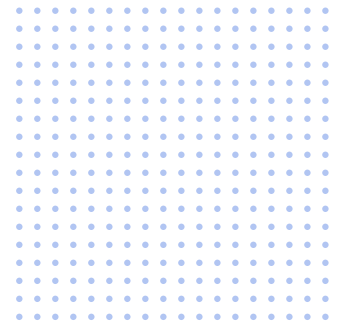




FOR JNU EE EXAM PREPARATION

JNU EE 2022 Question Paper · Ph.D Nanoscience - Engineering Sciences

EXAM

JNU EE

YEAR

2022

TYPE

Question Paper

SUBJECT

Ph.D Nanoscience - Engineering Sciences



Test Date : 09 Dec 2022

Test Slot : slot 2

Subject : PBES-Nanoscience Engineering Sciences

Sl. No.1

QBID:1052151

A resistor has a temperature coefficient of $0.0005/^{\circ}\text{C}$. If the resistor has a resistance of $680\ \Omega$ at 20°C , what will its resistance be at 90°C ?

- | | |
|-------------------|-------------------|
| (1) $740\ \Omega$ | (2) $204\ \Omega$ |
| (3) $704\ \Omega$ | (4) $506\ \Omega$ |

- (1) 1
(2) 2
(3) 3
(4) 4

1[Option ID=14601]

2[Option ID=14602]

3[Option ID=14603]

4[Option ID=14604]

Sl. No.2

QBID:1052152

A capacitor of $47\ \mu\text{F}$ is required to store 4J of energy. Determine the potential difference that must be applied to the capacitor.

- | |
|---------------------|
| (1) $412\ \text{V}$ |
| (2) $112\ \text{V}$ |
| (3) $214\ \text{V}$ |
| (4) $442\ \text{V}$ |

- (1) 1
(2) 2
(3) 3
(4) 4

1[Option ID=14605]

2[Option ID=14606]

3[Option ID=14607]

4[Option ID=14608]

Sl. No.3

QBID:1052153

A capacitor consists of six plates each of area 20 cm^2 separated by a dielectric of relative permittivity 4.5 and thickness 0.2 mm. Determine the value of capacitance.

- (1) 90 pF
- (2) 10 pF
- (3) 190 pF
- (4) 590 pF

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14609]

2[Option ID=14610]

3[Option ID=14611]

4[Option ID=14612]

Sl. No.4

QBID:1052154

An inductor of 20 mH is required to store 2.5 J of energy. Determine the current that must be applied.

- (1) 8.8 A
- (2) 25.81 A
- (3) 5.8 A
- (4) 15.81 A

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14613]

2[Option ID=14614]

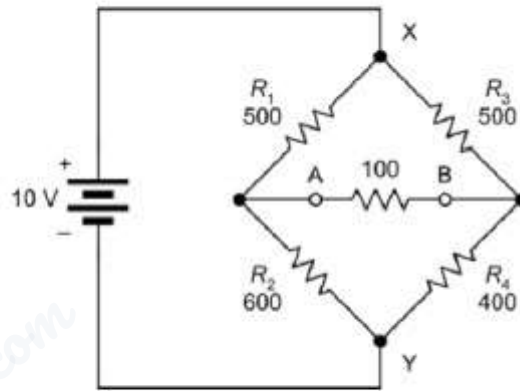
3[Option ID=14615]

4[Option ID=14616]

Sl. No.5

QBID:1052155

Figure given below shows a Wheatstone bridge. Determine the current that will flow in a $100\ \Omega$ load connected between terminals A and B.



- | | |
|-------------|------------|
| 1. 1.698 mA | 2. 1.08 mA |
| 3. 11.8 mA | 4. 5.6 mA |

- (1) 1
(2) 2
(3) 3
(4) 4

1[Option ID=14617]

2[Option ID=14618]

3[Option ID=14619]

4[Option ID=14620]

Sl. No.6

QBID:1052156

An initially uncharged $1\ \mu\text{F}$ capacitor is charged from a $9\ \text{V}$ d.c. supply via a $3.3\ \text{M}\Omega$ resistor. Determine the capacitor voltage 1 sec after connecting the supply.

- | | |
|-------------|--------------|
| (1) 2.8 V | (2) 12.358 V |
| (3) 2.358 V | (4) 21.8 V |

- (1) 1
(2) 2
(3) 3
(4) 4

1[Option ID=14621]

2[Option ID=14622]

3[Option ID=14623]

4[Option ID=14624]

Sl. No.7

QBID:1052157

A $10\ \mu\text{F}$ capacitor is charged to a potential of $20\ \text{V}$ and then discharged through a $47\ \text{k}\Omega$ resistor. Determine the time taken for the capacitor voltage to fall below $10\ \text{V}$.

- (1) $1.325\ \text{s}$
- (2) $0.325\ \text{s}$
- (3) $0.39\ \text{s}$
- (4) $0.03\ \text{s}$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14625]

2[Option ID=14626]

3[Option ID=14627]

4[Option ID=14628]

Sl. No.8

QBID:1052158

A $150\ \mu\text{F}$ capacitor is charged to a potential of $150\ \text{V}$. The capacitor is then removed from the charging source and connected to a $2\ \text{M}\Omega$ resistor. Determine the capacitor voltage 1 minute later.

Given exponential decay for $t/CR = k = 0.8187$.

- (1) $12.48\ \text{V}$
- (2) $122.8\ \text{V}$
- (3) $102.18\ \text{V}$
- (4) $2.8\ \text{V}$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14629]

2[Option ID=14630]

3[Option ID=14631]

4[Option ID=14632]

Sl. No.9

QBID:1052159

When the modulating frequency is doubled, the modulation index is halved, and the modulating voltage remains constant. The modulation system is

- (1) amplitude modulation
- (2) phase modulation
- (3) frequency modulation
- (4) Pulse width modulation

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14633]

2[Option ID=14634]

3[Option ID=14635]

4[Option ID=14636]

Sl. No.10

QBID:1052160

An LED is to be used to indicate the presence of a 21 V d.c. supply rail. If the LED has a nominal forward voltage of 2.2 V, and is rated at a current of 15 mA, determine the value of series resistor required and power dissipated in that resistance.

- (1) 1.25 k Ω ; 280 mW
- (2) 5.25 k Ω ; 28 mW
- (3) 8.25 k Ω ; 80 mW
- (4) 1.58 k Ω ; 180 mW

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14637]

2[Option ID=14638]

3[Option ID=14639]

4[Option ID=14640]

Sl. No.11

QBID:1052161

A transistor operates with $I_C = 30$ mA and $I_B = 600$ μ A. Determine the value of I_E and h_{FE} .

- (1) 30.6 mA & 500
- (2) 3.6 mA & 25
- (3) 30.6 mA & 50
- (4) 35.4 mA & 150

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14641]
 2[Option ID=14642]
 3[Option ID=14643]
 4[Option ID=14644]

Sl. No.12
QBID:1052162

A transistor operates with a collector current of 97 mA and an emitter current of 98 mA. Determine the value of base current and common emitter current gain.

- (1) 1 mA & 97
- (2) 10 mA & 97
- (3) 1 mA & 17
- (4) 100 mA & 7

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14645]
 2[Option ID=14646]
 3[Option ID=14647]
 4[Option ID=14648]

Sl. No.13
QBID:1052163

An amplifier with negative feedback applied has an open-loop voltage gain of 50 and one-tenth of its output is fed back to the input (i.e. $\beta = 0.1$). Determine the overall voltage gain with negative feedback applied.

- (1) 18.33
- (2) 80.54
- (3) 8.33
- (4) 5.83

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14649]
 2[Option ID=14650]
 3[Option ID=14651]
 4[Option ID=14652]

Sl. No.14
QBID:1052164

An operational amplifier operating with negative feedback produces an output voltage of 2 V when supplied with an input of 400 μ V. Determine the value of closed-loop voltage gain?

- (1) 174 dB
- (2) 70 dB
- (3) 44 dB
- (4) 74 dB

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14653]

2[Option ID=14654]

3[Option ID=14655]

4[Option ID=14656]

Sl. No.15

QBID:1052165

A wideband operational amplifier has a slew rate of 15 V/ μ s. If the amplifier is used in a circuit with a voltage gain of 20 and a perfect step input of 100 mV is applied to its input, determine the time taken for the output to change level.

- (1) 0.333 μ s
- (2) 0.133 μ s
- (3) 0.223 μ s
- (4) 0.199 μ s

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14657]

2[Option ID=14658]

3[Option ID=14659]

4[Option ID=14660]

Sl. No.16

QBID:1052166

Match List I with List II :Match operational amplifiers In List I to be most suitable for applications in List II:

List I	List II
A. AD548	I. a low-frequency amplifier for audio signals.
B. CA3140	II. Wideband amplifier
C. LM348	III. amplifying the low-level output from a piezoelectric vibration sensor
D. TL071	IV. a high-gain amplifier that can be used to faithfully amplify very small signals

Choose the correct answer from the options given below:

- (1) A-I, B-II, C-III, D-IV
- (2) A-I,B-II, C-IV,D-III
- (3) A-III, B-IV, C-I, D-II
- (4) A-IV, B-III, C-I, D-II

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14661]
 2[Option ID=14662]
 3[Option ID=14663]
 4[Option ID=14664]

Sl. No.17
 QBID:1052167

An operational amplifier with negative feedback applied produces an output of 1.5 V when an input of 7.5 mV is present. Determine the closed-loop voltage gain.

- (1) 200
- (2) 150
- (3) 300
- (4) 175

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14665]
 2[Option ID=14666]
 3[Option ID=14667]
 4[Option ID=14668]

Sl. No.18
 QBID:1052168

A summing amplifier with two inputs has $R_F = 10 \text{ k}\Omega$, and R_{IN} (for both inputs) of $2 \text{ k}\Omega$. Determine the output voltage when one input is at -2 V and the other is $+0.5 \text{ V}$.

- (1) 2.5 V
- (2) -1.5 V
- (3) -7.5 V
- (4) 7.5 V

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14669]

2[Option ID=14670]

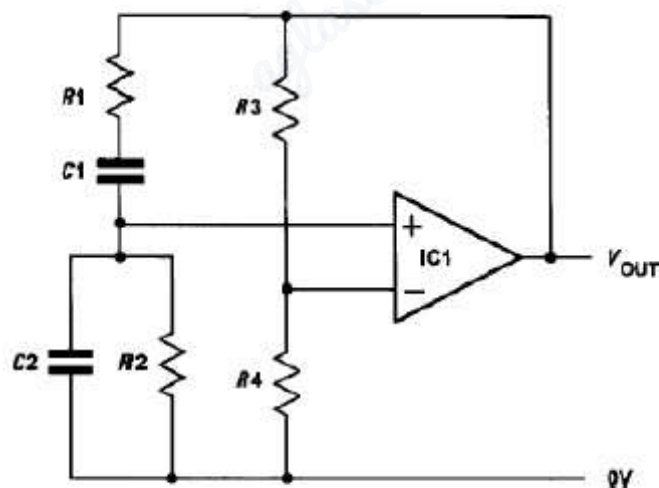
3[Option ID=14671]

4[Option ID=14672]

Sl. No.19

QBID:1052169

In a Wien bridge oscillator based on an operational amplifier shown below, if $C1 = C2 = 100 \text{ nF}$. Determine the output frequencies produced by this arrangement when $R1 = R2 = 6 \text{ k}\Omega$.



- (1) 665 Hz
- (2) 259 Hz
- (3) 760 Hz
- (4) 265 Hz

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14673]

2[Option ID=14674]

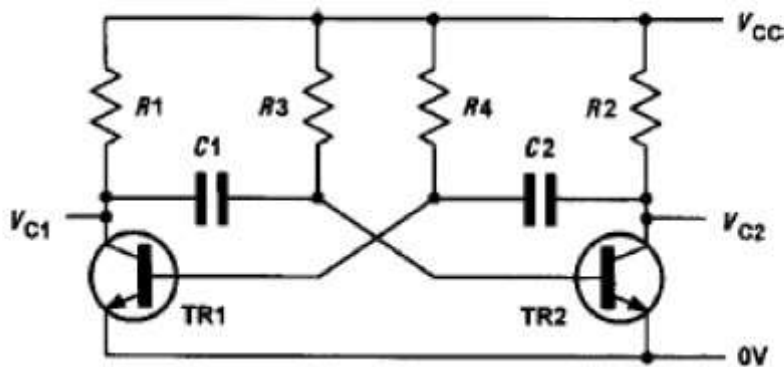
3[Option ID=14675]

4[Option ID=14676]

Sl. No.20

QBID:1052170

The astable multivibrator as shown below is required to produce a square wave output at 1 kHz. Determine suitable values for R_3 and R_4 if $C_1 = C_2 = 10 \text{ nF}$.



- (1) 71 k Ω and 71 k Ω
- (2) 71 k Ω and 75 k Ω
- (3) 75 k Ω and 17 k Ω
- (4) 11 k Ω and 73 k Ω

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14677]

2[Option ID=14678]

3[Option ID=14679]

4[Option ID=14680]

Sl. No.21

QBID:1052171

An amplifier with a gain of 8 has 10% of its output fed back to the input. Determine the gain of the stage with positive feedback.

- (1) 20
- (2) 80
- (3) 40
- (4) 45

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14681]

2[Option ID=14682]

3[Option ID=14683]

4[Option ID=14684]

Sl. No.22

QBID:1052172

A phase-shift oscillator is to operate with an output at 1 kHz. If the oscillator is based on a three-stage ladder network, determine the required values of resistance if three capacitors of 10 nF are to be used.

- | | |
|---------------------|---------------------|
| (1) 9.23 k Ω | (2) 6.49 k Ω |
| (3) 16.9 k Ω | (4) 60.4 k Ω |

- (1) 1
(2) 2
(3) 3
(4) 4

1[Option ID=14685]
2[Option ID=14686]
3[Option ID=14687]
4[Option ID=14688]

Sl. No.23
QBID:1052173

Identify the integrated circuit: 4001UBE

- (1) is a CMOS device 4000U
(2) is a CMOS device 4060U
(3) is an improved unbuffered version of the CMOS 4001
(4) is an unbuffered version of the CMOS 4050

- (1) 1
(2) 2
(3) 3
(4) 4

1[Option ID=14689]
2[Option ID=14690]
3[Option ID=14691]
4[Option ID=14692]

Sl. No.24
QBID:1052174

An integrated circuit marked '4050B 9832'. What type of device is it and when was it manufactured?

- (1) an unbuffered CMOS 4050 manufactured in the 23rd week of 2008
(2) an unbuffered CMOS 4050 manufactured in the 23rd week of 1999
(3) a buffered CMOS 5050 manufactured in the 2nd week of 1999
(4) a buffered CMOS 4050 manufactured in the 32nd week of 1998

- (1) 1
(2) 2
(3) 3
(4) 4

- 1[Option ID=14693]
 2[Option ID=14694]
 3[Option ID=14695]
 4[Option ID=14696]

Sl. No.25

QBID:1052175

Find the decimal equivalent of the binary number: 00001110 expressed in the 2's complement format.

- (1) -14
 (2) 24
 (3) -114
 (4) 28

- (1) 1
 (2) 2
 (3) 3
 (4) 4

- 1[Option ID=14697]
 2[Option ID=14698]
 3[Option ID=14699]
 4[Option ID=14700]

Sl. No.26

QBID:1052176

Find the octal equivalent of $(73.75)_{10}$

- (1) $(113.6)_8$
 (2) $(101.7)_8$
 (3) $(111.6)_8$
 (4) $(211.5)_8$

- (1) 1
 (2) 2
 (3) 3
 (4) 4

- 1[Option ID=14701]
 2[Option ID=14702]
 3[Option ID=14703]
 4[Option ID=14704]

Sl. No.27

QBID:1052177

Determine the hexadecimal equivalent of $(82.25)_{10}$

- (1) $(22.6)_{16}$
- (2) $(52.4)_{16}$
- (3) $(62.7)_{16}$
- (4) $(54.4)_{16}$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14705]

2[Option ID=14706]

3[Option ID=14707]

4[Option ID=14708]

Sl. No.28

QBID:1052178

Find the binary equivalent of $(17E.F6)_{16}$

- (1) $(1011001010.011000101)_2$
- (2) $(1011001010.010011101)_2$
- (3) $(101111110.1111011)_2$
- (4) $(1011001111.111011101)_2$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14709]

2[Option ID=14710]

3[Option ID=14711]

4[Option ID=14712]

Sl. No.29

QBID:1052179

Find the hex equivalent of $(1011001110.011011101)_2$

- (1) $(2CE.6C5)_{16}$
- (2) $(C2E.E68)_{16}$
- (3) $(ECE.6EE)_{16}$
- (4) $(2CE.6E8)_{16}$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

- 1[Option ID=14713]
 2[Option ID=14714]
 3[Option ID=14715]
 4[Option ID=14716]

Sl. No.30

QBID:1052180

A radio wave has a frequency of 162.5 kHz. If a beat frequency of 1.25 kHz is to be obtained, determine the two possible beat frequency oscillator (BFO) frequencies.

- (1) 150.5 kHz or 153.5 kHz
 (2) 160.75 kHz or 163.25 kHz
 (3) 170.75 kHz or 173.25 kHz
 (4) 190.75 kHz or 133.5 kHz

- (1) 1
 (2) 2
 (3) 3
 (4) 4

- 1[Option ID=14717]
 2[Option ID=14718]
 3[Option ID=14719]
 4[Option ID=14720]

Sl. No.31

QBID:1052181

A VHF Band II FM receiver with a 10.7 MHz IF covers the signal frequency range, 88 MHz to 108 MHz. Over what frequency range should the local oscillator be tuned?

- (1) 99.7 MHz to 188.7 MHz
 (2) 108.7 MHz to 128.7 MHz
 (3) 98.7 MHz to 118.7 MHz
 (4) 78.7 MHz to 128.7 MHz

- (1) 1
 (2) 2
 (3) 3
 (4) 4

- 1[Option ID=14721]
 2[Option ID=14722]
 3[Option ID=14723]
 4[Option ID=14724]

Sl. No.32

QBID:1052182

The type of a register, in which data is entered into it only one bit at a time, but has all data bits available as output is

- (1) serial-in parallel-out register
- (2) serial-in serial out register
- (3) parallel-in serial out register
- (4) parallel-in parallel-out register

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14725]

2[Option ID=14726]

3[Option ID=14727]

4[Option ID=14728]

Sl. No.33

QBID:1052183

Data can be changed from special code to temporal code by using

- (1) shift registers
- (2) counters
- (3) A/D converters
- (4) D/A converters

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14729]

2[Option ID=14730]

3[Option ID=14731]

4[Option ID=14732]

Sl. No.34

QBID:1052184

Determine power efficiency (η) and the % of total power carried by the sidebands of the AM wave for tone modulation when $\mu = 0.5$.

- (1) 11.0% and 1.11 %
- (2) 21.0 % and 10.1 %
- (3) 11.11% and 11.11 %
- (4) 10.5% and 10.5 %

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14733]

2[Option ID=14734]

3[Option ID=14735]

4[Option ID=14736]

Sl. No.35**QBID:1052185**

An angle-modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation

$$\varphi_{EM}(t) = 10 \cos(\omega_c(t) + 5 \sin 3000t + 10 \sin 2000\pi t).$$

Find the frequency deviation Δf .

- (1) 12384 Hz
- (2) 2387.3 Hz
- (3) 10387.5 Hz
- (4) 12387.32 Hz

(1) 1

(2) 2

(3) 3

(4) 4

1[Option ID=14737]

2[Option ID=14738]

3[Option ID=14739]

4[Option ID=14740]

Sl. No.36**QBID:1052186**

A 200 MHz carrier wave is frequency modulated by a 20 kHz sinusoidal modulating signal. If the maximum frequency deviation is 100 kHz, determine the modulation index.

- (1) 50
- (2) 2
- (3) 5
- (4) 7

(1) 1

(2) 2

(3) 3

(4) 4

1[Option ID=14741]

2[Option ID=14742]

3[Option ID=14743]

4[Option ID=14744]

Sl. No.37**QBID:1052187**

A 1200 kHz carrier wave is amplitude modulated by audio signals between 500 Hz and 1500 Hz. Find the channel width.

- (1) 5 kHz
- (2) 13 kHz
- (3) 30 kHz
- (4) 3 kHz

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14745]

2[Option ID=14746]

3[Option ID=14747]

4[Option ID=14748]

Sl. No.38

QBID:1052188

The counter which requires maximum number of flip-flops for a given Mod number is

- (1) ripple counter
- (2) BCD counter
- (3) ring counter
- (4) programmable counter

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14749]

2[Option ID=14750]

3[Option ID=14751]

4[Option ID=14752]

Sl. No.39

QBID:1052189

A sinusoidal signal with peak-to-peak amplitude of 1.28 volts is quantized into 128 levels using a midrise uniform quantizer. The quantization noise ratio is ;

- (1) 4 μ W
- (2) 2 μ W
- (3) 8 μ W
- (4) 18 μ W

- (1) 1
- (2) 2
- (3) 3
- (4) 4

- 1[Option ID=14753]
 2[Option ID=14754]
 3[Option ID=14755]
 4[Option ID=14756]

Sl. No.40
 QBID:1052190

The signal $\cos \omega_c t + 0.5 \cos \omega_m t \sin \omega_c t$ is

- (1) Both AM and FM
 (2) Neither AM nor FM
 (3) AM only
 (4) FM only

- (1) 1
 (2) 2
 (3) 3
 (4) 4

- 1[Option ID=14757]
 2[Option ID=14758]
 3[Option ID=14759]
 4[Option ID=14760]

Sl. No.41
 QBID:1052191

Which of the following Analog modulation scheme requires the minimum transmitted power and minimum channel bandwidth?

- (1) VSB
 (2) DSB - SC
 (3) AM
 (4) SSB

- (1) 1
 (2) 2
 (3) 3
 (4) 4

- 1[Option ID=14761]
 2[Option ID=14762]
 3[Option ID=14763]
 4[Option ID=14764]

Sl. No.42
 QBID:1052192

Figure of merit of SSB-SC receiver using coherent detection is

- (1) 0.33
- (2) 0.5
- (3) 1
- (4) 0.66

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14765]

2[Option ID=14766]

3[Option ID=14767]

4[Option ID=14768]

Sl. No.43

QBID:1052193

The noise power in FM demodulation by using frequency discriminator is proportional to the message band width W by

- (1) W^2
- (2) W^3
- (3) W
- (4) $\sqrt{W}$

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14769]

2[Option ID=14770]

3[Option ID=14771]

4[Option ID=14772]

Sl. No.44

QBID:1052194

An eight-bit D/A converter has a step size of 20 mV. Determine the full-scale output.

- (1) 7.9 V
- (2) 5.8 V
- (3) 5.1 V
- (4) 1.5 V

- (1) 1
- (2) 2

(3) 3

(4) 4

1[Option ID=14773]

2[Option ID=14774]

3[Option ID=14775]

4[Option ID=14776]

Sl. No.45**QBID:1052195**

A 400 W carrier is modulated to a depth of 75%. Calculate the total power in the modulated wave.

(1) 312.5 W

(2) 315 W

(3) 512.5 W

(4) 752 W

(1) 1

(2) 2

(3) 3

(4) 4

1[Option ID=14777]

2[Option ID=14778]

3[Option ID=14779]

4[Option ID=14780]

Sl. No.46**QBID:1052196**

The antenna current of an AM broadcast transmitter, modulated to a depth of 40 % by an audio sine wave is 11 Amp. It increased to 12 Amp as a result of simultaneous modulation by another audion sine wave. Find the total modulation index (m_t).

(1) 0.757

(2) 0.775

(3) 0.25

(4) 0.33

(1) 1

(2) 2

(3) 3

(4) 4

1[Option ID=14781]

2[Option ID=14782]

3[Option ID=14783]

4[Option ID=14784]

Sl. No.47**QBID:1052197**

One of the advantages of the base modulation over collector modulation of a transistor class C amplifier is

- (1) the lower modulating power required
- (2) higher power output per transistor
- (3) better efficiency
- (4) better linearity

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14785]

2[Option ID=14786]

3[Option ID=14787]

4[Option ID=14788]

Sl. No.48

QBID:1052198

Vestigial sideband modulation (C3F) is normally used for

- (1) HF point-to-point communications
- (2) monaural broadcasting
- (3) TV broadcasting
- (4) stereo broadcasting

- (1) 1
- (2) 2
- (3) 3
- (4) 4

1[Option ID=14789]

2[Option ID=14790]

3[Option ID=14791]

4[Option ID=14792]

Sl. No.49

QBID:1052199

In the spectrum of a frequency-modulated wave

- (1) the carrier frequency disappears when the modulation index is large
- (2) the amplitude of any side-band depends on the modulation index
- (3) the total number of sidebands depends on the modulation index
- (4) the carrier frequency cannot disappear

- (1) 1
- (2) 2
- (3) 3

(4) 4

1[Option ID=14793]
2[Option ID=14794]
3[Option ID=14795]
4[Option ID=14796]

Sl. No.50

QBID:1052200

The difference between phase and frequency modulation

- (1) is purely theoretical because they are the same in practice
- (2) is too great to make the two system compatible
- (3) lies in the poorer audio response of phase modulation
- (4) lies in the different definition of the modulation index

(1) 1

(2) 2

(3) 3

(4) 4

1[Option ID=14797]
2[Option ID=14798]
3[Option ID=14799]
4[Option ID=14800]