

138 PU Ph.D Electronics & Communication Engineering

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157 PU_2016_138_E

Which of the following is non-saturating?

- a) TTL
- b) CMOS
- c) ECL
- d) both (a) and (b)

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203 PU_2016_138_E

The number of logic or arithmetic operations with ALU IC 74181 can carry out is:-

- 32
- 8
- 4
- 16

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101 PU_2016_138_E

A silicon (PN) junction at a temperature of 20°C has a reverse saturation current of 10 pico Ampere. The reverse saturation current at 40°C for the same bias is approximately:-

- 50pA
- 40pA
- 60pA
- 30pA

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154 PU_2016_138_E

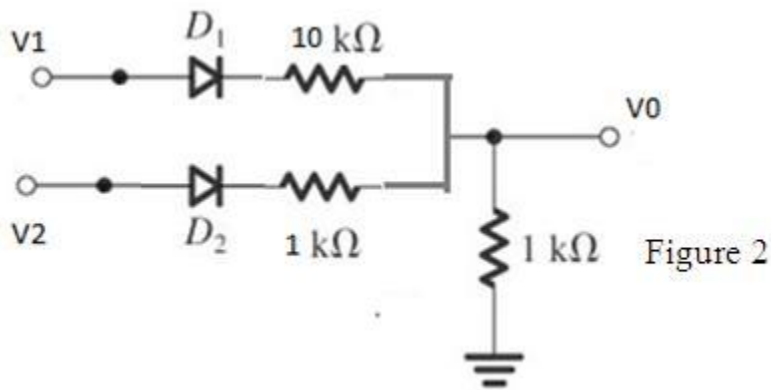
Two numbers in excess-3 code are added and the result is less than 8. To get equivalent binary:-

- 0111 is added
- 0011 is subtracted
- 0110 is subtracted
- 0011 is added

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143 PU_2016_138_E

In the circuit shown in Figure. 2, both diodes are ideal. If $V_1 = 10\text{ V}$ and $V_2 = 10\text{ V}$, which diode will conduct?



- D₂ only
- D₁ only
- Neither D₁ or D₂
- Both D₁ and D₂

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163 PU_2016_138_E

The resolution of a 12 bit D/A converter using a binary ladder with + 10 V as the full scale output will be:-

- 3.50 mV
- 2.44 mV
- 4.32 V
- 5.12 V

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158 PU_2016_138_E

For a Mod-64 synchronous counter, the number of flip flops and AND gates needed is:-

- 4 and 2 respectively
- 2 and 4 respectively
- 6 and 4 respectively
- 6 and 2 respectively

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131 PU_2016_138_E

Circular polarised waves result when:-

- Magnitudes are the same but phase difference is 90°
- Magnitudes are the same
- Phases are the same
- Magnitudes are the same but phase difference is zero

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175 PU_2016_138_E

The noise figure of individual stages of a two stage amplifier is 2.03 and 1.54 respectively. If gain of first stage is 62, the overall noise figure is:-

- 3.03
- 2.05
- 1.03
- 6.05

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180 PU_2016_138_E

An amplifier has an input resistance of 10 k Ω and the noise voltage is 10 μ V. If two such resistances of 10 k Ω each are connected in series at the input, the total noise voltage is about:-

- 10 μ V
- 11.12 μ V
- 14.14 μ V
- 20 μ V

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187 PU_2016_138_E

The number of PM radio channels which can be accommodated in a spectrum of 300 MHz is about:-

- 100
- 1500
- 10
- 500

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152 PU_2016_138_E

Current requirement of a peizo buffer is about:-

- 4 mA
- 2 mA
- 100 mA
- 20 mA

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192 PU_2016_138_E

Directive gain of elementary doublet is:-

- 10
- 1.5
- 0.5

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102 PU_2016_138_E

A rare gas has N atoms per m^3 . If electronic polarizability of single atom of this gas is α_e , then:-

- $\epsilon_0(\epsilon_r - 1) = N\alpha_e$
- $\epsilon_r = N\alpha_e$
- $\epsilon_0(\epsilon_r - 2) = N\alpha_e$
- $\epsilon_0\epsilon_r = N\alpha_e$

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103 PU_2016_138_E

A dielectric is subjected to alternating field. The dielectric losses are potential to:-

- Real part of dielectric constant
- Imaginary part of dielectric constant
- Either imaginary and real parts of dielectric constant
- Both imaginary and real parts of dielectric constant

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159 PU_2016_138_E

The following switching functions are to be implemented using a decoder

$$f_1 = \sum_m(1, 2, 4, 8, 10, 14)$$

$$f_2 = \sum_m(2, 5, 9, 15)$$

$$f_3 = \sum_m(2, 4, 5, 6, 7)$$

The minimum configuration of decoder is:-

- 4 to 16 line
- 2 to 4 line
- 5 to 32 line
- 3 to 8 line

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107 PU_2016_138_E

Two materials having temperature coefficients of 0.004 and 0.0004 respectively are joined in series. The overall temperature coefficient is likely to be:-

- 0.002
- 0.001
- 0.01
- 0.02

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130 PU_2016_138_E

A parallel polarised wave is incident from air into paraffin having relative permittivity 3, the value of its Brewster angle is:-

- 60°
- 30°
- 45°
- 150°

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167 PU_2016_138_E

In Bode diagrams an octave is a frequency band from:-

- ω_1 to $2\omega_1$
- ω_1 to $4\omega_1$
- ω_1 to $8\omega_1$
- ω_1 to $10\omega_1$

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105 PU_2016_138_E

The temperature at which some materials become superconductors is called:-

- Curie temperature
- Onnes temperature
- Neel temperature
- Transition temperature

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160 PU_2016_138_E

For a particular type of memory, the access time and cycle time are 200 ns each. The maximum rate at which data can be accessed by:-

- 2.5×10^6 /s
- 3.5×10^6 /s
- 5×10^6 /s
- 1.5×10^6 /s

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181 PU_2016_138_E

A sinusoidal voltage of 2 kV peak value is amplitude modulated to give 20% modulation. The peak value of each sideband term is:-

- 200 V
- 400 V
- 100 V
- 800 V

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104 PU_2016_138_E

A piece of copper and another piece of germanium are cooled from 30°C to 80 K. The resistance of:-

- Copper increases and germanium decreases
- Both increases
- Both decreases
- Copper decreases and germanium increases

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149 PU_2016_138_E

A 12 kHz pulse waveform is amplified by a circuit having an upper cut-off frequency of 1 MHz. The minimum input pulse width that can be accurately reproduced is:-

- 1 μ s
- 8.33 ms
- 1.8 μ s
- 83.33 μ s

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133 PU_2016_138_E

A circular waveguide carries TE_{11} mode whose radial electric field is given by $E_r = E_0 J_1(r) \sin \Phi$ V/m; where 'r' is the radial distance in cm, from the waveguide axis. The cut-off wavelength of the mode is:-

- 10 cm
- 3π cm
- 2π cm
- 8 cm

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183 PU_2016_138_E

The number of bits of information required to indicate the correct selection of 3 independent consecutive events out of 75 equal probable events is:-

- 24.92
- 18.69
- 10.46
- 6.23

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118 PU_2016_138_E

In monolithic IC's, all the components are fabricated by:-

- Etching
- Oxidation

- Diffusion process
- Evaporation

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208 PU_2016_138_E

A voltage wave $v = 10 + 20 \sin \omega t + 7.5 \sin 3\omega t$ is applied to a series combination of two elements. The current is $i = 5 \sin(\omega t + 20^\circ) + 1.5 \sin(3\omega t + 10^\circ)$. The elements are:-

- R and L
- Both inductances
- R and C
- L and C

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213 PU_2016_138_E

Which of the following is a static system?

- $y(t) = \frac{d}{dt} x(2t)$
- $y(t) = \frac{d}{dt} x(t)$
- $y(t) = x(t-1)$
- $y(t) = e^{x(t)}$

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127 PU_2016_138_E

Figure 1. Shows a pole zero plot of $I(s)$. The likely current response in time domain is:-

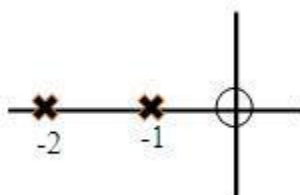


Figure 1

- $i(t) = e^{-1} - 2e^{-3t}$
- $i(t) = e^{-1} - 3e^{-3t}$
- $i(t) = e^{-1} - 2e^{-4t}$
- $i(t) = e^{-1} - 2e^{-2t}$

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198 PU_2016_138_E

Presently, the world's largest and most advanced multi-purpose communication satellite is:-

- INSAT-ID

- INSAT-2
- Intelsat-V
- Olympus-I

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171 PU_2016_138_E

For a good public address system, the sound intensity at the farthest point should be at least:-

- 20 dB over threshold of hearing
- 120 dB over threshold of hearing
- 80 dB over threshold of hearing
- 40 dB over threshold of hearing

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164 PU_2016_138_E

In a 5 x 7 dot matrix format, to store 64 alphanumeric characters we require:-

- 1120 bits
- 2240 bits
- 512 bits
- 4480 bits

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135 PU_2016_138_E

A rectangular waveguide (2.29 x 1.02) cm operates at a frequency of 11 GHz in TE₁₀ mode. If the maximum potential gradient of the signal is 5 kV/cm, then the maximum power handling capacity of the waveguide will be:-

- 61.11 mW
- 23.11 W
- 31.11 kW
- 61.11 W

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209 PU_2016_138_E

$$H(z) = \frac{1 + z^{-1}}{1 - \frac{5}{6}z^{-1} + \frac{1}{6}z^{-2}}$$

If the poles of H(z) are at:-

- $z = \frac{-1}{2}$ and $z = \frac{-1}{3}$

$z = -1$ and $z = -3$

$z = 1$ and $z = 3$

$z = \frac{1}{2}$ and $z = \frac{1}{3}$

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156 PU_2016_138_E

Four inputs A, B, C, D are fed to a NOR gate. The output of NOR gate is fed to an inverter. The output of inverter is:-

$\overline{A+B+C+D}$

$ABCD$

$A+B+C+D$

\overline{ABCD}

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140 PU_2016_138_E

The carrier mobility of a semiconductor is $0.4\text{m}^2/\text{Vs}$. Its diffusion constant at 300K will be m^2/s :-

0.53

0.16

0.01

0.04

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146 PU_2016_138_E

A transistor has a power rating of 8 W for a case temperature of 25°C . If derating factor is $30\text{mW}/^\circ\text{C}$, the power rating for 55°C case temperature is:-

6.8 W

8 W

7.5 W

7.1 W

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An 8 bit transistor register has output voltage of low-high-low-high-low-high-low-high. The decimal number stored is:-

75

85

95

105

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120 PU_2016_138_E

A wire has a resistance of R ohm. If another wire of the same material and same weight has double the diameter (as compared to the first wire), the resistance of the second wire will be:-

- 0.125 R
- $R / 16$
- $R / 2$
- 0.25 R

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165 PU_2016_138_E

A thermometer requires 1 minute to indicate the 98% of its final response to a step input. If it is a first order system, the time constant is:-

- 1 minute
- 1.5 minute
- 0.5 minute
- 0.25 minute

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116 PU_2016_138_E

If the energy gap of a semiconductor is 1.1 eV, then it would be:-

- Transparent to ultraviolet radiation
- Transparent to visible light
- Transparent to infrared radiation
- Opaque to visible light

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185 PU_2016_138_E

The probability of error in DPSK is less than PSK:-

- Equal
- Depend upon noise
- False
- True

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162 PU_2016_138_E

The access time of a word in 4 MB main memory is 100 ms. The access time of a word in a 32 kB data cache memory is 10 ns. The average data cache hit ratio is 0.95. The efficiency of memory access time is:-

- 9.5 ns

- 95 ns
- 14.5 ns
- 20 ns

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121 PU_2016_138_E

A circuit is replaced by its Thevenin's equivalent to find current through a certain branch. If $V_{TH} = 10\text{ V}$ and $R_{TH} = 20\ \Omega$, then the current through the branch:-

- will always be 0.5 A
- will always be equal to or less than 0.5 A
- may be less than 0.5 A
- may be 0.5 A or more or less

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174 PU_2016_138_E

The dc voltage on plate modulated class C amplifier is 8 kV. If the peak modulating voltage is 4 kV, the peak RF voltage delivered to load is:-

- 12 kV
- 32 kV
- 24 kV
- 0.5 kV

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194 PU_2016_138_E

Assuming earth to be a sphere of radius 6400 km and height of a geosynchronous satellite above earth as 36,000 km, the velocity of geosynchronous satellite in km/hr is:-

- 11,000
- 15,000
- 28,000
- 36,000

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177 PU_2016_138_E

In a 50 cm TV tube, a path difference of 2 km between direct wave and interfering wave would denote a displacement between main image and ghost image equal to:-

- 0.3 cm
- 0.6 cm
- 0.9 cm
- 6 cm

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111 PU_2016_138_E

The turn off time of a bipolar transistor is about:-

- 0.5 ns
- 10 ns
- 70 ns
- 150 ns

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178 PU_2016_138_E

A horizontal output stage is cutoff for retrace and 40% of trace. If time for each horizontal line is 64 μ s and retrace time is 12 s, the transistor is conducting for about:-

- 31 μ s
- 4.4 μ s
- 3.1 μ s
- 44 μ s

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161 PU_2016_138_E

A dynamic RAM cell which holds 5 V has to be refreshed every 20 ms so that the stored voltage does not fall by more than 0.5 V. If the cell has a constant discharge current of 0.1 pA, the storage capacitance of cell is:-

- 4×10^{-15} F
- 8×10^{-9} F
- 16×10^{-6} F
- 2×10^{-12} F

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169 PU_2016_138_E

$$G(s) = \frac{1}{s+1} \text{ and } H(s) = \frac{K}{s(s+2)}$$

A negative feedback system has stable for:- . The closed loop system is

- $8 \leq K \leq 14$
- $K < 6$
- $K > 20$
- $15 < K < 19$

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100 PU_2016_138_E

The two conductors of a transmission line carry equal current I in opposite direction. The force on each conductor is proportional to:-

- 1
- l^3
- l^2
- distance between the lines

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168 PU_2016_138_E

$$G(s)H(s) = \frac{K(s+10)}{s(s+8)(s+16)(s+72)}$$

In , the closed loop pole will be located at $s = -12$, when K equals to:-

- 5760
- 4355
- 9600
- 9862

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122 PU_2016_138_E

In an R-C circuit, the impedance is 40Ω at a frequency of 100 Hz. At 200 Hz, the impedance should be:-

- More than 20Ω but less than 40Ω
- 80Ω
- More than 40Ω but less than 80Ω
- 40Ω

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166 PU_2016_138_E

The transfer function $G_c = 5 \left(\frac{s+2.9}{s+5.4} \right)$ Can be for:-

- a) Lead compensator
- b) Lag compensator
- c) Either (a) or (b)
- d) Neither (a) or (b)

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219 PU_2016_138_E

A low-pass signal having a bandwidth of 3500Hz is sampled such that a guard band is available for ease in filtering. The sampling frequency used is 7500Hz. The guard bandwidth is:-

- 200Hz
- 500Hz

- 2000Hz
- 4000Hz

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217 PU_2016_138_E

The depth of penetration at 4 MHz is 10 cm, then at 2.5 MHz it is:-

- 13 cm
- 15.5 cm
- 6.25 cm
- 12 cm

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200 PU_2016_138_E

A balun transformer gives an impedance transformation of:-

- 4:1
- 1:2
- 1:4
- 2:1

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125 PU_2016_138_E

If a two port network is represented by an equivalent T network, the admittance of series arm in terms of ABCD parameter is equal to:-

- C
- $1 / B$
- $1 / C$
- $(A - 1) / B$

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244 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. Power drain of CMOS increases with operating frequency

R. All unused CMOS inputs should be tied either to a fixed voltage level (0 or V_{DD}) or to another input

- A is correct and R is wrong
- Both A and R are correct but R is not correct explanation for A
- A is wrong and R is correct
- Both A and R are correct and R is correct explanation for A

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227 PU_2016_138_M

Evaluate $\int_c \frac{\cos \pi z}{z^2 - 2z - 3} dz$ where c is $|z| = \frac{5}{2}$.

- $\frac{2i}{\pi}$
- πi
- $2\pi i$
- $\frac{\pi i}{2}$

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221 PU_2016_138_M

Find the values of k_1 and k_2 for which the non-homogeneous linear system, $3x-2y+z=k_2$; $5x-8y+9z=3$; $2x+y+k_1z=-1$ has a unique solution.

- $k_1 \neq -3$ and $k_2 = 5$
- $k_1 \neq -3$ and k_2 is any real number
- $k_1 = -3$ and k_2 is any real number
- $k_1 = -3$ and $k_2 = 5$

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246 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. If points at infinity are included, $G(s)$ has same number of poles and zeros

$$\frac{K(s+2)}{(s+5)^2}$$

R. The function as a zero at $s=-2$:

- Both A and R are correct and R is correct explanation for A
- Both A and R are correct but R is not correct explanation for A
- A is correct and R is wrong
- A is wrong and R is correct

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250 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. In FM all power amplifiers can be operated in class C

R. FM is a constant amplitude modulation system.

- Both A and R are correct and R is correct explanation for A

- A is correct and R is wrong
- Both A and R are correct but R is not correct explanation for A
- A is wrong and R is correct

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248 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. In an automobile, the amount of fuel admitted to the engine is adjusted as per the difference between desired and actual speed.

R. The control signal is the amount of fuel to be admitted to the engine

- Both A and R are correct but R is not correct explanation for A
- A is correct and R is wrong
- A is wrong and R is correct
- Both A and R are correct and R is correct explanation for A

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245 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. In hybrid digital circuits the problem of logic race can occur

R. In two level logic there is no problem of logic race

- A is wrong and R is correct
- Both A and R are correct and R is correct explanation for A
- Both A and R are correct but R is not correct explanation for A
- A is correct and R is wrong

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254 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. McMurray Bredford half bridge inverter uses complementary commutation

R. Three phase inverter can have two modes of operation

- A is correct and R is wrong
- Both A and R are correct and R is correct explanation for A
- Both A and R are correct but R is not correct explanation for A
- A is wrong and R is correct

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255 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

- A. The gate current of an SCR is always in the form of pulses.
R. The gate losses, in pulse triggering are low.

- Both A and R are correct but R is not correct explanation for A
 A is correct and R is wrong
 Both A and R are correct and R is correct explanation for A
 A is wrong and R is correct

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233 PU_2016_138_M

The value of $L^{-1}\left\{\frac{1}{\sqrt{s}(s-2)}\right\}$ is:-

- $e^t \operatorname{erf}(\sqrt{t})$
 $e^{2t} \operatorname{erf}(\sqrt{2t})$
 $e^{-2t} \operatorname{erf}(\sqrt{2t})$
 $\frac{e^{2t}}{\sqrt{2}} \operatorname{erf}(\sqrt{2t})$

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238 PU_2016_138_M

If the closed loop transfer function of a control system is given by $T(s) = \frac{s-5}{(s+2)(s+3)}$, then it is:-

- an unstable system
 a minimum phase system
 a non-minimum phase system
 an uncontrollable system

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236 PU_2016_138_M

Consider the following systems

$$y_1(t) = x(t + 4)$$

$$y_2(t) = \int_{-\infty}^t x(dT)$$

$$y_3(t) = 2 \frac{d}{dt} x(t)$$

The non-invertible system is

- $y_1(t)$ and $y_3(t)$
- Only $y_3(t)$
- $y_1(t)$ and $y_2(t)$
- All the above

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235 PU_2016_138_M

If V_b , Q and V_t represent branch voltage matrix, cut-set matrix and the twig voltage matrix, then the relationship between them is given by:-

- $V_b = Q^T V_t^T$
- $V_b = Q V_t^T$
- $V_b = Q V_t$
- $V_b = Q^T V_t$

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241 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. Sine wave with slew rate distortion looks rectangular

R. The maximum rate of output voltage change is called slew rate

- Both A and R are correct but R is not correct explanation for A
- A is wrong and R is correct
- A is correct and R is wrong
- Both A and R are correct and R is correct explanation for A

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251 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. Water waves are longitudinal but EM waves are transverse

R. In an EM wave electric field, magnetic field and propagation are mutually perpendicular.

- Both A and R are correct but R is not correct explanation for A
- Both A and R are correct and R is correct explanation for A
- A is wrong and R is correct
- A is correct and R is wrong

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229 PU_2016_138_M

At the Wimbledon, the probability that Federer qualifies for the final is 0.7, and the probability that Nadal qualifies for the semi-final is 0.5. The probability that Federer qualifies for the final or Nadal qualifies for the semi-final is 0.8. Given that Nadal qualifies for the semi-final, find the probability that Federer qualifies for the final.

- 0.8
- 0.9
- 0.6
- 0.2

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223 PU_2016_138_M

If $u = \left(\frac{\sqrt[4]{x} + \sqrt[4]{y}}{\sqrt[6]{x} + \sqrt[6]{y}} \right)^6$, $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$

- 4u
- $\frac{4}{u}$
- 6u
- $\frac{u}{2}$

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226 PU_2016_138_M

The partial differential equation of $z = f(x+at) - g(x-at)$ is:-

- $\frac{\partial z}{\partial t} = a \frac{\partial z}{\partial x}$
- $\frac{\partial^2 z}{\partial t^2} = \frac{\partial^2 z}{\partial x^2}$

$\frac{\partial^2 z}{\partial t^2} = \alpha^2 \frac{\partial^2 z}{\partial x^2}$

$\frac{\partial^2 z}{\partial t^2} + \frac{\partial^2 z}{\partial x^2} = 0$

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230 PU_2016_138_M

If the mean of 100 observation is 50 and their standard deviation is 4, then the sum of the squares of the observations is:-

- 261500
- 216600
- 216500
- 251600

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257 PU_2016_138_M

The following questions have two statements A (Assertion) and R (Reason). Read them and give correct answer as per following code

A. In a parallel circuit with three branches having R, L and C respectively and fed by a step current I, the current through inductance is always zero

R. The time constant of R-L circuit is L/R

- Both A and R are correct but R is not correct explanation for A
- A is correct and R is wrong
- Both A and R are correct and R is correct explanation for A
- A is wrong and R is correct

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293 PU_2016_138_D

An ideal power limited communication channel with additive white Gaussian noise with 1MHz bandwidth and signal to noise ratio of 15 is transmitting the information at theoretical maximum rate. If the Signal to Noise ratio is reduced to 7, how much bandwidth is required to maintain same rate:-

- 5 MHz
- 4/3 MHz
- 15/7 MHz
- 2 MHz

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260 PU_2016_138_D

The value of v_1 in Figure 3 is equal to

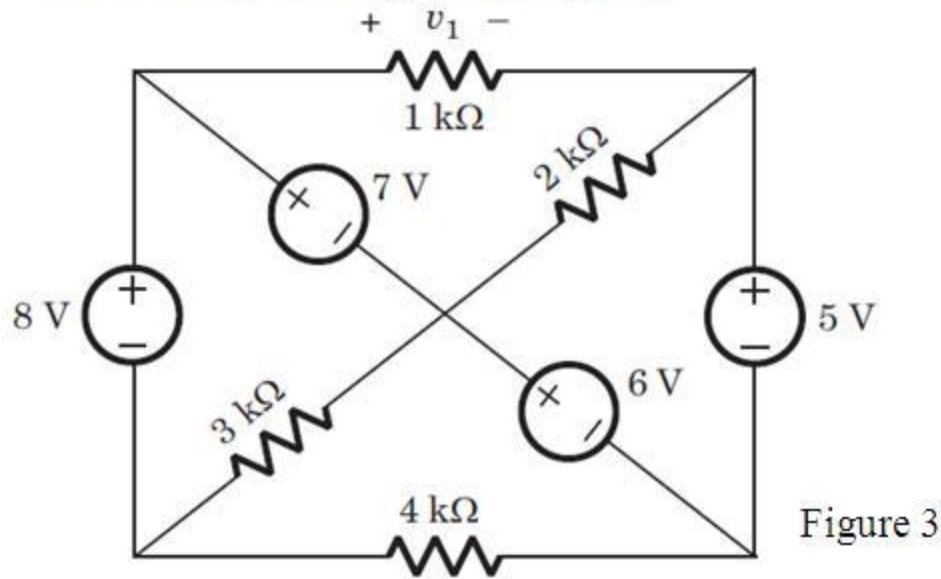


Figure 3

- 11 V
- 5 V
- 18 V
- 8 V

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279 PU_2016_138_D

For the circuit shown in Figure 17, find V_B and V_E for $v_1 = +2$ V. The BJT's have $\beta = 100$.

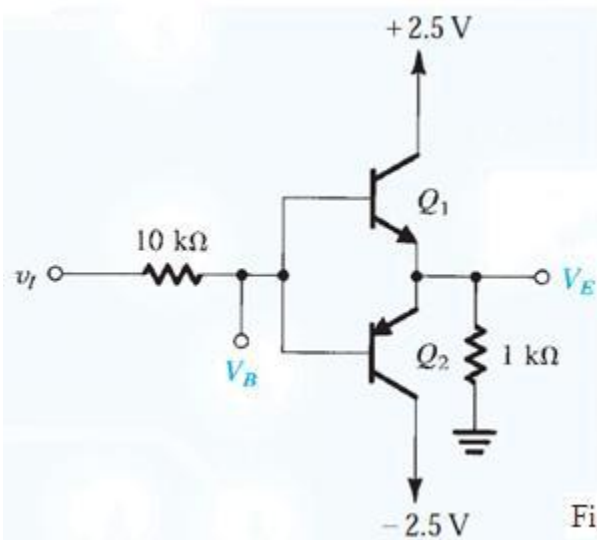


Figure 17

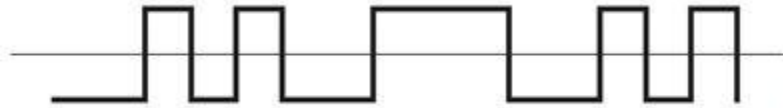
- 1.88 V, 1.18 V
- 1.68 V, 1.08 V

- 1.78 V, 1.48 V
- 1.68 V, 1.58 V

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289 PU_2016_138_D

Figure 24 shows a PCM signal in which amplitude level of + 1 volt and - 1 volt are used to represent binary symbol 1 and 0 respectively. The code word used consists of three bits. The sampled version of analog signal from which this PCM signal is derived is:-



- 8 4 3 1 2
- 4 5 1 2 3
- 6 4 3 1 7
- 1 2 3 4 5

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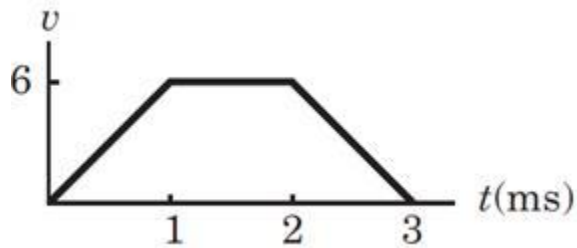
A 1.0 kHz signal is flat-top sampled at the rate of 180 samples/sec and the samples are applied to an ideal rectangular LPF with cut-off frequency of 1100 Hz, then the output of the filter contains:-

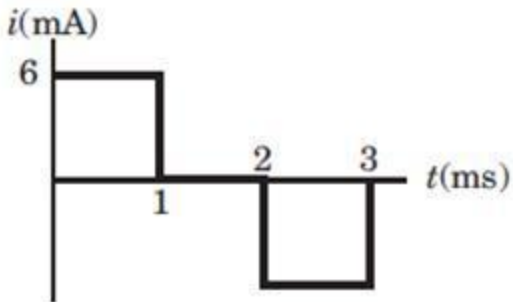
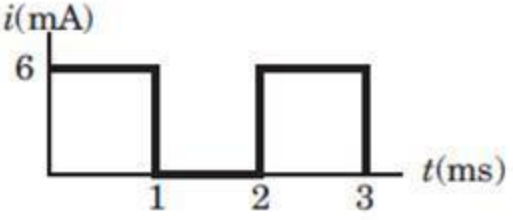
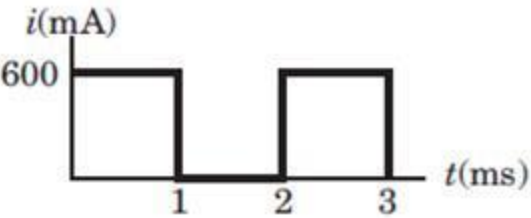
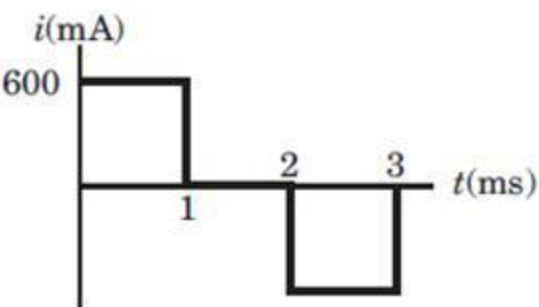
- 800 Hz, 900 and 1000 Hz components
- 800 and 900 Hz components
- 800 Hz and 1000 Hz components
- only 800 Hz component

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The voltage across a 100 μF capacitor is shown in Figure 4. The waveform for the current in the capacitor is represented as:-



- 
- 
- 
- 

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The sample function of a Gaussian process of zero mean and unit variance is uniformly sampled and then applied to a uniform quantizer having the input-output amplitude characteristic shown in Figure 26. Calculate the entropy of the quantizer output.

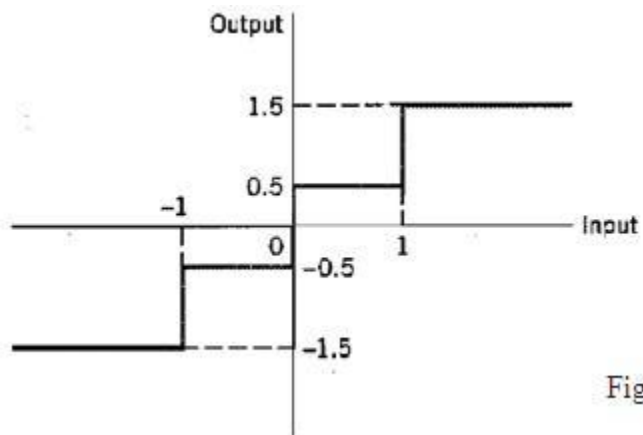


Figure 26

- 2.51 bits
- 1.91 bits
- 2.48 bits
- 1.58 bits

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The amplifier network shown in Figure 10 is stable if:-

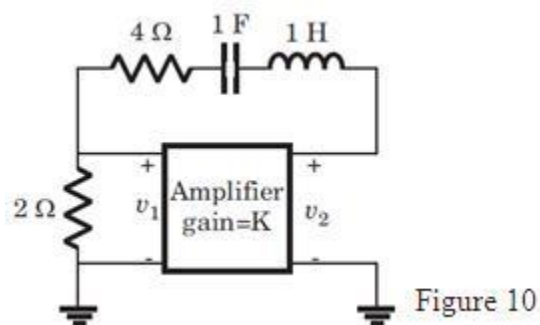


Figure 10

- $K \geq \frac{1}{3}$
- $K \leq 3$
- $K \geq 3$
- $K \leq \frac{1}{3}$

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For a class-A Power Amplifier, supply DC voltage is $\pm 12V$, the quiescent collector current is 72 mA and the load resistance is 100 ohms. If the output voltage across the load is 12V (p-p), the efficiency of the amplifier is (neglect the loss occurring the biasing resistors).

- 23.7%

- 33%
- 20.8%
- 25%

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An NMOS transistor with $k_n = 1 \text{ mA/V}^2$ and $V_t = 1 \text{ V}$ is operated with $V_{GS} = 2.5 \text{ V}$. What value of I_D is obtained in saturation?

- 1.75 mA
- 1.125 mA
- 2.5 mA
- 1.5 mA

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A signal has a bandwidth of 1 MHz. It is sampled at a rate 50% higher than the Nyquist rate and quantized into 256 level using a μ -law quantizer with $\mu = 225$. It was found that a sampling rate 20% above the rate would be adequate. So the maximum SNR, that 184. can be realized without increasing the transmission bandwidth, would be:-

- 70.3 dB
- 80.2 dB
- 50.1 dB
- 60.4 dB

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Branch current and loop current relation are expressed in matrix form as:-

$$\begin{bmatrix} i_1 \\ i_2 \\ i_3 \\ i_4 \\ i_5 \\ i_6 \\ i_7 \\ i_8 \end{bmatrix} = \begin{bmatrix} 0 & 1 & -1 & 0 \\ 0 & 0 & -1 & 1 \\ 1 & 0 & 0 & -1 \\ -1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix}$$

where i_j represent branch current and I_k loop current. The number of independent node equation is:-

- 7
- 4
- 6
- 5

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In the circuit of Figure 6 when $R = 0 \Omega$, the current $i_R = 10 \text{ A}$. The maximum power will be:-

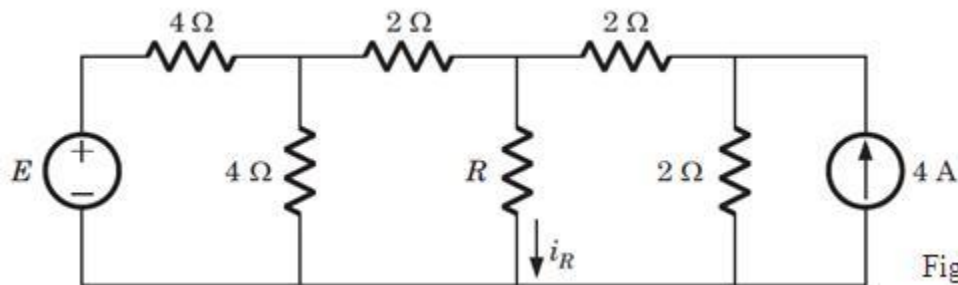


Figure 6

- 50 W
- 150 W
- 200 W
- 100 W

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Figure 27 shows the block diagram of a wideband frequency modulator using the indirect method. This modulator is used to transmit audio signals containing frequencies in the range of 100 Hz to 15 kHz. The narrowband phase modulator is supplied with a carrier of frequency $f_1 = 0.1 \text{ MHz}$ by a crystal controlled oscillator. A second crystal controlled oscillator supplies a sinusoidal wave of frequency of 9.5 MHz to the mixer. If the carrier frequency at the transmitter output, $f_c = 100 \text{ MHz}$, minimum frequency deviation $\Delta f = 75 \text{ kHz}$ and maximum modulation index in the phase modulator is equal to 0.3 radians, the frequency multiplication ratio n_1 and n_2 is given by:-

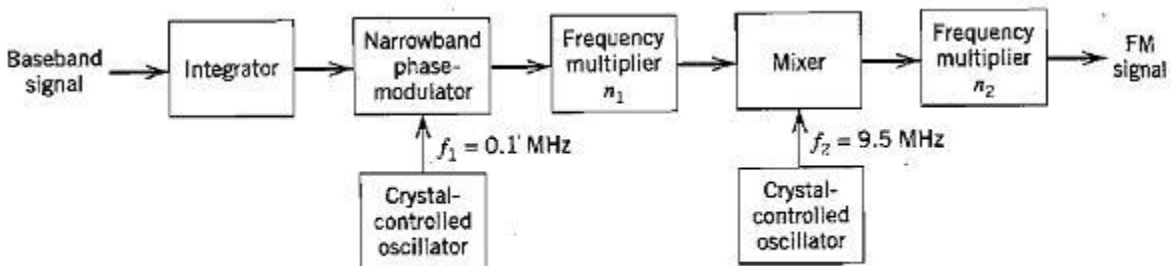


Figure 27

- 70 and 25
- 25 and 60

- 25 and 65
- 75 and 50

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Consider a rate 1/2, constraint length 7 convolutional code with free distance $d_{\text{free}} = 10$. The asymptotic coding gain for binary symmetric channel and binary input AWGN channel are:-

- 4 dB and 7 dB respectively
- 5 dB and 2 dB respectively
- 3 dB and 2 dB respectively
- 3 dB and 6 dB respectively

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For the circuit shown in Figure 14, find the labeled node voltage V_1 for $k'_n(W/L)=0.5\text{mA/V}^2$, $V_t=0.8\text{V}$ and $\lambda=0$.

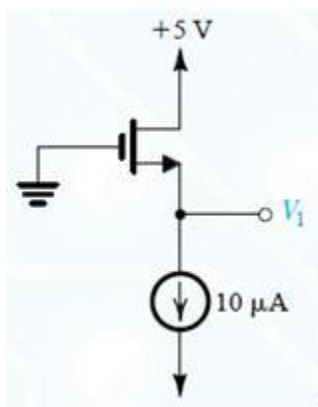


Figure 14

- 5 V
- +5 V
- 4.5 V
- 1 V

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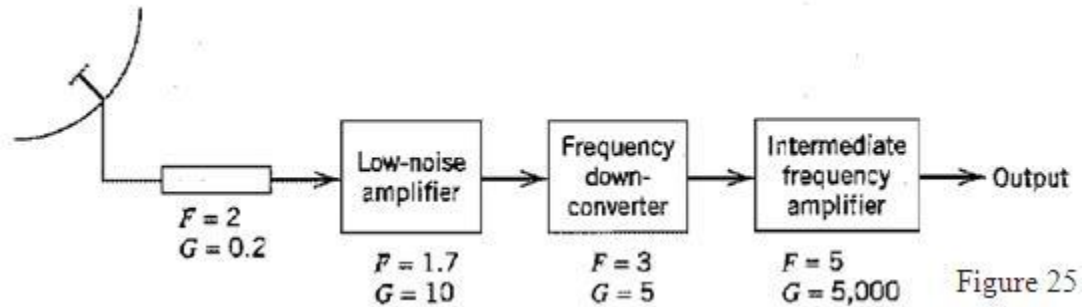
If z-transform is given by $X(z)=\cos(z^{-3}), |z|>0$ The value of $x[12]$ is:-

- $-\frac{1}{24}$
- $\frac{1}{6}$
- $\frac{1}{24}$
- $-\frac{1}{6}$

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Consider the receiver shown in Figure 25, which consists of a lossy waveguide, low-noise RF amplifier, frequency down-converter (mixer) and an IF amplifier. The figure includes the noise figures and power gains of these four components. The antenna temperature is 50 K. Assuming a room noise temperature of $T = 290$ K, calculate the effective noise temperature of the whole receiver.



- 526.2 K
- 426.4 K
- 626.6 K
- 500.2 K

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Consider the design of an IF amplifier for an FM radio receiver. Using two synchronously tuned stages with $f_0 = 10.7$ MHz and $3\text{-}\mu\text{H}$ inductors, find the 3-dB bandwidth of each stage so that the overall bandwidth is 200 kHz.

- 310.8 kHz
- 200 kHz
- 210.5 kHz
- 110.5 kHz

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A continuous wave beacon transmitter is located on a satellite in geostationary orbit. The beacon's 12 GHz output is monitored by an earth station positioned 40,000 km from the satellite. The satellite transmitting antenna is a 1 m dish with an aperture efficiency of 70 %, and the earth station receiving antenna is a 10 m dish with an aperture efficiency of 55 %. Calculate the received power given that the beacon's output power is 100 mW.

- 90 dBW
- 125 dBW
- 110 dBW
- + 90 dBW