



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.

Subject (Engg./Arch./Pharm./Mgmt./Sciences)

ENGINEERING

Discipline / Branch

ELECTRONICS

Name

Father's Name

Roll No.

Date : **10-07-2010**

Signature of Candidate

Signature of Invigilator

Q1. An ac voltage can be converted into a unidirectional voltage by using

- (a) a power amplifier circuit
- (b) an oscillator circuit
- (c) a multivibrator circuit
- (d) a rectifier circuit

Q2. An ideal voltage source is one which has

- (a) very high internal resistance
- (b) very low internal resistance
- (c) zero internal resistance
- (d) infinite internal resistance

Q3. A device whose characteristics are very close to that of an ideal current source is a

- (a) vacuum diode
- (b) transistor in common base mode
- (c) field-effect transistor
- (d) zener diode

Q4. A constant current source supplies a current of 300mA to a load of 1kΩ. When the load is changed to 100Ω, the load current will be

- (a) 3A
- (b) 30mA
- (c) 300mA
- (d) 600mA

Q5. The directive gain of a transmitting antenna is proportional to

- (a) its cross-sectional area
- (b) square of cross sectional area
- (c) square root of cross sectional area
- (d) cube root of cross sectional area

Q6. In a waveguide, the dielectric region is generally

- (a) air
- (b) magnetic material
- (c) brass
- (d) mica

Q7. To couple a coaxial line to a parallel wire line, it is best to use

- (a) slotted line
- (b) balun
- (c) directional coupler
- (d) $\lambda/4$ transformer

Q8. Three resistances of 15Ω each are connected in delta configuration. The resistance of equivalent star will have a value of

- (a) 15Ω
- (b) 5Ω
- (c) 40Ω
- (d) 45Ω

Q9. An RLC series circuit is excited by a step voltage E. The circuit current at $t = 0$ is

- (a) E/R
- (b) E/L
- (c) zero
- (d) infinity

Q10. Thevenin's equivalent circuit can be drawn

- (a) only in time domain
- (b) only in frequency domain
- (c) both in time and frequency domains
- (d) in frequency domain with some restrictions

Q11. Laplace transform method enables us to find the response in

- (a) steady state
- (b) transient state
- (c) both steady and transient states
- (d) transient state provided forcing functions do not exist

Q12. The curl of the gradient of a scalar function is equal to

- (a) 1
- (b) 0
- (c) infinity
- (d) 2π

Q13. An intrinsic semiconductor at absolute zero of temperature

- (a) behaves like an insulator
- (b) has a large number of holes
- (c) has a few holes and same number of electrons
- (d) behaves like a metallic conductor

Q14. In a semiconductor diode, the barrier potential offers opposition to only

- (a) majority carriers in both regions
- (b) minority carriers in both regions
- (c) free electrons in the N region
- (d) holes in the P region

Q15. A zener diode

- (a) has a high forward voltage rating
- (b) has a sharp breakdown at low reverse voltage
- (c) is useful as an amplifier
- (d) has a negative resistance

Q16. The light-emitting diode (LED)

- (a) is usually made from silicon
- (b) uses a reverse biased junction
- (c) gives a light output which increases with increase in temperature
- (d) depends on the recombination of holes and electrons

Q17. In a half wave rectifier, the peak value of ac voltage across the secondary of the transformer is $20\sqrt{2}$ V. If no filter circuit is used, the maximum dc voltage across the load will be

- (a) 28.28V
- (b) 14.14V
- (c) 20V
- (d) 9V

Q18. In a centre-tap full wave rectifier, V_m is the peak voltage between the center-tap and one end of secondary. The maximum voltage across the reverse-biased diode is

- (a) V_m
- (b) $\frac{1}{2} V_m$
- (c) $2V_m$
- (d) none of the above

Q19. In a PNP transistor, the electrons flow

- (a) out of the transistor at the collector and base leads
- (b) into the transistor at the emitter and base leads
- (c) into the transistor at the collector and base leads
- (d) out of the transistor at the emitter and base leads

Q20. A transistor connected in common-base configuration has

- (a) a low input resistance and a high output resistance
- (b) a high input resistance and a low output resistance
- (c) a low input resistance and a low output resistance
- (d) a high input resistance and a high output resistance

Q21. The operation of a JFET involves

- (a) a flow of minority carriers
- (b) a flow of majority carriers
- (c) recombination
- (d) negative resistance

Q22. The Q point in a voltage amplifier is selected in the middle of the active region because

- (a) it gives a distortionless output
- (b) the operating point then becomes very stable
- (c) the circuit then requires less number of resistors
- (d) it then requires a small dc voltage

Q23. In an amplifier, the coupling capacitors are used for

- (a) to control the output
- (b) to limit the bandwidth
- (c) to match the impedances
- (d) to prevent dc mixing with input or output

Q24. An amplifier circuit of voltage gain 100, gives 2V output. The value of input voltage is

- (a) 200V
- (b) 50V
- (c) 20mV
- (d) 2mV

Q25. The overall gain of a two stage RC coupled amplifier is 100. A signal voltage of 10V, 1kHz is applied across the output terminals of this amplifier. Then the voltage output obtained across the input terminals will be

- (a) 0.1V, 1kHz
- (b) 0V
- (c) 100V, 1kHz
- (d) 10V, 1kHz

Q26. Heat sinks are used in power amplifier circuits

- (a) to increase the output power
- (b) to reduce heat losses in the transistor
- (c) to increase the voltage gain of the power amplifier
- (d) to increase the collector dissipation rating of the transistor

Q27. The voltage gain of an amplifier is 100. On applying negative-feedback with $\beta = 0.03$, its gain will reduce to

- (a) 70
- (b) 99.97
- (c) 25
- (d) 3

Q28. We use a crystal oscillator because

- (a) it gives high output voltage
- (b) it works at high frequency
- (c) the frequency of oscillations remains substantially constant
- (d) it requires very low dc supply voltage

Q29. The attenuator in a signal generator is used to

- (a) provide an external shunt across the output terminals
- (b) vary the output impedance of the oscillator
- (c) increase the frequency of the output voltage
- (d) vary the output voltage amplitude in steps

Q30. When microprocessor processes both positive and negative numbers, the representation used is

- (a) 1's complement
- (b) 2's complement
- (c) signed binary
- (d) any of above

Q31. A mod 4 counter will count

- (a) from 0 to 4
- (b) from 0 to 3
- (c) from any number n to n + 4
- (d) none of the above

Q32. In a Boolean algebra, $a + ab = a$ is

- (a) Involution law
- (b) De-Morgan law
- (c) Absorption law
- (d) Idempotent law

Q33. Minimum number of NAND gates required to implement EX-OR gate is

- (a) 4
- (b) 5
- (c) 3
- (d) 2

Q34. Which one of the following is equivalent to AND-OR realization

- (a) NAND-NOR realization
- (b) NOR-NOR realization
- (c) NOR-NAND realization
- (d) NAND-NAND realization

Q35. The noise margin of a TTL gate is about

- (a) 0.2V
- (b) 0.4V
- (c) 0.6V
- (d) 0.8V

Q36. Implementation of full adder with 2 half adders requires

- (a) OR gate
- (b) NOR gate
- (c) AND gate
- (d) NAND gate

Q37. A Gray-to-Binary code converter requires

- (a) EX-OR gate
- (b) EX-NOR gate
- (c) NOR gate
- (d) EX-OR and EX-NOR gate

Q38. What is the number of selector lines required in a single-input n-output demultiplexer?

- (a) 2
- (b) n
- (c) 2^n
- (d) $\log_2 n$

Q39. The operation of a multiplexer is same as

- (a) OR-AND operation
- (b) AND-OR operation
- (c) OR-NAND operation
- (d) NOR-AND operation

Q40. In an SR flip flop, S=1 and R=1 gives

- (a) Set state
- (b) Reset state
- (c) Indeterminate state
- (d) None of the above

Q41. How many flip flops are required to implement divide-by-20 in a Johnson counter configuration?

- (a) 20 flip-flops
- (b) 10 flip-flops
- (c) 5 flip-flops
- (d) 1 flip-flop

Q42. Data can be changed from spatial code to temporal code and vice-versa by using

- (a) ADCs and DACs
- (b) Shift Registers
- (c) Timer
- (d) Synchronous Counter

Q43. The aperture time of an ADC is given by

- (a) $\frac{E_m}{2\pi\Delta E}$
- (b) $\frac{2\pi f}{\Delta E \cdot E_m}$
- (c) $\frac{\Delta E}{2\pi E_m}$
- (d) $\frac{2\pi E_m}{\Delta E}$

Q44. RAM is a

- (a) volatile memory
- (b) no-volatile memory
- (c) some time volatile and sometime non-volatile memory
- (d) none of the above

Q45. The Laplace Transform of a unit step function is

- (a) 1
- (b) $\frac{1}{s}$
- (c) s
- (d) $\frac{1}{s^2}$

Q46. The area of an impulse is

- (a) 1
- (b) 0
- (c) ∞
- (d) any finite value

Q47. The inverse Laplace transform of $\frac{1}{(s-a)^2}$ is

- (a) e^{at}
- (b) $-e^{at}$
- (c) $1 - e^{at}$
- (d) $-1 + e^{at}$

Q48. A voltage wave is $v = 50\sin \omega t$. Its average value calculated over full one cycle is

- (a) zero
- (b) 35.36V
- (c) 31.85V
- (d) none of the above

Q49. A voltage wave is $i = 100\sin(\omega t)$. Its average value calculated over one half cycle is

- (a) zero
- (b) 70.72V
- (c) 63.70V
- (d) none of the above

Q50. If $f(t)$ is an even function, the coefficients F_N in exponential form of Fourier series

- (a) are real
- (b) are imaginary
- (c) are complex
- (d) may be real or imaginary

Q51. The coefficients F_N in exponential form of Fourier series are

- (a) independent of frequency
- (b) function of frequency
- (c) even function of frequency
- (d) odd function of frequency

Q52. The derivative of unit step function is

- (a) unit impulse
- (b) ramp with slope 1
- (c) impulse
- (d) either (a) or (b)

Q53. If a number of even functions are added, the resultant sum is

- (a) even function
- (b) odd function
- (c) either even or odd function
- (d) mixture of odd and even functions

Q54. If a function is an odd function, its Fourier series

- (a) contains only sine terms
- (b) contains only cosine terms
- (c) contains a constant and sine terms only
- (d) contains a constant and cosine terms only

Q55. Z-transform of $[a(x_k) + b(y_k)] =$

- (a) $aX(z) - bY(z)$
- (b) $aX(z) + bY(z)$
- (c) $aX(z) + bY(z) + a/b$
- (d) $aX(z) + bY(z) - a/b$

Q56. The auto correlation of a sampling function is a

- (a) triangular function
- (b) gate function
- (c) signum function
- (d) none of the above

Q57. A stationary process has

- (a) all statistical properties independent of time
- (b) all statistical properties dependent of time
- (c) zero variance
- (d) ensemble average equal to time average

Q58. The term energy spectral density is associated with

- (a) periodic waveform
- (b) non-periodic waveform
- (c) both periodic and non-periodic waveform
- (d) none of the above

Q59. The Eigen values of matrix $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ are

- (a) 1,1
- (b) -1, -1
- (c) j,-j
- (d) 1,-1

Q60. Final value theorem is used for

- (a) steady state value of system output
- (b) initial value of output
- (c) transient behaviour of output
- (d) none of the above

Q61. In force voltage analogy the quantity analogous to spring constant K is

- (a) R
- (b) C
- (c) L
- (d) 1/C

Q62. For underdamped second order system, the rise time is the time required for the response to rise from

- (a) 0% to 100% of its final value
- (b) 10% to 90% of its final value
- (c) 5% to 95% of its final value
- (d) either (a) or (b)

Q63. A proportional controller is basically

- (a) an amplifier with adjustable gain
- (b) an integrating amplifier
- (c) an amplifier with infinite gain
- (d) an amplifier with almost zero gain

Q64. In an integral controller

- (a) the output is proportional to input
- (b) the rate of change of output is proportional to input
- (c) the output is proportional to rate of change of input
- (d) none of the above

Q65. Which control action is also called rate control?

- (a) proportional
- (b) derivative
- (c) integral
- (d) proportional plus integral

Q66. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is

- (a) stable
- (b) unstable
- (c) limitedly stable
- (d) either (a) or (c)

Q67. A lead compensator

- (a) speeds up the transient response
- (b) increases the stability margin
- (c) increases the stability margin and speeds up the transient response
- (d) none of the above

Q68. The frequency at which phase angle is 180° is called

- (a) phase cross over frequency
- (b) stability limit frequency
- (c) frequency of limited stability
- (d) gain margin frequency

Q69. A system has high gain and phase margins. The system is

- (a) very stable
- (b) sluggish
- (c) very stable and sluggish
- (d) oscillatory

Q70. A system is highly oscillatory if

- (a) gain margin is high
- (b) gain margin is close to 1
- (c) gain margin is close to 1 and phase margin is zero
- (d) gain margin is high and phase margin is 180°

Q71. A thermometer requires 1 minute to indicate 98% of its final response to a step input. If it is first order system, the time constant is

- (a) 1 minute
- (b) 0.5 minute
- (c) 0.25
- (d) 0.1 minute

Q72. The root locus branches

- (a) start from open loop poles and terminate at zero
- (b) start from open loop zeros and terminate at poles
- (c) may start from pole or zero and terminate at another pole or zero
- (d) none of the above

Q73. The phase angle curve of $G(j\omega) H(j\omega)$ can be drawn

- (a) by adding the phase angle curves of individual factors
- (b) by subtracting the phase angle curves of individual factors
- (c) by multiplying the phase angle curves of individual factors
- (d) by dividing the phase angle curves of individual factors

Q74. The polar plot of $G(j\omega) = 1/j\omega$ is

- (a) positive imaginary axis
- (b) positive real axis
- (c) negative imaginary axis
- (d) negative real axis

Q75. Sound waves travel as

- (a) longitudinal waves
- (b) transverse waves
- (c) both longitudinal and transverse waves
- (d) either longitudinal or transverse waves

Q76. In PCM, the biggest advantage as compared to AM is

- (a) larger bandwidth
- (b) larger noise
- (c) inability to handle analog signals
- (d) incompatibility with time division multiplex systems

Q77. Homodyne detection means

- (a) coherent detection
- (b) non-coherent detection
- (c) asynchronous detection
- (d) none of the above

Q78. Filter method and phasing methods are the methods for generating

- (a) SSB signal
- (b) vestigial side band signal
- (c) both SSB and vestigial side band signals
- (d) none of the above

Q79. For AM receivers, the standard IF frequency is

- (a) 106kHz
- (b) 455kHz
- (c) 1.07MHz
- (d) 10.7MHz

Q80. If carrier modulation by a digital bit stream having one of the possible phases of 0° , 90° , 180° , and 270° , then modulation is called

- (a) BPSK
- (b) QPSK
- (c) QAM
- (d) MSK

Q81. BPSK stands for

- (a) binary phase shift keying
- (b) broad phase shift keying
- (c) bit phase shift keying
- (d) binary pulse shift keying

Q82. PAM stands for

- (a) pulse analogue modulation
- (b) phase analogue modulation
- (c) pulse amplitude modulation
- (d) phase amplitude modulation

Q83. In FM modulation, pre-emphasis is done for

- (a) high frequency components
- (b) low frequency components
- (c) middle frequency components
- (d) both (a) and (b)

Q84. In a radio receiver, the input from local oscillator is fed to

- (a) RF amplifier
- (b) mixer
- (c) IF amplifier
- (d) detector

Q85. Permittivity has the units

- (a) farads\meter
- (b) coulomb\meter
- (c) farad\meter²
- (d) coulomb\ meter²

Q86. Coulomb's law

- (a) is a vector equation
- (b) is a scalar equation
- (c) may be a vector or scalar equation
- (d) is a phasor equation

Q87. The direction of induced emf is given by

- (a) Fleming's right hand rule
- (b) Cork screw rule
- (c) Fleming's left hand rule
- (d) KVL

Q88. The current through a pure capacitor is

- (a) displacement current
- (b) conduction current
- (c) partly displacement current and partly conduction current
- (d) either conduction current or displacement current

Q89. In transverse electromagnetic mode transmission lines

- (a) E is entirely transverse
- (b) H is entirely transverse
- (c) both E and H are entirely transverse
- (d) none of the above

Q90. For a lossless line short circuited at load end, the transmission coefficients for voltage and current are

- (a) 0 and 2 respectively
- (b) 2 and 0 respectively
- (c) 1 each
- (d) none of the above