



Discipline: **ELECTRONICS AND COMMUNICATIONS ENGINEERING**

(Faculty of Engineering & Technology)

**3<sup>rd</sup> PhD ENTRANCE TEST (PET-2018)**

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1. In a series RL circuit with constant voltage applied at  $t = 0$  by closing of a switch, the voltage appearing across L may be expressed by:

- (a) Positive exponential function
- (b) Negative exponential function
- (c) Sine function
- (d) Straight line

2. In a tank circuit, the impedance under the condition of resonance to occur at all frequencies is:

- (a)  $Z = \sqrt{L/C}$
- (b)  $Z = \sqrt{LC}$
- (c)  $Z = (1/2\pi) \sqrt{L/C}$
- (d)  $Z = \sqrt{\omega L/C}$

3. A discrete-time sinusoid is periodic only if its frequency is  $a/\pi$ :

- (a) Prime number
- (b) Integer number
- (c) Integer multiple of  $2\pi$
- (d) Rational number

4. The system described by the input-output equation  $y(n) = nx(n)$  is:

- (a) Time variant
- (b) Time invariant
- (c) Linear
- (d) Non-linear

5. Figure illustrate a system with input signal  $x(n]$ . The output  $y(n)$  is:

- (a)  $y(n) = x(n)$
- (b)  $y(n) = x(n+1)$
- (c)  $y(n) = x(n^2)$
- (d)  $y(n) = x(n-1)$



6. The energy of a signal  $x(n)$  is given by:

- (a)  $E = \int_{n=-\infty}^{\infty} |x(n)|^{n/2}$
- (b)  $E = \int_{n=-\infty}^{\infty} |x(n)|^2$
- (c)  $E = \int_{n=-\infty}^{\infty} |x(n)|^{1/2}$
- (d)  $E = \int_{n=-\infty}^{\infty} |x(n)|^n$

7. In regard to the energy (E) and average power (P) of a discrete time signal, read the following statements:

- I. If E is finite, P is zero
- II. If E is infinite, P is finite
- III. If E is infinite, P is infinite
- IV. If E is infinite, P may be either finite or infinite.

- (a) Only I & II are correct.
- (b) Only I, & III are correct
- (c) Only I, II, & IV are correct
- (d) Only I & IV are correct



8. The Law of Junction states that:
- (a) For a forward bias ( $V < V_T$ ) at room temperature, hole concentration at the junction in the n side is greatly increased over thermal equilibrium value
  - (b) For a forward bias ( $V \gg V_T$ ) at room temperature, hole concentration at the junction in the p side is greatly increased over thermal equilibrium value
  - (c) For a forward bias ( $V < V_T$ ) at room temperature, hole concentration at the junction in the p side is greatly increased over thermal equilibrium value
  - (d) For a forward bias ( $V \gg V_T$ ) at room temperature, hole concentration at the junction in the n side is greatly increased over the thermal equilibrium value
9. Operating voltage range of LEDs is:
- (a) 10-15 V
  - (b) 4-10 V
  - (c) 1-10 mV
  - (d) 1.7-3.3V
10. Schottky diode in a Schottky transistor:
- (a) Reduces storage delay time
  - (b) Is connected between base and emitter
  - (c) Increases stability
  - (d) Increases gain
11. For an amplifier with 1 MHz band-pass, the rise time is:
- (a) 0.01  $\mu$ s
  - (b) 0.25  $\mu$ s
  - (c) 0.35  $\mu$ s
  - (d) 1.0  $\mu$ s
12. In regard to the frequency stability of an oscillator:
- (a) Frequency stability increases as  $d\theta/d\omega$  increases
  - (b) Frequency stability increases as  $d\theta/d\omega$  decreases
  - (c) Frequency stability is independent of  $d\theta/d\omega$
  - (d) None of the above
13. Skin effect in copper interconnect:
- (a) Increases the resistance of the conductor with frequency
  - (b) Decrease the resistance of the conductor with frequency
  - (c) Does not affect the resistance of the conductor with frequency
  - (d) None of the above
14. In multistage amplifiers:
- (a) Zeros in the Bode plot determine both the upper and lower 3-dB frequencies
  - (b) Zeros and Poles in the Bode plot determine respectively upper and lower 3-dB frequencies
  - (c) Poles in the Bode plot determine both the upper and lower 3-dB frequencies
  - (d) None of the above
15. In regard to low threshold voltage in MOSFET, the following is/are correct:
- (a) It requires high power supply voltage
  - (b) It allows the use of a small power supply voltage
  - (c) It results in larger switching time
  - (d) All the above are correct



16. CE configuration in BJT is capable of:

- (a) Voltage gain greater than unity
- (b) Current gain greater than unity
- (c) Both voltage gain and current gain greater than unity
- (d) None of the above

17.  $A+BC$  is equivalent to:

- (a)  $A+B$
- (b)  $A+C$
- (c)  $(A+B)(A+C)$
- (d)  $(AC+B)$

18. Regarding virtual memory, the following is not true:

- (a) Translation of virtual address to physical address is done by MMU
- (b) MMU uses page table to map virtual pages to page frames
- (c) Typically, if physical memory is 64 KB, virtual memory may be 256 KB
- (d) None of the above

19. In wired-AND applications, open collector gates are used:

- (a) To avoid increased power dissipation in the on-state
- (b) To avoid increased temperature in the on-state
- (c) To increase power dissipation in off-state
- (d) To decrease power dissipation in off-state

20. In regard to TTL, the following statement(s) is/are correct:

- (a) It uses a multiple-emitter transistor
- (b) It has the topology of DTL
- (c) It is the fastest saturating logic
- (d) All of the above

21. A Darlington emitter follower is used in the output of a TTL gate to:

- (a) Increase its  $I_{OL}$
- (b) Reduce its  $I_{OH}$
- (c) Increase its speed
- (d) Reduce its power dissipation

22. A 2-bit binary multiplier can be implemented using:

- (a) 2-input AND gates only
- (b) 2-input XOR and 4-input AND gates only
- (c) Two 2-input NOR gates and one XOR gate only
- (d) XOR gates and shift registers

23. Lag compensation:

- (a) Inserts an extra zero into the transfer gain at lower frequency than the existing poles
- (b) Inserts an extra pole into the transfer gain at lower frequency than the existing poles
- (c) Inserts an extra pole into the transfer gain at higher frequency than the existing poles
- (d) Inserts an extra zero into the transfer gain at higher frequency than the existing poles



24. The gain margin of certain feedback system is 20 dB, the Nyquist plot will cross the negative real axis at the point:  
(a)  $s = -0.05$       (b)  $s = -0.2$        (c)  $s = -0.1$       (d)  $s = -0.6$
25. Consider a control system in which a step function is applied as input and the output remains below certain threshold for all the time. The system is:  
(a) Stable      (b) Unstable      (c) Always unstable       (d) Not necessarily stable
26. If impulse response of an LTI system is a unit step function, the transfer function is:  
(a)  $s$        (b)  $1/s$       (c)  $1$       (d)  $1/s^2$
27. A carrier is simultaneously modulated by two sine waves with the modulation indices 0.3 and 0.4. The resultant modulation index is:  
(a) 0.1       (b) 0.5      (c) 0.7      (d) 0.9
28. The following code word of a coding scheme will be the decoded symbol, if the received sequence over a BSC is 111010 and ML decoder is used:  
(a) 000000       (b) 101010      (c) 010101      (d) 111111
29. The envelope of the sum of two quadrature Gaussian noise signal obeys:  
(a) Normal distribution  
(b) Lognormal distribution  
(c) Passion distribution  
 (d) Rayleigh distribution
30. The IEEE 802.15.3c is:  
(a) A standard for outdoor cellular wireless networks  
(b) A standard for local area sensor networks  
 (c) A standard for indoor short range applications  
(d) A standard for metropolitan area networks
31. To prevent overloading in an IF amplifier in a receiver, the following is used:  
(a) Variable selectivity  
 (b) Variable sensitivity  
(c) Squelch  
(d) Double conversion
32. In Poisson distribution, the mean:  
 (a) Is equal to the variance  
(b) Is greater than variance  
(c) Is less than variance  
(d) None of these



33. Consider an example of the rolling of a dice with  $k = 1:6$ . Assign to the event  $A_k(t)$  a random process function  $x_k(t) = a \cos k\omega_0 t$ . The variance is:
- (a)  $a/2$        (b)  $a^2/2$       (c)  $a^2/3$       (d) zero
34. A static electric field in an charge free region is:
- (a) Solenoidal and irrotational  
 (b) Solenoidal and rotational  
 (c) Non-Solenoidal and irrotational  
 (d) Non-Solenoidal and rotational
35. The short circuited transmission line when close to an odd multiple of a quarter wavelength long behaves as:
- (a) Series resonant circuit  
 (b) Parallel resonant circuit  
 (c) Series or parallel resonant circuit depending the type of the load connected  
 (d) None of these
36. The intrinsic impedance of a conductor is given by:
- (a)  $\sqrt{(\omega\mu/\sigma)} \angle 45^\circ$       (b)  $\sqrt{(\omega\mu\sigma)} \angle 45^\circ$       (c)  $\sqrt{(\omega/\mu\sigma)} \angle 45^\circ$       (d)  $\sqrt{(\omega\mu/\sigma)} \angle 90^\circ$
37. The alloy used in the light source in 100-1600 nm region is:
- (a) GaAlAs       (b) InGaAsP      (c) Silicon      (d) InGaAs
38. The antenna diameter in a radar system is increased by a factor of four, the maximum range will be increased by a factor of:
- (a) 2       (b) 4      (c) 8      (d)  $\sqrt{2}$
39. The frequency range of mm waves is:
- (a) 3 GHz – 30 GHz  
 (b) 30 GHz – 300 GHz  
 (c) 1GHz – 100 GHz  
 (d) 10 GHz – 300 GHz
40. The velocity of propagation in any transmission line is given by:
- (a)  $v = \frac{1}{\pi\sqrt{LC}}$   
 (b)  $v = \frac{1}{2\pi\sqrt{LC}}$   
 (c)  $v = \frac{1}{\sqrt{L/C}}$   
 (d)  $v = \frac{1}{\sqrt{LC}}$

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