

**ELECTRONIC SCIENCE**

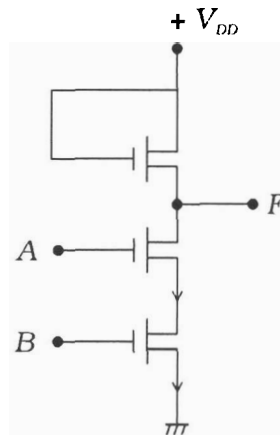
## Paper – II

1. Silicon crystal grows into
  - (A) Zinc blende structure
  - (B) Diamond structure
  - (C) Wurtzite structure
  - (D) None of these.
2. The Fermi level of a degenerate  $n$ -type semiconductor lies
  - (A) near the conduction band edge in the band gap
  - (B) at the middle of the band gap
  - (C) inside the conduction band
  - (D) anywhere in the band gap.
3. In a  $p$ - $n$  junction diode, the diffusion and drift currents are caused by
  - (A) all minority carriers
  - (B) all majority carriers
  - (C) all majority carriers for diffusion current and all minority carriers for drift current
  - (D) all majority carriers for drift current and all minority carriers for diffusion current.
4. The etchant for  $\text{SiO}_2$  in IC technology is
  - (A) HCl
  - (B) Acetic acid
  - (C) Formaldehyde
  - (D) HF.
5. The I-V characteristics of a practical  $p$ - $n$  junction is best expressed by
  - (A)  $I = K(V - V_r)$ ,  $V_r = \text{cut in}$ ,  $K = \text{constant}$
  - (B)  $I = I_0 (e^{eV/\eta kT} - 1)$ ,  $\eta > 1$
  - (C)  $I = I_0 (e^{eV/kT} - 1)$
  - (D)  $I = I_0 (e^{eV/kT} + 1)$ .

6. In a linear network, the ratio of voltage excitation to current response is unaltered when the positions of excitation and response are interchanged. This follows from
- (A) Principle of superposition
  - (B) Thevenin theorem
  - (C) Reciprocity theorem
  - (D) None of these.
7. If  $f_1$  and  $f_2$  are the lower and upper half power frequencies of a RLC circuit and  $f_0$  is the frequency of resonance then the selectivity of RLC circuit is given by
- (A)  $\frac{f_2 - f_0}{f_1 - f_0}$
  - (B)  $\frac{f_2 - f_1}{2f_0}$
  - (C)  $\frac{f_2 - f_1}{f_1 - f_0}$
  - (D)  $\frac{f_2 - f_1}{f_0}$ .
8. A parabolic function when differentiated yields
- (A) ramp function
  - (B) unit ramp function
  - (C) exponential function
  - (D) unit impulse function.
9. If the input voltage of a bridge rectifier is  $V_m \sin \omega t$ , then the peak inverse voltage (PIV) is
- (A)  $V_m$
  - (B)  $2V_m$
  - (C)  $\frac{2V_m}{\pi}$
  - (D)  $\frac{V_m}{2}$ .
10. The inverse of Laplace Transform of  $\frac{s+4}{2s^2+5s+3}$  is equal to
- (A)  $\frac{1}{2}[6 \exp(-t) - 5 \exp(3t/2)]$
  - (B)  $\frac{1}{2}[6 \exp(-t) - 5 \exp(-3t/2)]$
  - (C)  $\frac{1}{2}[6 \exp(t) - 5 \exp(-3t/2)]$
  - (D)  $\frac{1}{2}[6 \exp(-t) + 5 \exp(-3t/2)]$ .

11. The action of JFET in its equivalent circuit can be represented by
- (A) current controlled current source
  - (B) current controlled voltage source
  - (C) voltage controlled voltage source
  - (D) voltage controlled current source.
12. To solve the differential equation  $\frac{d^2v}{dt^2} - 2\frac{dv}{dt} + v_1 = 0$ , involving voltages  $v(t)$  and  $v_1$ , an OPAMP circuit requires at least
- (A) two OPAMP differentiators and one OPAMP adder
  - (B) one OPAMP integrator and two OPAMP adders
  - (C) two OPAMP integrators and one OPAMP adder
  - (D) one OPAMP integrator, one OPAMP differentiator and one OPAMP adder.
13. In the first stage inside the OPAMP-IC, external inputs are connected to the circuits which are
- (A) phase-splitter amplifier
  - (B) difference amplifier
  - (C) R-C coupled amplifier
  - (D) emitter follower.
14. In the low frequency equivalent circuit of a MOSFET
- (A)  $G$  is connected to  $D$  by a capacitor
  - (B)  $G$  is connected to  $D$  by a resistor
  - (C)  $G$  is not connected to  $D$
  - (D)  $G$  is connected to  $D$  with a current generator
- $G \equiv$  Gate,  $D \equiv$  Drain
15. One 4-to-16 decoder with active low outputs needs some additional logic gates to design a comparator to two 2-bit binary numbers. Those additional gates are
- (A) OR gates
  - (B) NAND gates
  - (C) EX-OR gates
  - (D) NOR gates.

16. The  $Q$  output becomes  $\bar{Q}$  for a  $T$  flip-flop when the  $T$  input is
- (A) 1
  - (B) 0
  - (C) 0 or 1
  - (D) 1 or 0.
17. "Multiplexing" means
- (A) one to many
  - (B) one to one
  - (C) many to many
  - (D) many to one.
18. The circuit in the figure is based on  $n$ -channel MOSFETS. For positive logic, the circuit works as a



- (A) NAND gate
  - (B) OR gate
  - (C) NOR gate
  - (D) AND gate.
19. 1 MB memory in computer technology means
- (A) 1048576 bytes
  - (B) 1024000 bytes
  - (C) 1000024 bytes
  - (D) 1000000 bytes.

20. When the following program segment is executed in a 8085 CPU based system, then the content of Reg A

LXI D, 9000H

DCX D

JZ 8050H

MVI A, 05H

RST1

8050 H MVI A, 06 H

RST1

- (A) 05H  
(B) 06H  
(C) 00H  
(D) none of these.
21. If instruction RST-5 is written in a program, the program control will jump to location  
(A) 0020H  
(B) 0024H  
(C) 0028H  
(D) 0002H.
22. Which of the following ports of 8255 supports bi-directional data transfer function ?  
(A) Port A  
(B) Port B  
(C) Port C upper  
(D) Port C lower
23. Choose the correct statement :  
(A) Instruction cycle is a part of machine cycle  
(B) An instruction cycle can have more than one opcode fetch machine cycles  
(C) In an execution cycle, there can be no fetch cycle  
(D) In 8085 AD bus is time-multiplexed.
24. For an 8085  $\mu$ P with 5 MHz clock, what is the time required to perform the instruction LDA 8085 ?  
(A) 0.8  $\mu$  sec  
(B) 2  $\mu$  sec  
(C) 2.6  $\mu$  sec  
(D) 3.2  $\mu$  sec.

25. For a statement : Do 10  $I = L, M, N$ , the number of iterations will be

(A)  $\left(\frac{M-L}{N}\right)$

(B)  $1 + \left(\frac{M-L}{N}\right)$

(C)  $1 - \left(\frac{M-L}{N}\right)$

(D)  $1 + \left(\frac{M+L}{N}\right)$ .

26. What will be the correct output statement of the following C program ?

```
/* program */
#include <stdio.h>
main ( )
{
    printf ("%0f\n",3.0/4.0);
    printf("%.1f\n",3.0/4.0);
    printf("%.2f\n", 3.0/4.0);
}
```

(A) 1  
0.75  
0.8

(B) 0.75  
0.8  
0.75

(C) 0.0  
0.75  
0.75

(D) 1  
0.8  
0.75

27. FORTRAN subroutine always

- (A) follows data card
- (B) follows main program
- (C) jumps main program
- (D) succeeds main program.

28. A quarter-wavelength of a lossless uniform transmission line open circuited at the load end behaves as
- (A) a perfect inductor
  - (B) a perfect capacitor
  - (C) a series tuned circuit
  - (D) a parallel tuned circuit.
29. To tune a microwave oscillation,  $p$ - $n$  junction diode may be used in
- (A) forward bias condition
  - (B) reverse bias condition
  - (C) no biasing is necessary
  - (D) all the above conditions are wrong.
30. An evanescent mode occurs when
- (A) a wave is attenuated rather than propagated
  - (B) the propagation constant is purely imaginary
  - (C)  $m = 0 = n$  so that all field components vanish
  - (D) the wave frequency is the same as the cut-off frequency
31. What is the differential statement of Poynting's theorem connecting Poynting vector ?  
Let  $\vec{S}$  be the Poynting vector,  $u$  be the field energy density,  $\vec{E}$  be the electric field and  $\vec{j}$  be the current density.
- (A)  $\vec{\nabla} \cdot \vec{S} + \vec{j} \cdot \vec{E} = 0$
  - (B)  $\vec{\nabla} \cdot \vec{S} + \frac{\partial u}{\partial t} + \vec{j} \cdot \vec{E} + IR = 0$
  - (C)  $\vec{\nabla} \cdot \vec{S} + \frac{\partial u}{\partial t} + \vec{j} \cdot \vec{E} = 0$
  - (D)  $\vec{\nabla} \cdot \vec{S} + \frac{\partial u}{\partial t} = 0.$
32. The condition of no distortion in a practical transmission line in terms of primary line constants is
- (A)  $RC = GL$
  - (B)  $RL = GC$
  - (C)  $RG = LC$
  - (D)  $RLGC = 1$

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33. Gunn diodes are called transferred electron device because
- (A) electrons are transferred from valence band to conduction band
  - (B) electrons are transferred from heavy hole band to light hole band
  - (C) electrons are transferred from heavy hole band to split-off band
  - (D) electrons are transferred from lower conduction band to higher conduction band.
34. In a low level AM transmitter, amplifier following the modulated state must be
- (A) Class-A
  - (B) linear Class-B
  - (C) Class-C
  - (D) Class-AB.
35. A DSB-SC AM signal is detected using
- (A) envelope detectors
  - (B) synchronous detectors
  - (C) limiter discriminators
  - (D) band-pass filters.
36. For normal speech signal to be transmitted, the bandwidth required for PCM channel would be
- (A) 1 kHz
  - (B) 8 kHz
  - (C) 16 kHz
  - (D) 64 kHz.
37. Sampling theorem finds application in
- (A) Amplitude modulation
  - (B) FM
  - (C) PCM
  - (D) Phase modulation.
38. Which of the following semiconductor devices acts like a diode and two resistors ?
- (A) SCR
  - (B) Diac
  - (C) Triac
  - (D) UJT.



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39. The emission from usual light sources is
- (A) totally coherent
  - (B) totally incoherent
  - (C) principally coherent
  - (D) principally incoherent.
40. Radiation emitted by a LED can be in the
- (A) UV region
  - (B) visible region
  - (C) visible as well as in the infrared region
  - (D) only in the infrared region.
41. A *p-i-n* photodiode, on an average, generates one electron-hole pair per five incident photons at a  $\lambda = 0.90 \mu\text{m}$ . Assuming all the photo-generated electrons are collected, what is the quantum efficiency of the diode ?
- (A) 20%
  - (B) 30%
  - (C) 40%
  - (D) 50%.
42. Given that Germanium ( Ge ) has a band gap of 0.67 eV, what is the wavelength that will be absorbed by it ?
- (A) 7,080 nm
  - (B) 4,560 nm
  - (C) 1,850 nm
  - (D) 1,100 nm.
43. Erbium-doped fibre amplifier repeaters operate at which of the following wavelength windows ?
- (A) Low dispersion window (  $\sim 1.3 \mu\text{m}$  )
  - (B) Low attenuation window (  $\sim 1.55 \mu\text{m}$  )
  - (C) Both of the above windows
  - (D) None of these.
44. The material for making an efficient LED should be
- (A) an indirect band gap type semiconductor
  - (B) a direct band gap type semiconductor
  - (C) a metal
  - (D) an insulator.

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45. Which of the following materials is not suitable for making an LED ?
- (A) GaAs
  - (B) Silicon
  - (C) InGaAsP
  - (D) GaAlAs.
46. Laser action in semiconductor  $p$ - $n$  junction is possible for
- (A) any finite value of forward current
  - (B) any finite value of reverse current
  - (C) current producing positive gain
  - (D) current sufficient to make gain exceeding total losses.
47. For the characteristic equation  $s^4 + 5s^3 + 5s^2 + 4s + k = 0$ , the system is stable if  $k$  lies in the range
- (A)  $4 > k > 0$
  - (B)  $80/105 > k > 0$
  - (C)  $2 > k > 0$
  - (D)  $84/25 > k > 0$ .
48. Nyquist stability criterion is based on the principle of
- (A) arguments
  - (B) imaginary numbers
  - (C)  $s$ -plane
  - (D) conjugates.
49. Hall effect transducers can be used to measure
- (A) mobility, conductivity and carrier type
  - (B) displacement, position and velocity
  - (C) position, magnetic flux and pressure
  - (D) displacement, position and magnetic flux.
50. The function of the dummy strain gauge, in measurement using two strain gauges, is to
- (A) increase the stability
  - (B) nullify the errors due to temperature
  - (C) measure the strain in both,  $X$  as well as  $Y$  directions
  - (D) increase the sensitivity of measuring system.