz
- 12.5 nW/Hz
- 25 μW/Hz