In The Name of God

Technical Language :Homeworks 3-10

Teacher: Dr. M. R. Ramezani

Passage 3

High-electron-mobility transistor, or HEMTs are remarkable devices because they overcome a fundamental problem of solid-state physics. Semiconductors, as their name implies, normally don't conduct electricity all that well. Usually, they must be doped with other kinds of atoms to become electrically conductive. But those impurities tend to interfere with the movement of electrons through the semiconductor's crystal lattice, limiting the conductivity that can be obtained.

In HEMTs, electrons are introduced into a III-V semiconductor not by doping but by placing the material in contact with another III-V compound that is doped. In essence, electrons fall a short distance into the undoped material, allowing a thin layer of it—the channel—to conduct electricity extremely well whenever the transistor is switched on.

HEMTs can be used singly or in integrated circuits with, say, 100 or even 1000 of them clustered together, but they can't yet work for microprocessors. The problem is that too many of the electrons that are supposed to flow through the channel from the transistor's source electrode to its drain instead seep out the controlling input electrode—the gate—creating heat. With millions of leaky transistors crowded together on the same chip, things would quickly get hot enough to melt.

In a silicon MOSFET, a layer of intervening insulation (traditionally silicon dioxide) prevents electrons from slipping out of the channel into the gate. In a HEMT, the channel is separated from the gate by a semiconductor, which, as you might expect, is somewhat conductive. What's needed here, of course, is an insulator, but for decades there have been no good gate insulators available for gallium arsenide. From time to time over the years, researchers seem to uncover a promising material, but nothing ever really panned out—until recently.

10 - What is the fundamental problem of solid-state physics?
1) dependency to impurities.
2) irregular semiconductor's crystal lattice.
3) solid-state devices cost a lot.
4) conductivity limitation.

11 - HEMT conducts electricity well because....
1) of a III-V compound semiconductor.
2) electrons pass through a short distance channel.
3) electrons flow through an undoped material.
4) all of the above.

12 - Why HEMTs can not be used in microprocessors? Because...
1) they are very bulky.
2) they are very costly.
3) of heat restriction.
4) of power considerations.

13 - The verb *seep out* in the third paragraph is closes to which of the following verbs in the above passage?
1) slipping out in the fourth paragraph.
2) panned out in the fourth paragraph.
3) doped in the first paragraph.
4) conduct in the second paragraph.

14 - The paragraph following the passage would most likely be about?
1) HEMT integrated circuits.
2) gate insulator for gallium arsenide.
3) silicon dioxide.
4) a promising material.

Passage 2

Millimeter-wave radios, those operating at 30 GHz and above, have been available for many years. But because of the high frequencies involved, they were built from costly, difficult-to-integrate gallium arsenide. Packaging the chips and connecting them to an antenna without losing most of the signal added to their cost.

Only recently has a millimeter-wave silicon radio in a cheap package even seemed possible. "When we first talked about doing this in silicon, people laughed at us," says Brian Gaucher, who headed IBM's millimeter-wave radio effort at the Thomas J. Watson Research Center, in Yorktown Heights, N.Y. Actually, IBM does not use silicon alone. Rather, it uses a high-speed alloy of silicon and germanium. IBM's latest silicon-germanium technology makes transistors that can switch at a rate as fast as 200 GHz. Gaucher and his colleagues built separate transmitter and receiver chips with antennas incorporated right into the plastic package, eliminating the need for signal sapping interconnects and economizing on packaging. The chips communicated at 630 megabits per second over a distance of 10 meters.

UCLA electrical engineering professor Behzad Razavi is taking a different approach from IBM's. He's making key parts of his transmitters and receivers using 130-nanometer and 90-nm silicon CMOS manufacturing technology—mature chip-making processes used today to make microprocessors. There could be two advantages to this. First, the process technology is now so common and widespread that the chips that result will no doubt be cheap. Second, as the many millions of transistors on a microprocessor attest, CMOS lets you integrate a lot of devices on the same chip. "If I can put one antenna on a chip, I can put on four," says Razavi. And CMOS transmitters at 60 GHz will need all the antennas they can get. As individual transistors get smaller, they will be less able to handle the power required for RF transmission. So it is possible to put multiple transmitter circuits on a chip in parallel.

7 - Why gallium arsenide has not been used in today Millimeter-wave radio applications? Because...
1) it is costly.
2) it can not be integrated too much.
3) it looses so much signals.
4) all of the above.

8 - Why does IBM's millimeter-wave radio seem to be commercialized? Because they...
1) used silicon germanium rather than gallium arsenide.
2) did not use signal sapping interconnects.
3) used plastic package.
4) all of the above.

9 - What is Razavi's solution for power consideration in RF transceivers? Using...

1) multiple transmitter circuits in a chip.
2) transmitter and receiver over a distance of 10 meters.
3) larger transistors.
4) multiple receiver circuits on a chip in parallel.

Passage 1

Data processing is any computer process that converts data into information. The processing is usually assumed to be automated and running on a mainframe, minicomputer, or personal computer. Because data are most useful when well-presented and actually informative, data-processing systems are often referred to as information systems to emphasize their practicality. Nevertheless, both terms are roughly synonymous, performing similar conversions; data-processing systems typically manipulate raw data into information, and likewise information systems typically take raw data as input to produce information as output .

To better market their profession, a computer programmer or a systems analyst that might once have referred, such as during the 1970s, to the computer systems that they produce as data-processing systems more often than not nowadays refers to the computer systems that they produce by some other term that includes the word information, such as information systems, information technology systems, or management information systems .

In the context of data processing, data are defined as numbers or characters that represent measurements from the real world. A single datum is a single measurement from the real world. Measured information is then algorithmically derived and/or logically deduced and/or statistically calculated from multiple data. Information is defined as either a meaningful answer to a query or a meaningful stimulus that can cascade into further queries .

More generally, the term data processing can apply to any process that converts data from one format to another, although data conversion would be the more logical and correct term. From this perspective, data processing becomes the process of converting information into data and also the converting of data back into information. The distinction is that conversion doesn't require a question (query) to be answered. For example, information in the form of a string of characters forming a sentence in English is converted or encoded from a keyboard's key-presses as represented by hardware-oriented integer codes into ASCII integer codes after which it may be more easily processed by a computer - not as merely raw, amorphous integer data, but as a meaningful character in a natural language's set of graphemes - and finally converted or decoded to be displayed as characters, represented by a font on the computer display. In that example we can see the stage-by-stage conversion of the presence of and then absence of electrical conductivity in the key-press and subsequent release at the keyboard from raw substantially-meaningless integer hardware-oriented data to evermore-meaningful information as the processing proceeds toward the human being.

3 - The passage is mainly about.....

1) changing data into information
2) the uses of computers
3) the operation of a computer programmer
4) the advantages of automated processing

Passage 4

When scaling a monitoring system to thousands of entities around a large network, you can find that network links become clogged just from the monitoring traffic. To solve this problem, some monitoring systems have remote probes that collect data and only send summaries back to the master station. If these are strategically placed around the network, they can greatly reduce the amount of network traffic generated. The master station stores the data and makes it available to the SAs. The master station also holds the master configuration and distributes that to the remote monitoring stations. This model scales much further than a single monitoring station or multiple unrelated monitoring stations.

Real-time monitoring systems also have scaling problems. When such a system is watching many aspects of many devices, there will always be some things that are "red," indicating some form of outage requiring attention. To scale the system appropriately, the SAs must be able to tell at a glance which of the "red" issues is the "reddest" and having the most impact. Essentially, the problem is that a monitoring system typically only has a few states to indicate the condition of the monitored item. Often there are only three: "green," "yellow," and "red." Monitoring many things requires a finer granularity. For example, a very granular priority system could be built in, and the reporting system could display the problems in a priority-ordered list.

6 - The best title for the passage would be.....

1) How to Make Network Links
2) The Functions of Large Networks
3) The Two problems of Monitoring Systems
4) The Definition of the Monitoring Traffic

Passage 6

Capacitors are one of the crucial elements in integrated circuits and are used extensively in many applications such as data converters, sample and holds, switched-capacitor circuits, radio-frequency oscillators, and mixers. Capacitors can occupy a considerable area in the integrated circuit designs. Therefore, an area-efficient capacitor is highly desirable. The problem is more pronounced in modern process technologies where the virtual spacing of the metal layers does not scale much, if at all. There are four types of capacitors which have been commonly used in IC design. There are gate capacitors, junction capacitors, conventional metal-to-metal/poly capacitors and thin-insulator capacitors. Gate capacitors have a high density- i.e. high capacitance per unit area. However, they are nonlinear and require a dc bias voltage to operate. Moreover, gate capacitors have a low breakdown voltage due to the thin gate oxide, and also have a medium quality factor. Junction capacitors suffer from some of the above problems as well. They are highly nonlinear, and need a dc bias voltage. In addition, factors such as their sensitivity to process variations, poor quality factor, and large temperature coefficient limit their use in many applications. Metal-to-metal and metal-to-poly capacitors, on the other hand, are linear and have high Q. They also exhibit very small temperature variations. Unfortunately, the density of a traditional metal to metal capacitor is very low due to the relatively thick inter-level oxide layers. The problem becomes more severe with scaled technologies since the vertical spacing of the metal layers stays relatively constant. As a result, standard parallel palate capacitors consume a larger percentage of the die area as technologies scales down. There has been a recent growth in the use of thin-insulator capacitors in IC applications. Double-poly capacitors and metal-insulator-metal (MIM) capacitors use a thin oxide to achieve high density. The capacitance density is much higher than the density of standard metal-to-metal capacitor, but it is slower

than the density of a gate capacitor built in the same technology. The need for additional masks process steps makes these capacitors more expensive compared to other types of capacitors. Double-poly capacitors and MIM capacitors are highly linear and have high quality factors, but due to the cost overhead, they are generally not available in standard digital processes.

29 - According to the text, ... are linear and posses high Q factor.
1) gate capacitors
2) junction capacitors
3) switched capacitors
4) metal-to-metal capacitors

30 - What makes MIM capacitors unsuitable for standard digital processes?
1) their nonlinearity
2) higher mask and processing cost
3) use of thicker oxide to achieve the desired density
4) low capacitor density compared to standard metal-to-metal capacitors

Passage 5

Cost overruns and project delays have led to a cloudy forecast for United States' new polar-orbiting weather satellites, which were originally supposed to start circling the North and South Poles in 2008. The greatly upgraded satellites, to consist of a group of three with three replacements, are meant to beam back weather data that would enable scientists to better predict hurricanes such as Katrina. But development of the satellites is far behind schedule and their total estimated cost has ballooned from US $6.5 billion to more than $10 billion. Consider that the whole annual budget for Earth observation from space is about $3 billion.

The new satellites would improve long-term weather prediction by producing more detailed images of ocean surface temperatures and winds, ocean color, land surface temperatures, terrestrial vegetation, and land cover characteristics. They also transmit that information at much higher speed than is currently possible. The 22-channel VIIRS will provide complete global coverage of Earth in one day, base on infrared imaging, yielding the first-ever color pictures to be seen from a satellite in real time. This improved fidelity will allow a closer look at the intensity of particular weather patterns, because the cameras won't just look at the top of the clouds but will be able to peer into hurricanes and drag out data on their interior temperature and moisture, information U.S. forecasters now get from less-cable sensors mounted on aircraft.

25 - The new polar-orbiting satellites project has (a) ----- problems (s).
1) financial
2) technical
3) financial and schedule
4) financial and technical

26 - The color pictures sent by new satellites will be notable because-----.
1) of their real-time operation
2) of their long-term weather predication
3) it will be the first time that a satellite sends high fidelity pictures
4) they provide complete global coverage of the Earth for the first time

Passage 4

Our goal is to develop an underwater vehicle that can autonomously explore and collect data in aquatic environment while surviving the harsh saltwater conditions and often turbulent waters of the open sea. In building Aqua, we are tracking one of the most challenging topics in robotics: integration vision and locomotion into an amphibious machine that can determine what is "seeing," where it is and where it is going. Unlike many earlier UVs (under water vehicle), Aqua is intended for shallower waters, and its design reflects this. Although the majority of UVs are large and unwieldy-some require a carne to lower them into the water- Aqua only measures only 50 by 65 by 13 centimeters and weights just 18 kilograms. Aqua is thus easier to deploy: you can literally throw it into the water, or it can launch itself from the beach.

Even though Aqua's compact size and amphibious locomotion make it ideal for operating around coral reefs, some of our collaborators have other ideas for the robot. They believe Aqua could serve as the basis for other robotic machines that could do environmental inspections in deep water or near shore lines; perform routine monitoring in aquacultures; and also help human drivers with predrive safety checks and physical tasks underwater.

Aqua, which releases no bubbles and is much smaller than a human, can collect similar data using its underwater cameras while being less intrusive to fish. True, Aqua can't yet recognize coral or other stationary marine life, let alone moving fish. But the video data the robot collects can be analyzed by an expert.

22 - Why was Aqua built?
1) to understand "what is seeing? "
2) to prove that an amphibious machine can be built.
3) to find a solution for one of the most challenging topics in robotics.
4) to independently and safely collect data from harsh under water environments.

23 - Which statement is true?
1) Aqua is as big as many other UVs.
2) It is hard to throw Aqua into water.
3) UVs usually can launch themselves into water.
4) Many earlier UVs were made for exploring deep waters.

24 - The text implies that the designers of Aqua think that in the feature the machine....
1) can be less intrusive to the fish
2) can send better video data
3) will be able to work with human beings
4) might be able to recognize stationary marine life

Passage 7

In a not too distant past, analog to digital (A/D) converters were realized by only a few highly specialized manufacturers worldwide for use as standard parts assembled in large hybrid and PCB modules. Today, the relentless trend of electronics integration and miniaturization is rapidly changing the way AID converters are used, designed and even produced. Because such converters are being increasingly used as macro blocks embedded in to very large scale integration (VLSI) mixed-signal systems, their traditional label of "general purpose" components is quickly moving the way to "tailor-made" components that can optimally meet target specifications for performance, cost and energy consumption.

8 - Which phrase best explains the term "tailor-made"?

1) target-included
2) specification-driven
3) special-purpose
4) performance-optimized

9 - Which of the following best explain "hybrid"?

1) analog and digital
2) assembled and converted
3) embedded and quantized
4) integrated and miniaturized

Passage 4

Electro Magnetic Radiation (EMR) from cellular cordless and hand-held radios have billions of timeless energy to cause ionization or damage to DNA contained in human tissue. The rapid and widespread use of this technology, however, has raised concern over possible adverse health effects, in particular brain cancer. Several studies which addressed this concern have been conducted in a few countries. These studies seem to rule out, with a reasonable level of confidence, any association between EMR from these devices and cancer.

A growing number of scientific experts have shifted positions regarding the use of these types of wireless devices. Many of these experts believe that cancer is a risk associated with EMR in the higher wattage ranges. For base stations located at radio sites, the consensus of the scientific community is that the power produced is far too low to cause health hazard so long as people are not being held in close proximity to the antennas.

It is important to note that cellular and cordless telephones are relatively new technologies, and it is impossible to prove that any product or exposure is absolutely safe in the absence of long-term research. So, a good precautionary approach would be for adults to keep cell phone conversations short and to discourage frequent, extended use of cell phones by children. A notable danger involving the use of cellular

phones is not radiation, but is rather the increased risk of driving accidents while using them. The results of several studies indicated that talking on a cell phone while driving significantly increases the risk of accidents, with some suggesting that it is almost as dangerous as driving while being drunk.

22 - The consensus of the scientific community for base stations is that there is:

1) A possible risk a brain cancer.
2) No risk at all.
3) No damage as long as people keep away from the site.
4) Damage as long as people keep away from the antennas.

23 - Some experts believe that:

1) Cancer due to EMR is not associated with cell phones.
2) Cancer due to EMR is not associated with low power.
3) Cancer due to EMR is associated with high power.
4) Cancer due to EMR is associated with medium power.

24 - It is impossible to prove health hazard from cell phones because:

1) Cell phone is a new technology.
2) Exposure is not safe.
3) Exposure is absolutely safe.
4) Of the absence of long-term research.

25 - What's a notable danger involving the use of cellular phones?

1) Driving.
2) Driving while being drunk
3) Driving while talking using a cell phone.
4) Radiation.

Passage 3

Teaching a machine to sense its environment is one of the most intractable problems of computer science but one European project is looking to nature for help in cracking the conundrum. It combined streams of sensory data to produce an adaptive, composite impression of surroundings in near real-time. It looked at basic neural models for perception and then sought to replicate aspects of these in silicon. It is said that the objective was to study sensory fusion in biological system and then translate that knowledge into the creation of intelligent computational machines. SENSEMAKER took its inspiration from nature by trying to replicate aspects of the brain's neural processes, which capture sensory data from eyes, ears and touch, and then combine these senses to present a whole picture of the scene or its environment. For example, sight can identify a kiwi, but touch can help tell if that kiwi is ripe, unripe or over-ripe. To explore these aspects of biological perception SENSEMAKER first developed a model of human perception, based on the best available data from the biological and neurological sciences.

Biological neurons use short and sudden increases in voltage to send information. These signals are more commonly known as action potentials, spikes or pulses. Computer science calls the phenomenon Spiking Neural Networks. More traditional or classical artificial neural networks use a simpler model. U The traditional model of an artificial neural network is quite removed from biological neurons, while the spiking neural networks we used are more faithful to what happens in the real biological brain," says Professor McGinnity. Similarly, adaptation is another aspect of the biological model, known as plasticity, where data flows through new routes in the brain to add further resources to data capture. If repeated over time, this plasticity becomes learning, where well-traveled routes through the brain become established and reinforce the information that passes.

As the model was being established, the team 'developed hardware demonstrators to implement and test components of the overall sensory fusion system. One project partner focused on implementations based on classical traditional neural networks _ essentially large arrays of simple threshold devices. In paralled another group used Field Programmable Gate Arrays to implement large arrays of spiking neural networks for emulation of a number of components of the sensory system, particularly the visual processing element. "Field Programmable Gate Arrays are hardware computing platforms that can be dynamically reconfigured and as such, are ideal for exploring artificial representations of biological neurons, since their ability to

reconfigure can be exploited, to some extent to mimic the plasticity of biological networks of neurons," says Professor McGinnity. This approach allows for flexibility, both in terms of rapid prototyping and the ease with which different neuron models can be implemented and test.

18 - What's the source of the data for SENSMAKER?

1) Brain's neural system.
2) Capture sensory data from the scenery.
3) Capture sensory data from human sense.
4) Nature.

19 - To explore the aspects of biological perception by SENSMAKER, first:

1) A model of human perception was developed.
2) Data from human senses were gathered.
3) Human brain system was studied.
4) Neural models for perception was sought to replicate aspects in silicon.

20 - Biological neurons signals are .....

1) short. 2) short and sudden. 3) spike or pulse. 4) 2 and 3.

21 - The main feature of the Field Programmer Data Array as the hardware of SENSMAKER is:

1) Dynamically reconfigured.
2) Ease of operation.
3) Plasticity of biological networks.
4) Rapid hardware prototyping.

Relays are supposed to protect the power system from those conditions that we consider to be undesirable. These conditions may be harmful to the power apparatus - such as a line, a transformer, or a bus _ but, more often, the potential is for harm to the power system. It is the system that may go unstable, split up, and cause a blackout. It is to prevent these happenings that the relays must act quickly and accurately. And this, in fact, is the central dilemma of relaying: how to be quick and accurate at the same time. If you can be slow, you can think things over and be more accurate. Quickness of action is an invitation to make mistakes. So, relays will make mistakes. They can err on the side of being too cautious: the relays will fail to trip when they should have - in the relaying jargon, this is failure of dependability. Or they err on the other side: they will trip when they should not have - again, in the jargon, this is a loss of security. Both errors are bad, but we have to accept both. The relay designer strikes a balance between the two errors, and depending upon what the protection engineer did with his balancing act, the system will be prone to over-tripping, thus bringing the power system down - or it will fail to trip soon enough and may bring the system down anyway. It is a tough balancing act.

8 - Relays must act quickly and accurately ....

1) to set up undesirable conditions in a power system
2) to harm the power apparatus under transient conditions
3) to prevent the power system from becoming unstable
4) to eliminate lines, transformers, and buses from a power system

Passage 2

Mechatronics draws heavily on the concepts of synergistic integration of mechanical engineering with electronics, computers and control in the design and manufacturing of products and processes. The key spirit of mechatronic products is to add intelligent components and systems which combine an optimum use of multidisciplinary technologies to shorten the development cycle with reduced cost and increased quality. Intelligence and flexibility are essential in a mechatronic product. To achieve the primary function of an integrated system, it is essential that the functional interaction and spatial integration between mechanical, electronic, control and information technologies be accomplished in a synergistic way. Sensor technologies are as important in the mechatronic system as the senses are to the human being. It has been estimated that 80% of all measurements made in industry are of displacement nature. Proximity distance measurement constitutes the largest group of measurements made in science and technology. Therefore, this paper focuses on the discussion on proximity sensor with different physical sensing principles such as inductive, capacitive, photoelectric, ultrasonic, linear variable differential transformer, etc., including sensors which are useful in mechatronic systems such as silicon sensors, fiber-optic sensors, force/torque sensors and load cells. Furthermore, advances in the manufacturing of silicon chips which are able to integrate sensing devices and signal-processing electronics have opened the world to the development of microsensors on a scale approaching three orders of magnitude smaller than the diameter of a human hair. A combination of microsensors and multisensors and multisensor fusion will make possible a new range of applications. Continuing developments in microsensor technology demonstrate that it may soon be practical to consider using very dense populations of highly redundant sensors in mechatronic products in much the same way that they appear in biological systems. A modern appliance is an example of a mechatronic product. A washing machine requires a number of sensors, about 10 or more, to detect the level of water, the type of materials to be washed, the degree of dirt, the concentration of detergent, etc., so that is can provide the required immediate feedback for reliable, flexible operation.

15 . What are the essential ingredients of mechatronic products?

1) Combination of inductive, capacitive, photoelectric and ultrasonic sensors.
2) Intelligence and flexibility.
3) Proximity sensing and distance measurements.
4) Sensors similar to those in the human body.

16 - Which of the following has helped develop microsensors on extremely small scales?

1) Advances made in the manufacturing of silicon chips.
2) Combination of microsensors and multisensors and multisensor fusion.
3) Use of signal-processing electronic in sensing devices.
4) Use of intelligence and flexibility in sensor technology.

17 - The operation of sensors discussed in this paper in mainly based on:

1) Ferromagnetic, resistive and signal processing principles.
2) Inductive, capacitive, and photoelectric principles.
3) Principles imitating human senses.
4) Proximity distance measurement.

Passage 3

For fault-finding you must have at least a multi meter, either analogue or digital. An oscilloscope is not absolutely essential but you will find yourself very restricted without one. It's like trying to repair a car while wearing a blindfold. For audio equipment, a signal source is needed. Clearly a function generator is useful but simpler and cheaper alternatives work well in most cases. You only need a fixed frequency source, say 400 or 1000Hz sine or square wave. For cassette recorders a tape with a constant 400Hz wave recorded on both channels is adequate for most fault-finding. However, for checking playback levels and frequency response and aligning the tape head, proper test tapes, which are expensive, are required. For serious work, a collection of test leads and audio connectors is essential. Most modern audio equipments use phono-sockets so it's worthwhile investing in cables which terminate in phono-plugs. For other types of sockets, adaptors are available.

5 - What is a less complicated and less expensive alternative for a function generator?

1) Signal source
2) A fixed source
3) Audio equipments
4) Fault-finding test tapes

6 - What are phono-sockets associated with?

1) Adaptors
2) Tests leading to audio connectors
3) Cables which lead to phono-plugs
4) All of the above

Passage 8

Factors associated with the scaling of CMOS technology such as reliability and density are driving down supply voltages. Furthermore, the rapid growth of portable applications promotes battery operation which favors low voltage and low power circuits. As a result, many suggest that future implementation of mixed analog-digital circuits using standard CMOS will have power supplies of 1.5 V or less. Communication large-scale integrations (LSIs) are predicted to be the target. Threshold voltages of future standard CMOS technologies may not decrease much below what is available today. This poses a great challenge to CMOS analog/mixed signal circuit design. Consider the standard push-pull CMOS amplifier/inverter and transmission gates. These circuits require the analog power supply to be at least equal to the sum of the magnitudes of the n-channel and p-channel thresholds. Probably the most important solution to the threshold voltage limitation is the bulk-driven MOSFET. The gate-source potential is taken to a dc voltage that is sufficient to turn on the MOSFET. The drain is connected normally and the signal is applied between the bulk and the source. The current flowing from the source to drain is modulated by the reverse bias on bulk-channel junction. The result is a junction field-effect transistor with the bulk as the signal input gate. Consequently, a high-input impedance depletion-mode device would result.

21 - What factors are the driving forces for reduced supply voltages of CMOS?
1) Device density
2) Device reliability
3) Hybrid technology
4) Both 1 and 2

22 - What can be predicted as the great challenge in designing the analog circuits?
1) Low power CMOS
2) Threshold voltage
3) Mixture of analog and digital blocks
4) Portable instruments and battery usage capability

23 - The threshold voltage of standard CMOS technologies ....
1) need not change at all
2) would be reduced drastically
3) will have to decrease to meet the current challenge
4) may not decrease much below what is available today

24 - What is the most viable solution for the threshold voltage limitations?
1) Using BJT or JFET
2) Further consumption of NMOS in output
3) Applying signal to bulk instead of the gate
4) Applying signal to the source instead of the gate

25 - Taking the gate-source potential to a dc voltage sufficient to turn on the MOSFET, connecting drain normally and applying the signal between the bulk and the source would result in ...
1) low-input impedance depletion-mode device
2) high-input impedance depletion-mode device
3) low-input impedance enhancement-mode device
4) high-input impedance enhancement-mode d

Passage 7

Most current commercial packages for harmonic analysis use a direct solution method whereby a harmonic current source, specified in advance, is injected into the linear network to determine the voltage and current distortion levels. This approach provides realistic frequency domain models of the linear ac system. However, a harmonic current source is usually an oversimplified model of the non-linear plant. The overall solution for twelve pulse converter test system depends not only on the system voltage source, current source and impedances, but on converter variables such as controller characteristics, firing angle constraints, etc. Iterative techniques are thus necessary to solve all these variables together to reach a final correct solution. In the harmonic models of ac-dc system available in the literature, the emphasis is on the solution technique, with a clear trend towards the Newton method. In comparison, the question of model accuracy has been given very little attention and some early models are still superior to those recently described.

Under realistic conditions, the switching instant of the bridge valves are not equispaced over one cycle due to converter action. The incorporation of switching angle modulation in the converter model permits an accurate derivation of the individual switching instants; their effect on transfers between the ac and dc system must be quantified, and all causes influencing the modulation must be accounted for. An early cause of firing angle modulation was the use of individual firing control.

16 - Which method is used in commercial packages for harmonic analysis?
1) Iterative solution
2) Direct solution
3) Indirect solution
4) Injection solution

17 - For what kind of system does the direct solution method provide realistic frequency domain models?
1) Linear ac systems
2) Linear dc systems
3) Non-linear systems
4) Linear ac and dc systems

18 - Which of the following items does the overall solution for twelve-pulse converter test system depend on?
1) Converter variables
2) System voltage sources
3) Current sources and impedances
4) All of the above

19 - Which techniques are important to solve variables such as controller characteristics and firing angle constraints?
1) Direct solution
2) Newton's method
3) Indirect solution
4) Iterative techniques

20 - What was an early cause of firing angle modulation?
1) The use of frequency control
2) The use of individual firing control
3) The use of impedance variable control
4) The use of harmonic current source control