PUNJAB TECHNICAL UNIVERSITY
JALANDHAR

Max. Marks: 90 **Time: 90 Mins.**

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- ***Fill all the information in various columns, in capital letters, with blue/black ball point pen.***
- ***Use of calculators is not allowed. Use Blue/Black ball point pen for attempting the questions.***
- ***All questions are compulsory. No negative marking for wrong answers.***
- ***To attempt a question, make a tick mark (√) at the right option/answer.***
- ***Each question has only one right answer.***
- ***Questions attempted with two or more options/answers will not be evaluated.***

Stream *(Engg./Arch./Pharm./Mgmt./App.Sci./Life Sci.)* **Engineering**

Discipline **Electronics**

Name .....

Father's Name .....

Roll No. ..... Date: **15-01-2011**

Signature of Candidate .....

Signature of Invigilator .....

Q. 1 The System Of linear equations has

$4x + 2y = 7$

$2x + y = 6$

(a) a unique solution .....

(b) no solution .....

(c) an infinite number of solutions .....

(d) exactly two distinct solutions .....

Q. 2 The equation sin(z) = 10 has .....

(a) no real or complex solution .....

(b) exactly two distinct complex solutions .....

(c) a unique solution .....

(d) an infinite number of complex solutions .....

Q. 3 Which of the following is NOT associated with a p-n junction .....

(a) junction capacitance .....

(b) charge storage capacitance .....

(c) depletion capacitance .....

(d) channel length modulation .....

Q. 4 A Silicon PN junction at a temperature of 20C has a reverse saturation current of 10 pico-amperes (pA). The reverse saturation at 40 C for the same bias is approximately .....

(a) 30pA .....

(b) 40pA .....

(c) 50pA .....

(d) 60pA .....

Q. 5 The primary reason for the widespread use of Silicon in semiconductor device technology is .....

(a) abundance of Silicon on the surface of earth .....

(b) large band gap of Silicon in comparison to Germanium .....

(c) favorable properties of Silicon-dioxide (SiO_2) .....

(d) lower melting point .....

Q. 6 The effect of current shunt feedback in an amplifier is to .....

(a) increase the input resistance and decrease the output resistance

(b)increase both input and output resistances

(c) decrease both the input and output resistances .....

(d) decrease the input resistance and increase the output resistance .....

Q. 7 The cascade amplifier is a multistage configuration of .....

(a) CC-CB .....

(b) CE-CB .....

(c) CB-CC .....

(d) CE-CC .....

Q. 8 Decimal 43 in hexadecimal and BCD number system is respectively

(a) B2, 0100 0010 .....

(b) 2B, 0100 0011 .....

(c) 2B, 0011 0100 .....

(d) B2, 0100 0100 .....

Q. 9 Which of the following analog modulation scheme requires the minimum transmitted power and the minimum channel bandwidth?

(a) VSB

(b) DSB-SC

(c) SSB

(d) AM

Q. 10Despite the presence of negative feedback, control systems still have problems of instability because the

(a) Components used have nonlinearities

(b) Mathematical analysis involves approximations

(c) Dynamic equations of the subsystems are not known exactly

(d) System has large negative phase angle at high frequencies.

Q. 11 The impurity commonly used for realizing the base region of a silicon n-p-n transistor is

(a) Gallium

(b) Indium

(c) Boron

(d) Phosphorous

Q. 12 If for a silicon n-p-n transistor, the base-to-emitter voltage (V_{BE})is 0.7 V and the collector –to-base voltage (V_{CB}) is 0.2 V ,then the transistor is operating in the

(a) Normal active mode

(b) Saturation mode

(c) Inverse active mode

(d) Cutoff mode

Q. 13 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

Q. 14 A digital system is required to amplify a binary-encoded audio signal .The user should be able to control the gain of the amplifier from a minimum to a maximum in 100 increments. The minimum number of bits required to encode , in straight binary,is

(a) 8

(b) 6

(c) 5

(d) 7

Q. 15 The Fourier transform of a conjugate symmetric function is always

(a) imaginary

(b) Conjugate anti-symmetric

(c) real

(d) Conjugate symmetric

Q. 16 An AM signal and a narrow –band FM signal with identical carriers, modulating signals and modulation indices of 0.1 are added together. The resultant signal can be closely approximated by

(a) Broadband FM

(b) SSB with carrier

(c) DSB-SC

(d) SSB without carrier

Q. 17 A 0 to 6 counter consists of 3 flip flops and a combination circuit of 2 input gate(s). The combination circuit consists of

(a) one AND gate

(b) one OR gate

(c) one AND gate and one OR gate

(d) two And gates

Q. 18 The output of the 74 series of TTL gates is taken from a BJT in

(a) Totem pole and common collector configuration

(b) Either totem pole or open collector configuration

(c) Common base configuration

(d) Common collector configuration

Q. 19 The minimum number of comparators required to build an 8 bit flash ADC is

(a) 8

(b) 63

(c) 255

(d) 256

Q. 20 A PD controller is used to compensate a system .Compared to the uncompensated system has

(a) a higher type number

(b) reduced damping

(c) higher noise amplification

(d) larger transient overshoot

Q. 21 The bandgap of silicon at 300K is

(a) 1.36eV

(b) 1.10eV

(c) 0.80eV

(d) 0.67eV

Q. 22 The input to a coherent detector is DSB-SC signal plus noise. The noise at the detector output is

(a) the in-phase component

(b) the quadrature-component

(c) zero

(d) the envelope

Q. 23 The noise at the input to an ideal frequency detector is white. The detector is operating above threshold. The power spectral density of the noise at the output is

(a) raised-cosine

(b) Flat

(c) Parabolic

(d) Gaussian

Q. 24 At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by

(a) 6dB

(b) 3dB

(c) 2dB

(d) 0dB

Q. 25 The depth of penetration of electromagnetic wave in a medium having conductivity σ at a frequency of 1 MHz is 25 cm. The depth of a penetration at a frequency of 4MHz will be

(a) 6.25 cm

(b) 12.50 cm

(c) 50.00cm

(d) 100.00cm

Q. 26 A series RLC circuit has a resonance frequency of 1 kHz and a quality factor Q=100. If each of R,L and C is doubled from its original value, the new Q of the circuit is

(a) 25

(b) 50

(c) 100

(d) 200

Q. 27 A 4-bit ripple counter and a 4 bit synchronous counter are made using flip flops having a propagation delay of 10 ns each. If the worst case delay in the ripple counter and the synchronous counter be R and S respectively, then

(a) R=10 ns S=40 ns

(b) R=40 ns S=10 ns

(c) R=10ns S=30 ns

(d) R=30 ns S=10 ns

Q. 28 Three identical amplifiers with each one having a voltage gain of 50, input resistance of 1KΩ and output resistance of 250Ω, are cascaded. The open circuit voltage gain of the combined amplifier is

(a) 49 dB

(b) 51 dB

(c) 98 dB

(d) 102 dB

Q. 29 In an 8085 microprocessor, the instruction CMP B has been executed while the content of the accumulator is less than that of register B. As a result

(a) Carry flag will be set but Zero flag will be reset

(b) Carry flag will be reset but Zero flag will be set

(c) Both Carry flag and Zero flag will be reset

(d) Both Carry flag and Zero flag will be set

Q. 30 Twelve 1Ω resistance are used as edges to from a cube. The resistance between two diagonally opposite corners of the cube

(a) 5/6Ω

(b) 1Ω

(c) 6/5Ω

(d) 3/2Ω

Q. 31What should be the oscillator frequency for tuning in 90 MHz on a FM radio with 110.7 MHz IF?

(a) 100.7 MHz

(b) 10.7 MHz

(c) 91.7 MHz

(d) 79.3 MHz

Q. 32 According to Hartley's law

(a) The maximum rate of information depends on the channel bandwidth

(b) The maximum rate of information transmission depends on the depth of modulation

(c) Redundancy is essential

(d) Only binary code may be used

Q. 33 The dynamic range of a PCM encoder with 10 bit code words for a minimum SQR of 35dB is

(a) 60 dB

(b) 70 dB

(c) 25 dB

(d) 27 dB

Q. 34 Speech amplifiers are usually operated as

(a) Class A

(b) Class B

(c) Class C

(d) Class AB

Q. 35 Frequency divider is

(a) Locked oscillator divider

(b) Bistable multivibrator divider

(c) Astable multivibrator divider

(d) Regenerative divider

Q. 36 The effective height of a vertical quarter wave radiator can be increased by

(a) Loading with lumped inductance

(b) Capacitive hat

(c) Supporting on an insulator

(d) Pumping more power

Q. 37 In a telephone exchange serving 6400 subscribers .The number of calls originating per hour during peak hr is 8315. The calling rate is

(a) 8315

(b) 1.3

(c) 0.77

(d) 6400

Q. 38 The spectral density of white noise is

(a) Exponential

(b) Uniform

(c) Poission

(d) Gaussian

Q. 39 In a DM (delta modulation) system, the granular (idling) noise occurs when the

(a) modulation signal increases rapidly

(b) pulse rate decreases

(c) modulating signal remains constant

(d) pulse amplitude decreases

Q. 40 To increase the radar range of ground and the surface targets to see well beyond the normal radar horizon, the electromagnetic wave propagation adopted is

(a) Ionospheric scatter

(b) Troposcatter

(c) Ground wave propagation

(d) Duct

Q. 41 Long wave AM broadcast transmitters need

(a) very large carrier power

(b) large carrier power

(c) small carrier power

(d) very small carrier power

Q. 42 The noise figure of an amplifier is 3dB. Its noise temperature will be about

(a) 145K

(b) 290K

(c) 580K

(d) 870K

Q. 43 If $f_1(t)$ and $f_2(t)$ are duration limited signal such that
$f_1(t) \neq 0$ for $1 < t < 3$=0 elsewhere
$f_2(t) \neq 0$ for $5 < t < 7$=0 elsewhere,
then the convolution of $f_1(t)$ and $f_2(t)$ is zero everywhere except for

(a) 1< t <7

(b) 3< t <5

(c) 5< t <21

(d) 6< t <10

Q. 44 Which one of the following difference equations is non-recursive ?[y(k)=output; u(k)=input]

(a) y(k+2)+2y(k+1)-3y(k)=u(k+1)

(b) y(k+1)+y(k)=u(k+1)+2u(k)+u(k-1)

(c) y(k+1)+y(k)=u(k+1)+u(k)+u(k-1)

(d) y(k+1)+y(k)=u(k+1)+3u(k)+u(k-1)

Q. 45 A periodic voltage having the Fourier series v(t)=1+4sinwt+2coswt volts is applied across a one-ohm resistor. The power dissipated in the one-ohm resistor is

(a) 1 W

(b) 11 W

(c) 21 W

(d) 24.5 W

Q. 46 A continuous-time system is governed by the equation
$3y^3(t)+2y^2(t)+y(t)=x^2(t)+x(t)$
{y(t) and x(t) respectively are output and input }. The system is

(a) linear and dynamic

(b) linear and non-dynamic

(c) non-linear and dynamic

(d) non-linear and non-dynamic

Q. 47 Which one of the following system is a casual system? [y(t) is output and u(t) is an input step function]

(a) y(t)=sin[u(t+3)]

(b) y(t)=5u(t)+3u(t-1)

(c) y(t)=5u(t)+3u(t+1)

(d) y(t)=sin[u(t-3)]+sin[u(t+3)]

Q. 48 Effective impedance in parallel resonance is given by

(a) R

(b) L/CR

(c) C/LR

(d) LC/R

Q. 49 A minimum reactance function is one which has

(a) no zeros at origin

(b) no poles at origin

(c) no zeros on imaginary axis

(d) no poles on imaginary axis

Q. 50 Generator action can be explained by

(a) Ohm's law

(b) Kirchhoff's law

(c) Lenz's law

(d) Newton's law

Q. 51 An electric network with 8 independent nodes will have

(a) 8 nodal equations

(b) 7 nodal equations

(c) 9 nodal equations

(d) 4 nodal equations

Q. 52 The Laplace transformation method enables one to find the response of a network in

(a) the transient state only

(b) the steady state only

(c) both transient and steady states

(d) the transient state provided sinusoidal forcing functions do not exist

Q. 53 A capacitor used for a power factor correction in single-phase circuit decreases

(a) the power factor

(b) the line current

(c) both the line current and the power factor

(d) the line current and increase power factor

Q. 54 A low-pass filter circuit is basically

(a) a differentiating circuit with low time constant

(b) a differentiating circuit with large time constant

(c) an integrating circuit with low time constant

(d) an integrating circuit with large time constant

Q. 55 The poles and zeros of a driving-point function of a network are simple and interlace on the negative real axis with a pole closest to the origin. It can be realized

(a) by an LC network

(b) as an RC driving-point impedence

(c) as an RC driving –point admittance

(d) only by RLC network

Q. 56 A transmission line has reflection coefficient equal to 0.5.The VSWR is

(a) 3

(b) 0

(c) 2

(d) 1

Q. 57 Thermionic emission of electrons results from

(a) photovoltaic effect

(b) electrostatic fields

(c) high temperatures

(d) strong magnetic fields

Q. 58 A zener diode when biased correctly

(a) never overheats

(b) acts as a fixed voltage

(c) has a constant voltage across it

(d) has a constant current passing through it

Q. 59 A PIN diode is frequently used as

(a) harmonic generator

(b) peak clipper

(c) voltage regulator

(d) switching diode for frequencies into GHz range

Q. 60 The primary control on drain current in a JFET, is exerted by which of the following

(a) gate reverse bias

(b) channel resistances

(c) voltage drop across channel

(d) size of depletion regions

Q. 61 Satellite used for intercontinental communication are known as

(a) Comsat

(b) Domsat

(c) Marisat

(d) Intelsat

Q. 62 A supergroup pilot is

(a) applied at each multiplexing bay

(b) used to regulate the gain of individual repeaters

(c) applied at each adjustable-equalizer

(d) fed in at a GTE

Q. 63 Higher order TDM levels are obtained by

(a) dividing pulse widths

(b) using the α-law

(c) using the μ-law

(d) forming super master groups

Q. 64 Losees in optical fibers can be caused by (indicate the false statements)

(a) impurities

(b) microbending

(c) attenuation in the glass

(d) stepped index operation

Q. 65 Indicate the noise whose source is in a category different from that of the other three

(a) Solar noise

(b) Cosmic noise

(c) Atmospheric noise

(d) Galactic noise

Q. 66 The channel capacity of a band limited Gaussian channel is (B is the channel bandwidth)

(a) C= $B\log_2 S/N$

(b) C= $(\log_2 S/N)/B$

(c) C= $B\log_2(1+S/N)$bit/sec

(d) C= $B\log_2(1+S/N)$

Q. 67 A communication channel distributed by additive white Gaussian noise has a bandwidth w and a bandwidth of 4KHz and SNR of 15. The highest transmission rate that such a channel can support (in K-bit/sec) is

(a) 16

(b) 1.6

(c) 3.2

(d) 60

Q. 68 A radar is to have a maximum range of 60 km. The minimum allowable PRF for unambiguous reception is

(a) 2500μs

(b) 100PPS

(c) 2500PPS

(d) 5000PPS

Q. 69 The most probable bandwidth of a transplander in a satellite communication system is

(a) 10 MHz

(b) 10 GHz

(c) 36 MHz

(d) 1 MHz

Q. 70 A PLL can be used to demodulate

(a) PAM signals

(b) PCM signals

(c) FM signals

(d) DSB-SC signals

Q. 71 The first partial derivative of $z=x^3 + y^2 -3axy^2$ with respect to x is

(a) $3x^2-3ay^2$

(b) $2y-6axy$

(c) $3x^2+2y-3ay^2$

(d) $3x^2-6axy$

Q. 72 The maximum value of directional derivative of the function $\mu=2x^2+3y^2+5z^2$ at a point (1,1,-1) is

(a) 10

(b) -4

(c) $\sqrt{152}$

(d) 152

Q. 73 The magnitude of gradient of gradient of the function $f=xyz^3$ at (1,0,2)

(a) 0

(b) 3

(c) 8

(d) ∞

Q. 74 The sum of infinite series 1+1/2+1/3+

(a) π

(b) ∞

(c) 4

(d) $\pi^2/4$

Q. 75 We wish to solve x2-2=0 by Newton Raphson technique. Let the initial guess be $x_0=1.0$. Subsequent estimate of $x(x_1)$ will be

(a) 1.414

(b) 1.5

(c) 2

(d) None

Q. 76 In the gauss-elimination method for solving a system of linear algebraic equations triangularisation leads to

(a) Diagonal matrix

(b) Lower triangular matrix

(c) Upper triangular matrix

(d) singular matrix

Q. 77 A product is 0.5% defective and is packed in cartoon of 100.What will be the mean of such defective cartoon?

(a) 0.5

(b) 1

(c) 0.25

(d) 0

Q. 78 In a manufacturing plant the probability of making a defective bolt is 0.1. The mean and standard deviation of defective bolts in a total of 900 bolts are respectively

(a) 90,9

(b) 9,90

(c) 81,9

(d) 9,81

Q. 79 Probability of two friends sharing the same birth month is

(a) 1/6

(b) 1/12

(c) 1/144

(d) 1/24

Q. 80 The variance analysis is conserved with

(a) Determining change in a dependent variable per unit change in an independent variable

(b) Determining whether a quantitative factor affects the mean of an output variable

(c) Determining whether a significant correlation exists between an output variable and an input variable

(d) Determining whether variances in two or more population are significantly different

Q. 81 Four voice signals, each limited to a 4KHz and sampled at Nyquist rate, are converted into binary PCM signal using 256 quantizations levels. The bit transmission rate for the time division multiplexed signal will be .

(a) 8 Kbps

(b) 64 Kbps

(c) 256 Kbps

(d) 512 Kbps

Q. 82 The trigonometric Fourier series of an even function of time does not have the

(a) dc term

(b) cosine term

(c) sine term

(d) odd harmonic term

Q. 83 A band pass signal has significant frequency components in the range of 1.5MHz to 2 MHz. If the signal is to be reconstructed from its samples the minimum sampling frequency will be

(a) 1MHz

(b) 2MHz

(c) 3.5MHz

(d) 4MHz

Q. 84 If a sky wave with a frequency of 50 MHz is incident on the D-region at an angle of 80 degrees, then the angle of refraction is

(a) 15 degrees

(b) 60 degrees

(c) 30 degrees

(d) 55 degrees

Q. 85 A radar receives an echo from a target 20μs after sending the signal. The approximate range of the target is

(a) 300m

(b) 3000m

(c) 600m

(d) 6000m

Q. 86 The rate at which information can be passed through a telecommunication channel depends on the

(a) carrier frequency

(b) bandwidth

(c) transmission loss

(d) transmitter power

Q. 87 The input impedance of an S.C loss-less line of length $\lambda/8$ is

(a) zero

(b) resistive

(c) inductive

(d) capacitive

Q. 88 Coherent demodulation of FSK signal can be effective using

(a) Correlation receiver

(b) Band pass filters and envelope detector

(c) Matched filter

(d) Discriminator detector

Q. 89 Source encoding in a data communication system is done in order to

(a) enhance the information transmission rate

(b) reduce the transmission errors

(c) conserve the transmitted power

(d) facilitate clock recovery in the receiver

Q. 90 convolution of $x(t+5)$ with the impulse function $\delta(t-7)$ is equal to

(a) $x(t-12)$

(b) $x(t+12)$

(c) $x(t-2)$

(d) $x(t+2)$