GATE Electronics & Communication Sample Paper 2011

1 The drain of an n-channel MOSFET is shorted to the gate so that VGS = VDS. The threshold voltage (VT) of MOSFET is 1 V. If the drain current (ID) is 1 mA for VGS = 2V, then for VGS = 3V, ID is
A) 2 mA
B) 3 mA
C) 9 mA
D) 4 mA
Answer : (D)

2 The first and the last critical frequency of an RC-driving point impedance function must respectively be
A) a zero and a pole
B) a zero and a zero
C) a pole and a pole
D) a pole and a zero
Answer : (D)

3 In what range should Re(s) remain so that the Laplace transform of the function $e^{(a+2)t+5}$ exits?
A) Re (s) > a + 2
B) Re (s) > a + 7
C) Re (s) < 2
D) Re (s) > a + 5
Answer : (A)

4 A parallel plate air-filled capacitor has plate area of l0-4 m2 and plate separation of 10-3 m. It is connected to a 0.5 V, 3.6 GHz source. The magnitude of the displacement current is (e0 = 1/36p x 10-9 F/m)
A) 10 mA
B) 100 mA
C) 10 A
D) 1.59 mA
Answer : (A)
5 For the polynomial P(s) = s5 + s4 + 2s3 + 2s2 + 3s + 15, the number of roots which lie in the right half of the s-plane is
A) 4
B) 2
C) 3
D) 1
Answer : (B)

6 The phase velocity of an electromagnetic wave propagating in a hollow metallic rectangular waveguide in the TE10 mode is
A) equal to its group velocity
B) less than the velocity of light in free space
C) equal to the velocity of light in free space
D) greater than the velocity of light in free space
Answer : (D)

7 A device with input x(t) and output y(t) is characterized by: $y(t) = x^2(t)$. An FM signal with frequency deviation of 90 kHz and modulating signal bandwidth of 5 kHz is applied to this device. The bandwidth of the output signal is
A) 370 kHz
B) 190 kHz
C) 380kHz
D) 95kHz
Answer : (C)

8 The Q – meter works on the principle of
A) mutual inductance
B) self inductance
C) series resonance
D) parallel resonance
Answer : (C)

9 The Fourier transform of a conjugate symmetric function is always
A) imaginary
B) conjugate anti-symmetric
C) real
D) conjugate symmetric
Answer : (C)

10 An ideal op-amp is an ideal
A) voltage controlled current source
B) voltage controlled voltage source
C) current controlled current source
D) current controlled voltage source
Answer : (B)

1 A digital-to-analog converter with a full-scale output voltage of 3.5 V has a resolution close to 14m V. Its bit size is
A) 4
B) 8
C) 16
D) 32
Answer : (B)

2 A single-phase half-controlled rectifier is driving a separately excited dc motor. The dc motor has a back emf constant of 0.5 V/rpm. The armature current is 5 A without any ripple. The armature resistance is 2W. The converter is working from a 280 V, single phase ac source with a firing angle of 80°. Under this operating condition, the

speed of the motor will be
A) 339 rpm
B) 359 rpm
C) 366 rpm
D) 386 rpm
Answer : (C)

3 In relation to the synchronous machines, which one of the following statements is false?
A) In salient pole machines, the direct-axis synchronous reactance is greater than the quadrature-axis synchronous reactance
B) The damper bars help the synchronous motor self start
C) Short circuit ratio is the ratio of the field current required to produce the rated voltage on open circuit to the rated armature current
D) The V-curve of a synchronous motor represents the variation in the armature current with field excitation, at a given output power
Answer : (C)

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Answer : (A)
5 The 8085 assembly language instruction that stores the content of H and L registers into the memory locations 2050H and 2051H, respectively, is
A) SPHL 2050_H
B) SPHL2051_H
C) SHLD 2050_H
D) STAX 2050_H
Answer : (C)

6 If E is the electric field intensity, Ñ(Ñ x E) is equal to
A) E
B) | E |
C) null vector
D) zero
Answer : (D)

7 The insulation strength of an EHV transmission line is mainly governed by
A) load power factor
B) switching over-voltages
C) harmonics
D) corona
Answer : (B)

8 The Q – meter works on the principle of
A) mutual inductance

B) self inductance
C) series resonance
D) parallel resonance
Answer : (C)

9 A 800 kV transmission line is having per phase line inductance of 1.1 mH/km and per phase line capacitance of 11.68 nF/km. Ignoring the length of the line, its ideal power transfer capability in MW is
A) 1204 MW
B) 1504 MW
C) 2085 MW
D) 2606 MW
Answer : (C)

10 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
A) 8/6
B) 12
C) 16
D) 8
Answer : (C)

11 At an industrial sub-station with a 4 MW load, a capacitor of 2 MVAR is installed to maintain the load power factor at 0.97 lagging. If the capacitor goes out of serivce, the load power factor becomes
A) 0.85
B) 1.00
C) 0.80 lag
D) 0.90 lag
Answer : (C)

12 The conduction loss versus device current characteristic of a power MOSFET is best approximated by
A) a parabola
B) a straight line
C) a rectangular hyperbola
D) an exponentially decaying function
Answer : (A)

13 High Voltage DC (HVDC) transmission is mainly used for
A) bulk power transmission over very long distances
B) inter-connecting two systems with the same nominal frequency
C) eliminating reactive power requirement in the operation
D) minimizing harmonics at the converter stations
Answer : (A)

14 For the equation,
$s3 – 4s2+ s + 6 = 0$
the number of roots in the left half of s-plane will be

A) 0
B) 1
C) 2
D) 3
Answer : (C)

15 For the function f(x) = x2 e-x, the maximum occurs when x is equal to
A) 2
B) 1
C) 0
D) -1
Answer : (B)

1 A system has poles at 0.01 Hz, 1 Hz and 80 Hz; zeros at 5 Hz, 100 Hz and 200 Hz. The approximate phase of the system-response at 20 Hz is
A) – 90°
B) 0°
C) 90°
D) – 180°
Answer : (A)

2 In an abrupt p-n junction, the doping concentrations on the p-side and n-side are NA = 9x 1016/cm3 and ND = 1 x 1016/cm3 respectively. The p-n junction is reverse biased and the total depletion width is 3 m m. The depletion width on the p-side is
A) 2.7 mm
B) 0.3 mm.
C) 2.25 mm
D) 0.75 mm
Answer : (B)

3 A master-slave flip-flop has the characteristic that
A) change in the input immediately reflected in the output
B) change in the output occurs when the state of the master is affected
C) change in the output occurs when the state of the slave is affected
D) both the master and the slave states are affected at the same time
Answer : (C)

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Answer : (A)

5 The phase velocity of an electromagnetic wave propagating in a hollow metallic rectangular waveguide in the TE10 mode is
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C) equal to the velocity of light in free space
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Answer : (D)

6 Noise with uniform power spectral density of N0W/Hz is passed through a filter H (w) = 2 exp(-jwtd) followed by an ideal low pass filter of bandwidth BHz. The output noise power in Watts is
A) $2N_0B$
B) $4N_0B$
C) eN_0B
D) $16\ N_0B$
Answer : (B)

7 The cascade amplifier is a multistage configuration of
A) CC-CB
B) CE-CB
C) CB-CC
D) CE-CC
Answer : (B)

8 Consider a lossless antenna with a directive gain of +6dB. If 1 mW of power is fed to it the total power radiated by the antenna will be
A) 4 mW
B) 1 mW
C) 7 mW
D) 1/4 mW
Answer : (A)

9 The bandgap of Silicon at room temperature is
A) 1.3 eV
B) 0.7 eV
C) 1.1 eV
D) 1.4 eV
Answer : (C)

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12 For the polynomial P(s) = s5 + s4 + 2s3 + 2s2 + 3s + 15, the number of roots which lie in the right half of the s-plane is
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B) 2
C) 3
D) 1
Answer : (B)

13 An AM signal is detected using an envelope detector The carrier frequency and modulating signal frequency are 1 MHz and 2 kHz respectively. An appropriate value for the time constant of the envelope detector is
A) 500 msec
B) 20 msec
C) 0.2 msec
D) 1 msec
Answer : (B)

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B) 12
C) 16
D) 8
Answer : (C)

15 Consider the following statements S1 and S2.
S1: The b of a bipolar transistor reduces if the base width is increased.
S2: The b of a bipolar transistor increases if the doping concentration in the base is increased. Which one of the following is correct?

A) S1 is FALSE and S2 is TRUE
B) Both S1 and S2 are TRUE
C) Both S1 and S2 are FALSE
D) S1 is TRUE and S2 is FALSE
Answer : (D)

-1 A circuit has a resistance of 11 W, a coil of inductive reactance 120 W, and a capacitor with a 120-W reactance, all connected in series with a 110-V, 60-Hz power source. What is the potential difference across each circuit element?

A) (a) VR = 110 V, (b) VL = VC = 1.2 Kv
B) (a) VR = 120 V, (b) VL = VC = 2.4 kV
C) (a) VR = 4.8 V, (b) VL = VC = 0 kV
D) (a) VR = 5.0 V, (b) VL = VC = 8.0 V

Q-2 Applying DeMorgan’s theorem to the expression , we get

A) (A+B)+C
B) A(B + C)
C) Both A & B
D) None of above

Q-4 Refer Below figure to Determine the resonant frequency…

A) 123.4 kHz
B) 61.7 kHz
C) 45.97 kHz
D) 23.1 kHz

Q-4 Express the decimal number 57 in binary.

A) 100101
B) 111010
C) 110010
D) 111001

Q-5 A vertical electric dipole antenna

a) radiates uniformly in all directions.
b) radiates uniformly in all horizontal directions, but more strongly in the vertical direction.
c) radiates most strongly and uniformly in the horizontal directions
d) does not radiate in the horizontal directions

Q-6 A particle oscillates according to the equation y=5.0 cos 23 t, where y is in centimeters. Find its frequency of oscillation and its position at t=0.15 s.

a) f = 23 Hz, y = -4.8 cm
B) f = 3.7 Hz, y = -5.0 cm
C) f = 3.7 Hz, y = -4.8 cm
D) f = 3.7 Hz, y = +4.8 cm

Q-7 A 10.0-μF capacitor is in series with a 40.0-W resistance, and the combination is connected to a 110-V, 60.0-Hz line. Calculate (a) the capacitive reactance, (b) the impedance of the circuit, (c) the current in the circuit, (d) the phase angle between current and supply voltage

A) (a) 0.0038W (b) 305W (c) 0.415 A (d) voltage lags by 8.58°
B) (a) 266W (b) 269W (c) 0.409 A (d) voltage lags by 81.4°
C) (a) 16 kW (b) 72 kW (c) 2.75 A (d) voltage lags by 6.63°
D) (a) 2.6 kW (b) 262W (c) 0.256 MA (d) voltage leads by 81.4°

Q-8 A circuit has a resistance of 11 W, a coil of inductive reactance 120 W, and a capacitor with a 120-W reactance, all connected in series with a 110-V, 60-Hz power source. What is the potential difference across each circuit element?

A) (a) VR = 110 V, (b) VL = VC = 1.2 Kv
B) (a) VR = 120 V, (b) VL = VC = 2.4 kV

C) (a) VR = 4.8 V, (b) VL = VC = 0 kV
D) (a) VR = 5.0 V, (b) VL = VC = 8.0 V

Q-9 What is the primary function of multiplexing?

A) To match the frequency range of a signal to a particular channel.
B) To reduce the bandwidth of a signal.
C) To select one radio channel from a wide range of transmitted channels.
D) To allow a number of signals to make use of a single communications channel.

Q-10 A second step to further increase system capacity is a digital access method called TDMA (Time Division Multiple Access). Using the same frequency channelization and reuse as FDMA analog but adding a time sharing element, the effective capacity is:

A) Doubled
B) Tripled
C) Reduced by one third
D) Unchanged

Q-11 What are Pseudo-Random noise sequences, or P/N Sequences?

A) P/N Sequences are known sequences which exhibit the properties or chracteristics of random sequences
B) P/N Sequences can be used to logically isolate users on the same physical (frequency) channel
C) P/N Sequences appear as random noise to everyone else, except to the transmitter and intended receiver
D) All of the above

Q-12 An op-amp integrator has a square-wave input. The output should be

A) a sine wave.
B) a triangle wave
C) a square wave.
D) pure DC.

Q-13 What is the relationship between the series and parallel resonant frequencies of a quartz crystal?

A) They are equal.
B) Parallel resonant frequency is approximately 1 kHz higher than series resonant frequency
C) Series resonant frequency is approximately 1 kHz higher than parallel resonant frequency.
D) none of the above

Q-14 Refer Below figure to Determine the resonant frequency…

A) 123.4 kHz
B) 61.7 kHz
C) 45.97 kHz
D) 23.1 kHz

Q-15 Which FET amplifier(s) has (have) a phase inversion between input and output signals?

A) common-gate
B) common-drain
C) common-source
D) all of the above