4. For a phase-modulated signal, Carson's rule still applies, but the maximum frequency deviation is

$$\begin{aligned}\Delta\omega &= ak_p\omega_{\text{mod}} = \Delta\theta\omega_{\text{mod}}\\ &= (1\text{ V})\left(0.3\ \frac{\text{rad}}{\text{V}}\right)(75\times10^3\text{ Hz})\\ &= 22{,}500\text{ Hz}\end{aligned}$$

Substitute into Carson's rule.

$$\begin{aligned}\text{BW} &\approx 2(\Delta\omega+\omega_{\text{mod}})\\ &= 2(\Delta\theta\omega_{\text{mod}}+\omega_{\text{mod}})\\ &= (2)(22.5\times10^3\text{ Hz}+75\times10^3\text{ Hz})\\ &= \boxed{195\times10^3\text{ Hz}\quad(200\text{ kHz})}\end{aligned}$$

The answer is (D).

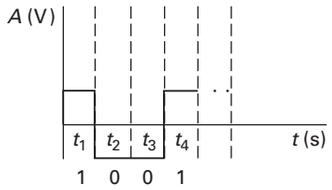
5. The number of mapping locations, M, for binary digits, n, is

$$M = 2^n = (2)^4 = 16$$

There are 16 potential modulations of the carrier.

The answer is (D).

6.



Assuming that the signal starts at zero, the first interval represents a change and equals a logic 1.

A change occurs in the consecutive ~~signals from bit~~ interval t_1 to t_2, and therefore the second interval ~~equals logic 1~~.

changes to logic 0.

remains

No change occurs from t_2 to t_3, so t_3 ~~is~~ logic 0.

A change occurs from t_3 to t_4, so t_4 ~~is~~ logic 1. The net result is a signal of 1001.

changes to

The answer is (C).

7. Inverting an NRZ-M signal does not change the transitions from one bit interval to the next. The logic circuitry is able to detect the same signal, 1101.

The answer is (D).

8. The bandwidth efficiency (noting that $D=1$) is defined as

$$\begin{aligned}\eta_{\text{BW}} &= \frac{R_s}{\text{BW}} = \frac{\frac{\log_2 M}{T}}{\frac{D}{2T}} = \frac{2\log_2 M}{D}\\ &= 2\log_2 4\\ &= \boxed{4}\end{aligned}$$

The answer is (C).

9. The bandwidth efficiency is

$$\eta_{\text{BW}} = \frac{R_s}{\text{BW}}$$

Solving for the signal rate and substituting the given values and the calculated efficiency from Prob. 8 gives

$$\begin{aligned}R_s &= \eta_{\text{BW}}(\text{BW})\\ &= (4)(10\text{ kHz})\\ &= \boxed{40\text{ kHz}\quad(40\text{ kbps})}\end{aligned}$$

The answer is (C).

10. The Nyquist criterion is specifically designed to achieve zero intersymbol interference.

The answer is (A).

11. The probability of error for a PAM scheme is

$$\mathcal{P}(e) = \left(1-\frac{1}{M}\right)\text{erfc}\sqrt{\left(\frac{3\log_2 M}{M^2-1}\right)\left(\frac{E_b}{N_0}\right)}$$

The number of bits in a symbol for an M-ary modulation scheme is

$$\text{bits} = \log_2 M = \log_2 4 = 2$$

The symbols are 00, 01, 10, and 11 in a 4-ary scheme with 2 bits per symbol.

Substituting $M=4$ and $E_b/N_0=1$ gives

$$\begin{aligned}\mathcal{P}(e) &= \left(1-\frac{1}{4}\right)\text{erfc}\sqrt{\left(\frac{3\log_2 4}{(4)^2-1}\right)(1)}\\ &= (0.75)\text{erfc}(0.63)\end{aligned}$$

Communications

problem 6 in chapter 34

Return to Questions (/admin/questions/0?sfield=magento_id&stext=0000165367&sdka=&stype=&sdiff=)

Test Bank Question preview

Question

The frequency where an optical band begins in an optical isolator is approximately 3×10^{14} Hz. The wavelength this frequency correlates to is most nearly

Answers

(A) ~~9~~ μm

Replace with: 1

(B) 10 μm

(C) 90 μm

(D) 100 μm

The answer is ~~(D).~~

Replace with: (A).

Solution

The frequency and wavelength are related by

$$\begin{aligned}\lambda &= \frac{c}{f} \\ &= \frac{3.00 \times 10^8 \ \frac{\text{m}}{\text{s}}}{3 \times 10^{14} \ \text{Hz}} \\ &= 1 \times 10^{-6} \ \text{m} \quad (\sout{100} \ \mu\text{m})\end{aligned}$$

Replace with: 1

QUESTION DATA

Vendor
0000165367

Solving Time

Difficulty
easy

Quantitative?
No

Status
Active

Created On
04/19/2019 03:08:32 PM

Published On
04/19/2019 03:08:32 PM

Modified On
02/24/2020 05:54:44 PM

OTHER VERSIONS

DISCIPLINES

KNOWLEDGE AREAS

PRODUCTS USED IN

problem 34 in chapter 56

Return to Questions (/admin/questions/0?sfield=magento_id&stext=59971&sdka=&stype=&sdiff=)

Test Bank

Question preview

Question

Two alternative piping schemes are being considered by a water treatment facility. Head and horsepower are reflected in the hourly cost of operation. On the basis of a 10-year life and an interest rate of 12%, what is most nearly the number of hours of operation for which the two installations will be equivalent?

	alternative A	alternative B
pipe diameter	4 in	6 in
head loss for required flow	48 ft	26 ft
size motor required	20 hp	7 hp
energy cost per hour of operation	$0.30	$0.10
cost of motor installed	$3600	$2800
cost of pipes and fittings	$3050	$5010
salvage value at end of 10 years	$200	$280

Answers

(A) 1000 hr

(B) 3000 hr

(C) 5000 hr

(D) 6000 hr

The answer is (A).

Solution

Since the head and horsepower data are already reflected in the hourly operating costs, there is no need to work with head and horsepower.

Let N = no. of hours operated each year.

QUESTION DATA

Vendor
0000059971
Solving Time

Difficulty
easy
Quantitative?
No
Status
Active
Created On
02/13/2018 05:18:40 PM
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02/13/2018 05:18:40 PM
Modified On
02/24/2020 05:55:02 PM
OTHER VERSIONS
DISCIPLINES
KNOWLEDGE AREAS
PRODUCTS USED IN

$$\begin{aligned}
\text{EUAC(A)} &= (\$3600 + \$3050)\,(A/P, 12\%, 10) \\
&\quad - (\$200)\,(A/F, 12\%, 10) + 0.30N \\
&= (\$6650)\,(0.1770) - (\$200)\,(0.0570) + 0.30N \\
&= 1165.65 + 0.30N \\
\text{~~EUAC(B)~~} &= \text{~~(\$2800 + \$5010) (A/P, 12\%, 10)~~} \\
&\quad \text{~~+ (\$280) (A/F, 12\%, 10) + 0.10N~~} \\
&= (\$7810)\,(0.1770) - (\$280)\,(0.0570) + 0.10N \\
&= 1366.41 + 0.10N
\end{aligned}$$

Replace with insert below or here: 0000059971_ELPP2_274_Insert 1.doc

$$\begin{aligned}
\text{EUAC(A)} &= \text{EUAC(B)} \\
1165.65 + 0.30N &= 1366.41 + 0.10N \\
N &= \boxed{1003.8 \text{ hr} \quad (1000 \text{ hr})}
\end{aligned}$$

0000059971

Replace part of solution with:

$$EUAC\left(B\right) = (\$2800 + \$5010)(A/P,12\%,10) - (\$280)(A/F,12\%,10) + 0.10N$$