



Punjab Technical University

Maximum Marks: 90

Time: 90Mins.

Entrance Test for Enrollment in Ph.D Programme

Important Instructions

- ➔ Fill all the information in various columns, in Capital letters, with blue/black point pen for attempting the questions
- ➔ Use of calculators is not allowed.
- ➔ Make attempt by writing the answer in capital Letters in the box against each question number.
- ➔ All questions are compulsory. Each Question has only one right answer. No Negative marking for wrong answers.
- ➔ Questions attempted with two or more options/answers will not be evaluated.

Stream:Engineering

DisciplineElectrical Engineering

Name

Fathers Name

Roll NumberDate: 13-07-2014

Signature of Candidate:

Signature of Invigilator

- 1 For a series R-L-C circuit at resonance condition, the power factor of the circuit at lower half power frequency is
 - A) leading
 - B) lagging
 - C) unity
 - D) zero
- 2 Pure capacitive circuit takes power from the ac line when
 - A) voltage and current are of same sign
 - B) voltage -ive and current +ive
 - C) voltage +ive and current -ive
 - D) none of these
- 3 A resistance of R ohm is connected in one branch of a network. The current in this branch is x A. If this resistor is replaced by a smaller value, the current in this branch
 - A) will be more than x A
 - B) it may be more or less than x A
 - C) will be less than x A
 - D) none of these

- 4 A coil with a certain number of turns has a specified time constant. If the number of turns is halved, its time constant would
- A) remain same
 - B) becomes four-fold
 - C) becomes doubled
 - D) get halved
- 5 In an ac circuit, 12 ohm resistor is connected in parallel with a series combination of 20 F capacitor and 20 H inductor. This circuit is supplied with a sinusoidal ac voltage source of 15 V in series with 3 ohm resistor. The current supplied by the source will be
- A) 5 A
 - B) 1 A
 - C) data given are insufficient
 - D) none of these
- 6 The system characterized by the equation $y(t) = ax(t)+b$ is
- A) non-linear
 - B) linear if $b > 0$
 - C) linear if $b < 0$
 - D) none of the above
- 7 Two coupled coils connected in series have an equivalent inductance of 20 mH or 12 mH depending on the inter-connection. Then the mutual inductance M between the coils is
- A) 4 mH
 - B) 8 mH
 - C) 12 mH
 - D) 2 mH
- 8 In a two-wattmeter method of power measurement, one of the wattmeters will show zero reading when the power factor of load is
- A) zero
 - B) less than 0.5
 - C) more than 0.5
 - D) none of above
- 9 A low – pass filter with a cut-off frequency of 30Hz is cascaded with a high-pass filter with a cut-off frequency of 20Hz. The resultant system of filters will function as
- A) an all-pass filter
 - B) an all-stop filter
 - C) an band stop (band-reject) filter
 - D) a band – pass filter

- 10 Which quantity in a magnetic circuit is analogous to electromotive force in an electric circuit?
- A) current
 - B) ampere-turns
 - C) magnetic flux
 - D) magnetic flux density
- 11 In a given magnetic circuit, a current of 1 A flowing in the exciting winding produces a flux of 1 Wb. If the circuit reluctance is doubled, for the production of same flux, the exciting current required would be
- A) 2 A
 - B) 1 A
 - C) 0.5 A
 - D) 1.5 A
- 12 A circular disc of radius 4 m with a charge density $\rho_s = 12 \sin\phi \mu\text{C}/\text{m}^2$ is enclosed by surface S, net flux (in μC) crossing S is
- A) 0
 - B) 2
 - C) 5
 - D) 10
- 13 The average power delivered to an impedance $(5+j4)$ ohm by a current $10\cos(100\omega t+10^\circ)\text{A}$ is
- A) 44.2 W
 - B) 250 W
 - C) 62.5 W
 - D) 125 W
- 14 If two capacitors (C_1 and C_2) are connected in parallel through a switch S, when S is open, C_1 is charged to 20 V. When S is closed at $t = 0$, the current through C_2 for $t \geq 0$ is
- A) zero
 - B) a step function
 - C) an exponentially decaying function
 - D) an impulse function
- 15 KCL and KVL are applicable to
- A) any type of electrical network
 - B) only linear
 - C) only non-linear network
 - D) only linear bilateral network

- 16 If b is the number of branches and n is the number of nodes in a connected graph, the number of links corresponding to any tree of a graph is
- A) $n+1-b$
 - B) $b-n+1$
 - C) $n-b-1$
 - D) $n-b$
- 17 A transformer has maximum efficiency at $4/5^{\text{th}}$ of full-load. Its iron loss (P_i) and full load copper loss (P_c) are related as
- A) $P_i / P_c = 25/16$
 - B) $P_i / P_c = 4/5$
 - C) $P_i / P_c = 5/4$
 - D) $P_i / P_c = 16/25$
- 18 If a transformer is operated at rated frequency but at a voltage less than its rated value, no load current and iron loss as compared to their rated values will
- A) increase, decrease respectively
 - B) both decrease
 - C) decrease, increase respectively
 - D) both increase
- 19 Voltage regulation of a transformer having pure resistive load is
- A) always negative
 - B) always positive
 - C) it may be positive, zero or negative depending on the load current
 - D) it does not depend on the nature of load
- 20 The no-load speed of a 230V, separately excited D.C. motor is 1400 rpm. The armature resistance drop and brush drop are neglected. The field current is kept constant at rated value. The torque of the motor in N-m for an armature current of 10A is
- A) 12.55
 - B) 15.69
 - C) 20.18
 - D) 7.65
- 21 In a synchronous machine, hunting is predominately damped by
- A) mechanical losses in rotor
 - B) iron losses in rotor
 - C) copper losses in stator
 - D) copper losses in rotor

- 22 When a two-winding transformer is connected as an auto transformer, its kVA rating
- A) remains the same
 - B) increases
 - C) decreases
 - D) rise to 100%
- 23 The power rating of a servo motor as compared to conventional electric motors is
- A) low
 - B) high
 - C) equal
 - D) very high
- 24 In an induction motor the rotor field runs with respect to the stator field
- A) at synchronous speed in the same direction as the stator field
 - B) at the slip speed in the same direction as the stator field
 - C) at synchronous speed in the opposite direction as the stator field
 - D) at zero speed
- 25 The power input to an induction motor is 100 kW when it runs at 2% slip. The stator losses are assumed negligible. Rotor copper loss is
- A) 2 kW
 - B) 4 kW
 - C) 98 kW
 - D) 1 kW
- 26 Which of the following dc motor is suitable for intermittent load?
- A) Shunt
 - B) Series
 - C) Cumulatively compounded
 - D) Differentially compounded
- 27 In a thyristor, in general, the ratio of latching current to holding current is
- A) One
 - B) less than one
 - C) more than one
 - D) none of above
- 28 The di/dt rating of an SCR is specified for its
- A) decaying anode current
 - B) rising gate current
 - C) decaying gate current
 - D) rising anode current.

- 29 A single phase full converter with RL load can be operated in
- A) first quadrant only
 - B) first and second quadrant only
 - C) first and fourth quadrant only
 - D) all four quadrants
- 30 A single-phase full-bridge VSI operating in square-wave mode supplies a purely inductive load. If the inverter time period is T , then the time duration for which each of the feedback diodes conduct in a cycle is
- A) T
 - B) $T/4$
 - C) $T/2$
 - D) $T/8$
- 31 The output voltage of a dc to dc converter can be ----- input dc voltage
- A) equal to
 - B) less than
 - C) more than
 - D) all of above
- 32 A step-up chopper supplying a load at 400 V and operating at 250 V. The off time of switch is 20 μs and current through inductor is continuous and ripple free. The frequency of chopper in is
- A) 31.25 kHz
 - B) 21.25 kHz
 - C) 0.031 kHz
 - D) 31250 Hz
- 33 The number of control lines for 16 to 1 multiplexer is
- A) 2
 - B) 4
 - C) 3
 - D) 5
- 34 How many controlled switches will be required for operating a dc motor in all four quadrants using dc chopper circuit?
- A) one
 - B) two
 - C) three
 - D) four

- 35 As compared to power MOSFET, a BJT has
- A) lower switching losses but higher conduction losses
 - B) higher switching losses but lower conduction losses
 - C) higher switching and conduction losses
 - D) lower switching and conduction losses
- 36 Improper biasing of a transistor circuit leads to
- A) distortion in the output signal
 - B) faulty location of load line
 - C) excessive heat production at collector terminals
 - D) heavy loading of emitter terminal
- 37 Two resistors of resistances 30 ± 2 ohm and 60 ± 3 ohm are connected in parallel. What will be absolute and relative error in equivalent resistance?
- A) $11/9$ ohm, $11/180$
 - B) $9/11$ ohm, $180/11$
 - C) $9/11$ ohm, $11/180$
 - D) $13/11$ ohm, $11/180$
- 38 Moving iron instruments can be used for the measurement of
- A) a.c. and d.c.
 - B) a.c. only
 - C) d.c. only
 - D) half wave rectified a.c.
- 39 The power in a 3-phase balanced system/load can be measured by using
- A) two wattmeters
 - B) one wattmeter
 - C) three wattmeters
 - D) none of the above
- 40 The burden of a current transformer is expressed in terms of
- A) VA rating of a current transformer
 - B) primary winding current
 - C) secondary winding current
 - D) voltage rating of a current transformer
- 41 The resolution of a $4\frac{1}{2}$ digit voltmeter is
- A) 0.0001
 - B) 0.0020
 - C) 0.0010
 - D) 0.0002

- 42 A 10 bit A/D converter is used to digitise an analog signal in the 0 to 5 V range. The maximum peak to peak ripple voltage that can be allowed in the dc supply voltage is
- A) nearly 100 mV
 - B) nearly 5.0 mV
 - C) nearly 25 mV
 - D) nearly 75 mV
- 43 CPU of an 8085 microprocessor consists of
- A) ALU, accumulator, general and special purpose registers
 - B) accumulator, timing and control unit
 - C) ALU, accumulator, timing and control circuits
 - D) ALU, accumulator, general and special purpose registers, timing and control circuits
- 44 Which of the following is/are sequential circuit(s)
- A) register
 - B) memory
 - C) counters
 - D) all of above
- 45 The good effect of corona on overhead lines is to
- A) reduce the steepness of surge fronts
 - B) reduce the radio interference from the conductor
 - C) increase the power factor due to corona loss
 - D) none of above
- 46 In overhead transmission lines the effect of capacitance can be neglected when the length of line is less than
- A) 200 km
 - B) 120 km
 - C) 160 km
 - D) 80 km
- 47 Relay used for protection of short transmission lines is
- A) reactance relay
 - B) impedance relay
 - C) mho relay
 - D) none of these

- 48 In case the characteristic impedance of the line is equal to the load impedance
- A) all energy will pass to earth
 - B) the system will resonant badly
 - C) all energy will be lost in transmission line
 - D) all energy sent will be absorbed by the load
- 49 In a thermal power plant, the feed water coming to the economiser is heated using
- A) H.P. steam
 - B) direct heat in the furnace
 - C) L.P. steam
 - D) flue gases
- 50 The inertia constant of a 100 MVA, 50 Hz, 4-pole generator is 10 MJ/MVA. If the mechanical input to the machine is suddenly raised from 50 MW to 75 MW, the rotor acceleration will be equal to
- A) 22.5 electrical degree/ s²
 - B) 225 electrical degree/ s²
 - C) 125 electrical degree/ s²
 - D) 12.5 electrical degree/ s²
- 51 The rated voltage of a 3-phase power system is given as
- A) rms phase voltage
 - B) rms line to line voltage
 - C) peak line to line voltage
 - D) peak phase voltage
- 52 The insulation resistance of a 30 km long underground cable is 10 MΩ. Other things being the same, the insulation resistance of a 15 km long cable will be
- A) 20 MΩ
 - B) 40 MΩ
 - C) 5 MΩ
 - D) 10 MΩ
- 53 Which of the following quantities are specified for a load bus
- A) active and reactive power
 - B) magnitude of bus voltage and its angle
 - C) active power and magnitude of bus voltage
 - D) reactive power and magnitude of bus voltage

- 54 A three-phase 11/66 kV, delta/star transformer, protected by Merz-price scheme has CT ratio 400/5 on LT side. Ratio of CT on HT side will be equal to
- A) 1:23
 - B) $23:\sqrt{3}$
 - C) 23:1
 - D) $\sqrt{3}:23$
- 55 A 3-phase four wire star connected load takes line current of $5\angle 90^\circ\text{A}$, $5\angle -90^\circ\text{A}$ and 5A. The neutral current is
- A) 5 A
 - B) 0 A
 - C) 10 A
 - D) 15 A
- 56 In which of the following types of fault all sequence currents are equal?
- A) three-phase
 - B) line to line
 - C) line to ground
 - D) double line to ground fault
- 57 A STATCOM is a and can exchangepower with the power system
- A) shunt device, reactive
 - B) both series and shunt device, reactive
 - C) series device, active
 - D) shunt device, active
- 58 Direction of flow of reactive and active power between two nodes in any electric system depends on
- A) magnitude and phase angle of voltage of nodes respectively
 - B) magnitude of voltage of nodes only
 - C) phase angle of voltage of nodes only
 - D) phase angle and magnitude of voltage of nodes respectively
- 59 For a given base voltage and base volt amperes, the per unit impedance value of an element is x. The per unit impedance value of this element when the voltage and volt amperes bases are both halved will be
- A) 0.5x
 - B) 2x
 - C) x
 - D) 4x

- 60 In z-plane, the unit circle corresponds to
- A) imaginary axis of s-plane
 - B) negative real axis of s-plane
 - C) positive real axis of s-plane
 - D) origin of the s-plane
- 61 For the signal $f(t) = 3\sin 8\pi t + 6\sin 12\pi t + \sin 14\pi t$, the minimum sampling frequency (in Hz). Satisfying the Nyquist criterion is
- A) 16
 - B) 24
 - C) 28
 - D) 14
- 62 The characteristic polynomial $F(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$ is
- A) stable
 - B) marginally stable
 - C) unstable
 - D) none of these
- 63 In exponential series form, the state transition matrix is
- A) e^{At}
 - B) e^{-At}
 - C) e^{-A}
 - D) e^A
- 64 Zero of which compensator is located nearest to origin
- A) lead compensator only
 - B) both lead and lag compensator
 - C) lag compensator only
 - D) none of these
- 65 The steady-state error of a feedback control system with a ramp input becomes finite in a
- A) type zero system
 - B) type two system
 - C) type one system
 - D) type three system

- 66 The impulse response of a LTI system is a unit ramp function, then the corresponding transfer function of the system is
- A) $1/s$
 - B) $1/s^2$
 - C) s
 - D) 1
- 67 The open loop transfer function of a unity-gain feedback control system is given by, $G(s) = K/(s+1)(s+2)$, the gain margin of the system in dB is given by
- A) zero
 - B) two
 - C) one
 - D) infinity
- 68 Polar plot of $G(s) = 1/[s(1 + s\tau)]$
- A) crosses the negative real axis
 - B) crosses the negative imaginary axis
 - C) crosses the positive imaginary axis
 - D) none of the above
- 69 A system is stable if
- A) all the poles of the transfer function have positive real parts
 - B) all the poles of the transfer function have zero real parts
 - C) all the poles of the transfer function have negative real parts
 - D) stability does not depend on the nature of poles of a system
- 70 For a given system, its transfer function depends on
- A) input only
 - B) initial conditions
 - C) output only
 - D) none of these
- 71 The initial slope of Bode plot for a transfer function having simple pole at origin is
- A) 20dB/decade
 - B) -20dB/decade
 - C) -40dB/decade
 - D) zero

- 72 The Fourier transform of a constant K is given as (here notations used have their usual meanings)
- A) $2\pi K \delta(\omega)$
 - B) $\pi K \delta(\omega)$
 - C) $K \delta(\omega) / 2\pi$
 - D) $K \delta(\omega) / \pi$
- 73 The bridge method commonly used for measurement of capacitance is
- A) Heaviside Campbell bridge
 - B) Hay's bridge
 - C) De Sauty's bridge
 - D) Wien bridge
- 74 Peak overshoot explicitly indicative of
- A) settling time
 - B) rise time
 - C) natural frequency
 - D) damping ratio
- 75 The value of maximum torque for a slip ring type induction motor depends on
- A) rotor resistance only
 - B) rotor inductance only
 - C) stator resistance only
 - D) both rotor resistance and rotor inductance
- 76 The sequence components of the fault current are as follows: $I_{\text{positive}} = j2.5 \text{ pu}$, $I_{\text{negative}} = -j0.9 \text{ pu}$, $I_{\text{zero}} = -j1.6 \text{ pu}$. The type of fault in the system is
- A) LG
 - B) LL
 - C) LLG
 - D) LLLG
- 77 If an induction motor is started using DOL and star-delta starter, the ratio of starting current drawn by the motor using DOL and star-delta starter will be
- A) one
 - B) more than one
 - C) less than one
 - D) starting current does not depend on types of starter used.

- 78 Protection scheme used for detection of loss of excitation of a very large generating unit feeding power into a grid employs
- A) offset mho relay
 - B) undervoltage relay
 - C) underfrequency relay
 - D) percentage differential relay
- 79 Distributed winding and short chording employed in ac machines will results in
- A) reduction in emf and increase in harmonics
 - B) increase in both emf and harmonics
 - C) reduction in both emf and harmonics
 - D) increase in emf and reduction in harmonics
- 80 Two areas, each having several synchronous generators and loads, are interconnected by an ac line and a HVDC link. Which of following statements is true in the steady state?
- A) both areas should have the same frequency
 - B) both areas need not have the same frequency
 - C) the direction of power flow in the HVDC link cannot be reversed
 - D) the total power flow between the areas can be changed by controlling the HVDC converters alone
- 81 The incremental fuel costs of two generating plants are
- $$C_1 = 0.05 P_1^2 + AP_1 + B$$
- $$C_2 = 0.10 P_2^2 + 3AP_2 + 2B$$
- Where A, B are constants. P_1 and P_2 are power generated in plant 1 and 2. The two plants optimally share 1000 MW at an incremental cost of 100Rs/MWh. The ratio of P_2 to P_1 is
- A) 1:4
 - B) 4:1
 - C) 1:2
 - D) none of these
- 82 In Common Emitter amplifier, the un-bypassed emitter resistance provides
- A) voltage-shunt feedback
 - B) current-series feedback
 - C) negative-voltage feedback
 - D) positive-current feedback
- 83 The signal flow graph is used for the determination of
- A) transfer function of a system
 - B) initial conditions of a system
 - C) response of a system for a given input
 - D) both (a) and (c)

- 84 A system is defined by its impulse response $h(n) = 2^n u(n - 2)$. The system is
- A) stable and casual
 - B) casual but not stable
 - C) stable but not casual
 - D) unstable and non-casual
- 85 In RH criteria if all the elements in a row are zero's it indicates
- A) Roots lies on origin
 - B) Roots lies on positive real axis
 - C) Roots lie on imaginary axis
 - D) Roots lie on negative real axis
- 86 Which one of the following statements is NOT TRUE for a continuous time causal and stable LTI system?
- A) all the poles of the system must lie on the left side of the $j\omega$ axis
 - B) zeros of the system can lie anywhere in the s-plane
 - C) all the poles must lie within $|s| = 1$
 - D) all the roots of the characteristic equation must be located on the left side of the $j\omega$ axis
- 87 The speed of conversion is maximum in
- A) Successive-approximation A/D converter
 - B) Parallel-comparative A/D converter
 - C) Counter ramp A/D converter
 - D) Dual-slope A/D converter
- 88 A 4-bit synchronous counter uses flip-flops with propagation delay times of 15 ns each. The maximum possible time required for change of state will be
- A) 15 ns
 - B) 30 ns
 - C) 45 ns
 - D) 60 ns
- 89 The 'equal area criterion' for the determination of transient stability of the synchronous machine connected to an infinite bus
- A) ignores lines as well as synchronous machine resistances and shunt capacitances
 - B) assumes accelerating power acting on the rotor as constant
 - C) ignores the effect of voltage regulator and governor but considers the inherent damping present in the machine
 - D) takes into consideration the possibility of machine loosing synchronism after it has survived during the first swing

90 Since input resistance of an operational amplifier is infinite

- A) its output resistance is zero
- B) its input current is zero
- C) it becomes a current controlled device
- D) none of these