

Model Questions for Entrance Examination of Ph.D. (Electronic Science)

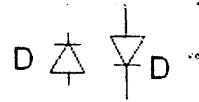
Max. Marks: 100]

[Max. Time: One Hours

- Note:**
1. All questions are compulsory.
 2. All questions carry equal marks.
 3. Select correct response choice for each question.
 4. There will be no negative marking.

Q1 The laplace transform of a square wave with amplitude of peak value A and period T is
 (a) $\frac{1+e^{-sT}}{1-e^{-sT}}$ (b) $\frac{A(1-e^{-sT})}{s(1+e^{-sT})}$ (c) $\frac{A(1+e^{-sT})}{s(1-e^{-sT})}$ (d) $\frac{A(1-e^{-sT})}{s(1+e^{-sT})}$

Q2 Name the diode circuit shown in fig.
 (a) Clamper (b) Clipper
 (c) Bidirectional clipper (d) Full - wave rectifier



Q3 The rms value of load current in a full wave rectifier is given by
 (a) $\frac{2I_o}{\pi}$ (b) $\frac{I_o}{\sqrt{2}}$ (c) $\frac{2I_o}{3}$ (d) $\frac{I_o}{2\sqrt{2}}$

Q4 The other name of early effect in a BJT is
 (a) clamping (b) depletion (c) clipping (d) base-width modulation

Q5 The quantity I_{CO} in a silicon transistor is of the order of
 (a) $10 \mu A$ (b) $0.1 A$ (c) $10 nA$ (d) $0.1 mA$

Q6 A self-bias circuit of a BJT employs how many biasing resistors?
 (a) 4 (b) 2 (c) 1 (d) None

Q7 The current I_{DSS} in a JFET occurs when V_{GS} is equal to
 (a) 0 (b) V_P (c) $> V_P$ (d) $< V_P$

Q8 An n-channel MOSFET works in depletion mode when V_{GS} is
 (a) positive (b) negative (c) zero (d) equal to V_{DS}

Q9 The common-drain amplifier has drain resistance R_D and source resistance R_S as
 (a) $R_D \neq 0, R_S = 0$ (b) $R_D = 0, R_S \neq 0$ (c) $R_D \neq 0, R_S = 0$ (d) $R_D = R_S = 0$

Q10 The upper cut-off frequency f_{β} of a high frequency CE amplifier is given by $f_{\beta} = (n) \cdot h_{fe}$. The value of n is
 (a) $\frac{1}{2}$ (b) $\frac{1}{2\sqrt{2}}$ (c) $\sqrt{2}$ (d) $\frac{1}{\sqrt{2}}$

Q11 The emitter-follower circuit employs which type of feedback?
 (a) voltage-series (b) current-series (c) voltage-shunt (d) current-shunt

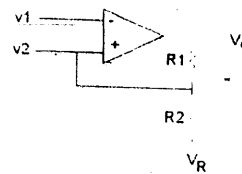
Q12 Which of the following is the fastest A/D converters
 (a) Comparator converter (c) Successive approximation
 (b) Counter type (d) Dual slope

Q13 Which of the following is analytical model of MOSFET
 (a) SPICE LEVEL 3 (c) EKV
 (b) BSIM3x3 (d) None of these

Q14 What are the elements employed by a crystal oscillator?
 (a) R-C (b) L-C (c) L-R (d) L-R-C

Q15 What is the function performed by the circuit shown in adjacent figure?

- (a) clipper (b) rectifier
(c) clamper (d) Schmitt trigger

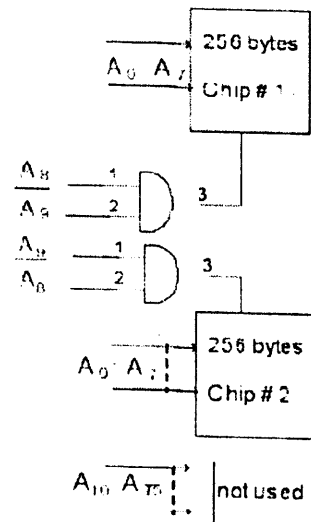


- Q16 Which of the parameters is not specified for digital ICs?
(a) Power dissipation (b) propagation delay (c) Noise Margin (d) Bandwidth
- Q17 In the binary number 110.101 the fractional part has the value
(a) 0.125 (b) 0.625 (c) 0.875 (d) 0.525
- Q18 Consider the following statements :
A totem pole configuration used in output stage of an op-amp has the advantage of using :
1. only n-p-n BJTs.
2. complementary symmetrical pair of transistor.
3. only one transistor.
which of the following is correct?
(a) 1 alone (b) 2 alone (c) 3 alone (d) 1 and 3
- Q19 A 1-bit full adder takes 20ns to generate carryout bit and 40 ns for Sum bit. What is the maximum rate of addition per second when four 1-bit full adders cascaded?
(a) 10^7 (b) 1.25×10^7 (c) 6.25×10^7 (d) 10^5
- Q20 Which one of the following statement is not correct?
(a) An 8 input MUX can be used to implement any 4 variable function.
(b) A 3 to 8 line DEMUX can be used to implement any 4 variable function.
(c) A 64 input MUX can be built using nine 8 input mux.
(d) A 6 line to 64 line DEMUX can be built using nine 3 line to 8 line DEMUXs.
- Q21 For ECL, the switching speed is very high because
(a) negative logic is used.
(b) the transistors are not saturated when conducting.
(c) emitter-coupled transistors are used.
(d) multi-emitter transistors are used.
- Q22 Which of the following circuits can be used as parallel-to-series converter?
(a) Digital Counter (c) De-multiplexer
(b) Decoder (d) Multiplexer
- Q23 If in a shift register, Q_0 (inverted output) is fed back to input the resulting counter is
(a) Twisted ring counter with N states (c) Twisted ring counter with 2N states
(b) Ring Counter with N states (d) Ring Counter with 2N states
- Q24 The 2's complement representation of -17 is
(a) 010001 (b) 110001 (c) 101110 (d) 101111
- Q25 The value of 2^5 in octal system
(a) 40 (b) 20 (c) 400 (d) 200
- Q26 Race condition always arises in a
(a) Combination circuit (c) Synchronous circuit
(b) Asynchronous circuit (d) Digital circuit

- Q27 The astable multivibrator has
 (a) two stable states (c) Two quasi-stable states
 (b) one stable and one quasistable state (d) None of the above
- Q28 The effective channel length of a MOSFET in saturation decreases with increase in
 (a) gate to source voltage (c) bulk to source voltage
 (b) drain to source voltage (d) does not change with any voltage
- Q29 In a microprocessor, the service routine for a certain interrupt starts from a fixed location of memory which cannot be externally set, but the interrupt can be delayed or rejected. Such an interrupt is
 (a) non-maskable and non-vectored (c) non-maskable and vectored
 (b) maskable and non-vectored (d) maskable and vectored

Q30 What memory address range is not represented by chip # 1 and chip # 2 in the figure. A_0 to A_{15} in this figure are the address line and CS means chip select.

- (a) 0100-02 FF
 (b) 1500-16 FF
 (c) F900-FAFF
 (d) F800- F9FF



- Q31 The maximum number of I/O ports in 8086 microprocessor are
 (a) 256 (b) 8K (c) 32K (d) 64K
- Q32 CISC machines
 (a) have fewer instructions than RISC machines (c) have medium clock speeds
 (b) use more RAM than RISC machines (d) use variable size instructions
- Q33 The attenuator is used in TWT to
 (a) Help bunching (c) Prevent Saturation
 (b) Prevent Oscillation (d) Increase Gain
- Q34 The number of spectral components when two sine waves are multiplied are
 (a) One (b) Two (c) Four (d) Eight
- Q35 An FM signal with deviation δ is passed through a mixer, and has its frequency reduced five fold. The deviation in the output of the mixer is
 (a) 5δ (b) $\delta/5$ (c) δ (d) Indeterminate
- Q36 The following microwave diode is suitable for very low power oscillations only
 (a) 8254 (b) 8259 (c) 8255 (d) 8279
- Q37 The following IC is used for prioritizing interrupts in the microprocessor based system
 (a) IMPATT (b) Tunnel (c) Gunn (d) LSA

- Q38 The advantage of self-correcting code is that
 (a) It is a weighted code (c) It is easy to decode electronically
 (b) It has even parity (d) All of these
- Q39 Two milliammeters, with full-scale current of 1 mA and 10 mA, are connected in parallel and they read 0.5 mA and 2.5 mA respectively. Their internal resistances are in the ratio of
 (a) 1:10 (b) 10:1 (c) 1:5 (d) 5:1
- Q40 Pirani gage or hot-wire metre is used for the measurement of
 (a) Temperature, radiant heat (c) Liquid level thickness
 (b) Relative humidity (d) Gas flow, gas pressure
- Q41 The torque produced in an indicating instrument by utilizing magnetic, electrodynamic, electromagnetic, thermal, chemical and electrostatic effects is known as _____ torque.
 (a) Controlling (b) Deflecting (c) Damping (d) Restoring
- Q42 The colour of the spot on the screen of a CRO is a characteristic of
 (a) Electron gun in CRT (c) The coating material of the screen
 (b) The type of waveform being observed (d) The velocity of electrons striking the screen
- Q43 The temperature coefficient of resistance for thermistors
 (a) Low and negative (c) Low and positive
 (b) High and negative (d) High and positive
- Q44 Patterning on a IC layer is done using
 (a) Photolithography (b) Etching (c) CVD (d) Epitaxy
- Q45 In regard to NMOS and PMOS, the following statement is correct
 (a) NMOS is faster but occupies more area (c) NMOS is faster and occupies less area
 (b) PMOS is faster but occupies more area (d) NMOS is slower but occupies less area
- Q46 The parasitic bipolar transistors in CMOS leads to
 (a) Latch-up (b) Better stabilized circuits (c) Low power circuits (d) Nothing
- Q47 The VTC of a fully complementary CMOS circuit is characterized by
 (a) $V_{OL} = 0$ and $V_{OH} < V_{DD}$ (c) $V_{OL} > 0$ and $V_{OH} < V_{DD}$
 (b) $V_{OL} > 0$ and $V_{OH} = V_{DD}$ (d) $V_{OL} = 0$ and $V_{OH} = V_{DD}$
- Q48 The number of repeaters along a coaxial cable link depends upon
 (a) The number of coaxial cables in the tube (c) The separation between the equalizers
 (b) The bandwidth of the system (d) None of these
- Q49 A vector field is given by $\vec{A} = 10e^{-r} \cdot \cos\phi \cdot \hat{a}_r - 15 \cdot \cos\phi \cdot \hat{a}_z$ in cylindrical co-ordinates. Then curl \vec{A} at $(4, \pi/2, 0)$ will be
 (a) $3.75\hat{a}_r + 0.045\hat{a}_z$ (c) $1.75\hat{a}_r + 0.45\hat{a}_z$
 (b) $7.5\hat{a}_r + 0.009\hat{a}_z$ (d) $7.5\hat{a}_r - 0.045\hat{a}_z$
- Q50 At the given probability of error, binary coherent FSK is inferior to binary coherent PSK by
 (a) 6 dB (b) 3 dB (c) 2 dB (d) 0 dB

Model Questions for Entrance Examination of Ph.D. (Electronic Science)

Max. Marks: 100]

[Max. Time: Two Hours

- Note: 1. Attempt any five questions out of eight.
2. All questions carry equal marks.

1. (a) Explain how the barrier potential is developed in a pn junction and metal-semiconductor junction in thermal equilibrium. (10)
(b) Explain the energy band diagram of a MOS diode in thermal equilibrium and show the formation of depletion region in MOS diode. (10)
2. (a) What are the various modes of operation available in BJT, emphasizing the active mode for an ideal PNP transistor? (10)
(b) Explain Laplace transform and solve the following differential equation by Laplace transform $Y'' + 4Y' + 4Y = t^2 e^{-2t}$ which satisfies the initial condition $Y(0) = 0; Y'(0) = 0$ (10)
3. (a) What do you understand by GUNN effect? How do we generate microwave oscillations using the GUNN Diode. (10)
(b) Explain the phenomenon of population inversion in semiconductors. Explain the principle of semiconductors LASERS in the light of this principle. (10)
4. (a) Explain FSK principle used in digital communication. Discuss error probability of this phenomenon. (10)
(b) Describe the composition of an optical Fibre, emphasizing the role of each constituent. Distinguish between step and graded index optical Fibres. (10)
5. (a) Describe the method used for the resistivity measurement of an arbitrary shaped sample. (10)
(b) What do you understand by an epitaxial layer, describe the Chemical Vapour Deposition Method used for its growth? (10)
6. (a) Enlist and explain the photolithographic steps used in Silicon IC technology. (10)
(b) Explain ion-implantation process for introducing a dopant into the semiconductor. What do you understand by the term "channeling" associated with it? (10)
7. (a) Design a synchronous Mod-5 Counter with J-K flip-flops. Draw the logic and timing diagrams. (10)
(b) What are various D/A conversion techniques, describe Ladder network method to describe D/A conversion. (10)
8. (a) Enlist and describe the elements of a computer Integrated experimentation. Explain your answer with a simple experimental design. (10)
(b) With the help of a block diagram, explain the working of a Lock-in-Amplifier. Mention its use in some electronic control application. (10)