

RT Held on 21-03-2017 (A/N)

Electrical Engineering

Time Allowed: Two Hours

Maximum Marks: 100

1.

Inside a hollow conducting sphere the electric field

- (a) changes with the distance from the centre
- (b) changes with the charge given to the sphere
- (c) is a non-zero constant
- (d) is zero

2.

The magnetic vector potential due to a single conductor carrying fixed current is

- (a) Zero
- (b) Infinite
- (c) Definite and finite
- (d) Undefined

3.

In a PWM inverter the fundamental frequency is

- (a) Equal to switching frequency
- (b) One fifth of switching frequency
- (c) Double the switching frequency
- (d) Independent of switching frequency

4.

A conductor carrying current towards the observer (out of plane) is under the influence of North Pole experience force in

- (a) Left hand side
- (b) Right hand side
- (c) Upward direction
- (d) Downward direction

5.

A box with given dimensions encloses positive point charge q . If the dimensions of the box are doubled, the flux in the box will be

- (a) Four times
- (b) Doubled
- (c) Halved
- (d) Unchanged

6.

The wavelength of Electromagnetic waves in a waveguide is

- (a) Inversely proportional to the phase velocity
- (b) Greater than that in free space
- (c) Directly proportional to the phase velocity
- (d) Dependant only on waveguide dimensions and free space wavelength

7.

A long solenoid is carrying a current I . The associated power

- (a) Does not flow at all
- (b) Flows along the axis of solenoid
- (c) Flows along the circumferential direction
- (d) Flows along the radial direction

8.

The ratio of displacement and conduction current of a conductor

- (a) Increases with frequency
- (b) Increases with both frequency and conductivity
- (c) Decreases with conductivity and increases with frequency
- (d) Decreases with both frequency and conductivity

9.

A plane EM wave travelling along $+z$ direction, with electric field $E_x = 2 \cos(\omega t)$ and $E_y = 2 \cos(\omega t + 90)$. The wave is

- (a) Linearly polarized
- (b) Right circularly polarized
- (c) Left circularly polarized
- (d) Elliptically polarized

10.

The imaginary part of dielectric constant determines

- (a) The component of the current which is in-phase with the applied field
- (b) The amount of energy absorbed per m^3
- (c) The amount of applied field
- (d) The component of the current which is in-quadrature with the applied field

11.

For an insulating material, dielectric strength and dielectric losses should be, respectively

- (a) High and high
- (b) Low and high
- (c) High and low
- (d) Low and low

12.

Which one of the following superconducting material is not commonly utilized?

- (a) Niobium-Zirconium
- (b) Copper-Constantan
- (c) Niobium-Titanium
- (d) Niobium-Tin inter-metallic compound

13.

The electrical conductivity of Silicon can be altered by

- (a) Sintering
- (b) Squeezing
- (c) Doping
- (d) Gettering

14.

Which of the following materials is having less than unity relative permeability μ_r and negative magnetic susceptibility?

- (a) Ferromagnetic
- (b) Paramagnetic
- (c) Diamagnetic
- (d) Antiferromagnetic

15.

Hard magnetic materials are utilized in permanent magnets. In terms of hysteresis behaviour, a hard magnetic material does not possess

- (a) Low energy loss when subjected to alternating magnetic field
- (b) High remanence and coercitivity
- (c) Saturation flux density
- (d) Low initial permeability

16.

When an external field E is applied to a molecule carrying a permanent dipole moment μ_p , the external field will tend to align μ_p along the direction of E . This is known as

- (a) Orientational polarization
- (b) Electronic polarization
- (c) Ionic polarization
- (d) Permanent polarization

17.

Which property of solid state materials has the largest range in its value?

- (a) Electrical conductivity
- (b) Density
- (c) Modulus of elasticity
- (d) Temperature range over which the solid state is retained

18.

Which of the following properties is not pertaining to ceramics?

- (a) Malleable and ductile
- (b) Hard and brittle
- (c) Good electrical and thermal insulator
- (d) Good resistance to chemical attack

19.

Ceramic materials having high permittivity greater than 12 and permittivity less than 12 are used for making

- (a) Bricks for high temperature furnaces and plaster of paris, respectively
- (b) Connecting terminals of electrical items and bricks for high temperature furnaces, respectively
- (c) Bushings of the transformers and capacitors, respectively
- (d) Capacitors and bushings of the transformers, respectively

20.

Maximum power will be delivered from an ac source to a resistive load when the magnitude of the source impedance is equal to

- (a) Half of the load resistance
- (b) Double the load resistance
- (c) The load resistance
- (d) Zero

21.

The potential coil of a wattmeter is designed for minimum inductance so that current through it is

- (a) Proportional to voltage and out of phase with it
- (b) Inversely proportional to voltage and almost in phase with it
- (c) Proportional to voltage and in phase with it
- (d) Inversely proportional to voltage and lagging by 90°

22.

Statement (I): DRAM memory is available with much larger size than static RAM.

Statement (II): DRAM needs refreshing after 2 to 4 msec.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

23.

Head phones/audio amplifiers are used as balance detectors in AC Bridge at frequency of

- (a) 250 Hz and above
- (b) Less than 250 Hz
- (c) More than 4 kHz
- (d) 500 kHz

24.

Wien Bridge is mainly used for the measurement of

- (a) Resistance
- (b) Inductance
- (c) Power factor
- (d) Capacitance in terms of resistance and frequency

25.

A strain gauge having a gauge factor of -160 is:

- (a) p-type semiconductor
- (b) n-type semiconductor
- (c) bonded metal foil type
- (d) unbounded metal wire type

26.

The working of optical fiber is based on one of the following properties of electromagnetic waves

- (a) Dispersion
- (b) Refraction
- (c) Scattering
- (d) Total internal reflection

27.

A 3-phase balanced load with lagging power factor is supplied by a 3-phase balanced supply, sequence RYB. The potential coil of the wattmeter is connected across RY while the current coil is connected in phase B. The wattmeter reading will be indicative of

- (a) Real power
- (b) Reactive power
- (c) Volt-amperes
- (d) Wattmeter will not deflect

28.

How many control lines are present in analog to digital converter in addition to reference voltage?

- (a) 1
- (b) 2
- (c) 3
- (d) 4

29.

What is the conversion time of a 12-bit counter type ADC with 1 MHz clock frequency to convert a full scale input?

- (a) 4.095 μ s
- (b) 4.095 ms
- (c) 4.95 s
- (d) 4.95 ms

30.

With what operation in the complex frequency domain does shifting (translation) in the time domain correspond?

- (a) Multiplication of the variable by an exponential quantity
- (b) Multiplication of the variable by a constant
- (c) Division of the variable by a constant
- (d) Division of the variable by a rational function

31.

The secondary of a CT is never left open circuited, while the primary is energized because

1. Heat dissipation in the core will be very large
2. The core will get saturated and permanently magnetized rendering it useless
3. Dangerously high emf will be induced in the secondary

Which of the above reasons are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

32.

The errors in current transformers can be reduced by designing them with

1. Large primary ampere turns
2. Primary and secondary windings wound closely together
3. Primary and secondary windings wound with large cross-section
4. Core made of high permeability and low loss magnetic materials avoiding any joints in the core and using low values of flux density

Which of the above statements are correct?

- (a) 1, 2 and 3 only
- (b) 3 and 4 only
- (c) 1, 2 and 4 only
- (d) 1, 2, 3 and 4

33.

If ramp input is applied to a type-2 system, then its steady state error is

- (a) Infinity
- (b) Zero
- (c) Negative constant
- (d) Positive constant

34.

The time response of a second order system to a step input is expressed as, $c(t) = 1.66 e^{-8t} \sin(6 t + 28^\circ)$. The damping factor of the system is

- (a) 0.9
- (b) 0.8
- (c) 0.7
- (d) 0.6

35.

Statement (I): For fault in a power system, the term critical clearing time is related to transient stability limit.

Statement (II): Steady state stability limit is higher than transient stability limit.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

36.

Statement (I): The machine control instructions of 8086 microprocessor control the bus usage and execution.

Statement (II): The flag manipulation instructions directly modify all the flags of 8086.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)
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- (d) Statement (I) is false but Statement (II) is true

37.

A single phase full-bridge inverter controls the power in resistive load. Input dc voltage is 220 V and PWM with five equal pulses per half cycle is used. The rms voltage of the load for pulse width of 30° is

- (a) 378.4 V
- (b) 242 V
- (c) 200.8 V
- (d) 166.6 V

38.

A null-type instrument as compared to deflection type instrument has

- (a) Higher accuracy
- (b) Lower sensitivity
- (c) Faster response
- (d) All of these

39.

An inverter will operate in rectifier mode when the output voltage phasor and output current phasor have a phase difference, which is

- (a) Less than $\pi/2$
- (b) Between $3\pi/2$ and 2π
- (c) Greater than $\pi/2$
- (d) Zero

40.

Which one of the following devices will be used for providing the rate-feedback voltage in position control systems?

- (a) Potentiometer
- (b) Synchro-transmitter
- (c) Synchro-transformer
- (d) Tachogenerator

41.

To cancel the low order harmonics in the output voltage of an inverter, the PWM switching scheme used is

- (a) Delta PWM
- (b) Stepped PWM
- (c) Sinusoidal PWM
- (d) Trapezoidal PWM

42.

The effect of distance-velocity lag / transportation lag is

- (a) To increase the phase margin
- (b) To reduce the phase margin
- (c) To improve the transient response of the system
- (d) All of these

43.

A servo-mechanism has its moment of inertia $10 \times 10^{-6} \text{ kg m}^2$, retarding friction $400 \times 10^{-6} \text{ Nm/rad/sec}$. The output has an error of 0.004 Nm/rad . The natural frequency of the system is

- (a) 10 rad/sec
- (b) 20 rad/sec
- (c) 30 rad/sec
- (d) 40 rad/sec

44.

Three identical amplifiers with each having a voltage gain of 50 are cascaded. The open-loop circuit voltage gain of the combined amplifier is

- (a) 49 dB
- (b) 51 dB
- (c) 98 dB
- (d) 102 dB

45.

For normal operation n-channel JFET requires

- (a) Negative gate bias (but not zero) and positive drain voltage
- (b) Zero or negative gate bias and positive drain voltage
- (c) Negative gate bias and negative drain voltage
- (d) Positive gate voltage and negative drain voltage

46.

In a microprocessor, the address of the next instruction to be executed, is stored in

- (a) Stack pointer
- (b) Address latch
- (c) Program counter
- (d) General purpose registers

47.

Which of the following statements is correct for the system?

$$\dot{X} = \begin{bmatrix} 2 & 3 \\ 0 & -5 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U,$$

- (a) The system is controllable but unstable
- (b) The system is uncontrollable but unstable
- (c) The system is controllable but stable
- (d) The system is uncontrollable but stable

48.

FM signals are always generated at:

- (a) High level
- (b) Low level and then amplified by a series of highly efficient class C, D, E or F amplifiers
- (c) Zero level
- (d) Oscillator frequency

49.

The acceleration error constant for a system with open-loop transfer function given by $G(s)H(s) = \frac{k}{s^2(s+1)(s+15)(s+20)}$ is

- (a) $\frac{k}{200}$
- (b) $\frac{k}{300}$
- (c) 20
- (d) 30

50.

Consider the following statements related to cache memory:

1. The microprocessor can access the cache memory without wait states
2. Cache memory is a very fast static RAM
3. Cache memory is a very fast static ROM

Which of the above statements are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

51.

If the direction of current flowing in a conductor is, in the plane of the paper away from the viewer, the magnetic flux lines produced by it are

- (a) Straight lines parallel to the conductor and in the opposite direction of current flow
- (b) Straight lines parallel to the conductor and in the direction of current flow
- (c) Concentric circles in the clockwise direction as seen by viewer
- (d) Concentric circles in the anticlockwise direction as seen by viewer

52.

In a power transformer

- (a) Open circuit and short circuit tests are conducted on low voltage side
- (b) Open circuit and short circuit tests are conducted on high voltage side
- (c) Open circuit test is conducted on high voltage side and short circuit test on low voltage side
- (d) Open circuit test is conducted on low voltage side and short circuit test on high voltage side

53.

The modulated peak value of a signal is 10 V while the un-modulated carrier is 8 V. The modulation index of such an amplitude-modulated wave is

- (a) 0.75
- (b) 0.50
- (c) 0.25
- (d) 0.125

54.

Generally high-power transformers are oil-immersed type. This is because oil is a better insulator than air and

- (a) Oil has poor thermal conductivity
- (b) Convection currents in the oil help carry heat away from the windings and the core
- (c) Oil immersed transformers are smaller in size
- (d) Oil has high boiling point

55. All day efficiency is meant to judge the performance of a

- (a) Distribution transformer
- (b) Auto transformer
- (c) Voltage transformer
- (d) Current transformer

56.

If R is equivalent resistance, X is equivalent reactance, I is full-load current, and $\cos\theta$ is leading power factor, the voltage drop of a transformer from no-load to full-load is

- (a) $I (R \cos \theta - X \sin \theta)$
- (b) $I (R \cos \theta + X \sin \theta)$
- (c) $I (X \cos \theta + R \sin \theta)$
- (d) $I (R \sin \theta - X \cos \theta)$

57.

Consider the following two components for 'Synchronous reactance' X_s of a synchronous machine:

1. The armature reaction reactance X_{ar}
2. The leakage reactance X_{al}

Which of the above components is/are affected by magnetic saturation?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

58.

For a three phase induction motor the blocked rotor test is conducted at

- (a) Rated voltage and rated current
- (b) Rated current and reduced voltage
- (c) Rated voltage and reduced current
- (d) Reduced voltage and reduced current

59.

The motor used for driving a record player deck is

- (a) DC series motor
- (b) AC series motor
- (c) Synchronous motor
- (d) Hysteresis motor

60.

In an alternator, the voltage across the load may exceed the no load voltage, if the power factor of the load is

- (a) Unity
- (b) Leading
- (c) Lagging
- (d) Zero

61.

Nuclear power stations are normally used to meet

- (a) Peak load
- (b) Base load
- (c) Average load
- (d) Any load

62.

Efficiency of transformer is maximum during

- (a) Eddy current loss equals hysteresis loss
- (b) The sum of the eddy current loss and hysteresis loss is a minimum
- (c) The total core loss equals copper loss
- (d) The power factor of the load is unity

63.

Consider the following parameters in 1:1 transformer:

1. Current
2. Voltage
3. Frequency

The primary and secondary of the transformer will have the same

- (a) Current and Voltage only
- (b) Current and Frequency only
- (c) Voltage and Frequency only
- (d) Current, Voltage and Frequency

64. In a power system, the network affected by the method of neutral grounding is

- (a) Zero sequence networks
- (b) Negative sequence networks
- (c) Positive sequence networks
- (d) All of these

65.

The most economical and efficient method of controlling the speed of a compound wound DC motor is by, controlling the

- (a) Armature current
- (b) Field winding voltage
- (c) Current in the shunt field winding
- (d) Current in the series field winding

66.

Total MMF per pole of a compound wound machine is

- (a) Average of ampere turns per pole of shunt and series windings
- (b) Sum of the ampere turns per pole of shunt and series windings
- (c) Ampere-turns of series windings
- (d) Ampere-turns of shunt windings

67.

When the load at the receiving end of a long transmission line is removed, the sending end voltage becomes less than the receiving end voltage. This effect is called

- (a) Ferranti effect
- (b) Kelvin effect
- (c) Proximity effect
- (d) Skin effect

68.

The transient stability limit of a power system can be appreciably increased by introducing

- (a) Series inductance
- (b) Shunt inductance
- (c) Series capacitance
- (d) Shunt capacitance

69.

In a power system MCB acts as:

1. Switch
2. Short circuit protection device
3. Overload protection device

- (a) 1 only
- (b) 2 only
- (c) 3 only
- (d) 1, 2 and 3

70.

If an intrinsic semiconductor is doped with a very small amount of boron, then in the extrinsic semiconductor so formed, the number of electrons and holes will

- (a) Decrease
- (b) Increase
- (c) Decrease and increase respectively
- (d) Increase and decrease respectively

71.

Dynamic characteristics of a diode can be obtained from

- (a) Transfer characteristics
- (b) Static characteristics
- (c) Static characteristics and load line
- (d) Static characteristics and transfer characteristics

72.

Synchronous machines are called 'synchronous' because, their

- (a) Speed is directly related to the line frequency
- (b) Speed is directly related to the rate of change of line frequency
- (c) Operating speed is slightly lower than synchronous speed in motor mode
- (d) Operating speed is slightly greater than synchronous speed in generator mode

73.

Thermal runaway is not possible in FET because, the temperature of FET increases

- (a) The mobility decreases
- (b) The trans-conductance increases
- (c) The drain current increases
- (d) The mobility increases

74.

Schottky barrier diode can be used as

- (a) Low noise amplifier
- (b) Low level detector
- (c) Power supply rectifier
- (d) Variable capacitance device

75.

The time required for collector current I_{CS} to change from 90 % to 10 % is

- (a) Rise time
- (b) Fall time
- (c) On time
- (d) Storage time

76.

Negative feedback in an amplifier

- (a) Reduces gain
- (b) Increases frequency and phase distortions
- (c) Reduces bandwidth
- (d) Increases noise

77.

The expression $\eta = \frac{\pi}{4} \left(1 - \frac{V_{min}}{V_{cc}}\right) \times 100\%$ represents the collector circuit efficiency of

- (a) Class A amplifier
- (b) Class B amplifier
- (c) Class C amplifier
- (d) Push-pull amplifier

78.

In an operational amplifier input offset current I_{io} is equal to

- (a) $\frac{(I_{B1}+I_{B2})}{2}$
- (b) $(I_{B1} - I_{B2})$
- (c) $\frac{(I_{B1}-I_{B2})}{2}$
- (d) $(I_{B1} + I_{B2})$

79.

For a master-slave flip-flop:

- (a) Change in the input is immediately reflected in the output
- (b) Change in the output occurs when the state of the master is affected
- (c) Change in the output occurs when the state of the slave is affected
- (d) Both the master and the slave states are affected at the same time

80.

The task performed by 8086 instruction: `IN AL, 05H` is,

- (a) Copy 05H into lower 8 bits of AX
- (b) Copy data from address formed by combining higher 8 bits of BH with 05H into AH
- (c) Copy data from address 05H into AL
- (d) Copy contents of AL at address 05H

81.

A 6 pole, 50 Hz, 3 phase induction motor runs at 800 rpm at full load. What is the value of slip at this load condition?

- (a) 20 %
- (b) 30 %
- (c) 15 %
- (d) 25 %

82.

The instruction (for 8086) to 'AND each bit of memory offset [BX] with AX' is

- (a) and [ax], bx
- (b) and [ax], [b(x)]
- (c) and ax, bx
- (d) and ax, [bx]

83.

What is the content of the program counter after the execution of the following instructions after reset

LXIH, 2600H

MVIL, 07H

PC HL

- (a) 0000H
- (b) 2600H
- (c) 2607H
- (d) 0726H

84.

The programmable peripheral interface can be programmed in

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

85.

In 8085 microprocessor, contents of Register pair BC are FFFFH. After executing instruction INX B, the values of various flags will be: (Initially CY = 0, Z = 0 and P = 0)

- (a) CY = 0, Z = 0 and P = 0
- (b) CY = 1, Z = 1 and P = 1
- (c) CY = 0, Z = 1 and P = 0
- (d) CY = 0, Z = 1 and P = 1

86.

Memory mapped I/O means

- (a) Memory of the microprocessor also occupies I/O space
- (b) I/O devices are given memory addresses
- (c) I/O devices are connected in the I/O space
- (d) I/O devices are not allocated memory addresses

87.

Consider the following instructions:

1. XRA A
2. CMC
3. ANA A
4. MOV A, A

Which of the above can be used to reset carry flag without affecting contents of any register and operation of 8085 microprocessor?

- (a) 1, 2 and 3
- (b) 1 and 4 only
- (c) 2 and 4 only
- (d) 3 only

88.

Intel's 8212 is a

- (a) A/D converter
- (b) D/A converter
- (c) 16 bit I/O port
- (d) 8 bit I/O port

89.

In one method of calculating depreciation, a fixed depreciation charge is made every year and interest compounded on it annually. Which method is it?

- (a) Diminishing value method
- (b) Sinking fund method
- (c) Straight line method
- (d) Fixed depreciation method

90.

Consider the following statements regarding the nuclear power plants:

1. A thermal reactor needs a moderator material
2. In a nuclear reactor, multiplication factor is kept almost equal to one
3. Nuclear power plants are used as peak load plants only

Which of the above statements are correct?

- (a) 1, 2 and 3
- (b) 1 and 2 only
- (c) 1 and 3 only
- (d) 2 and 3 only

91.

A signal $m(t) = 5 \cos 2\pi 100 t$, frequency modulates a carrier. The resulting FM signal is $10 \cos (2\pi \times 10^5 t) + 15 \sin (2\pi 100 t)$. The approximate bandwidth of the FM is

- (a) 0.1 kHz
- (b) 1.0 kHz
- (c) 3.2 kHz
- (d) 100 kHz

92.

With $\Delta\phi$ = peak phase deviation and f_m = modulating signal frequency, the equivalent peak deviation is

(a) $\Delta f_{eq} = \Delta\phi \cdot f_m$

(b) $\Delta f_{eq} = \frac{f_m}{\Delta\phi}$

(c) $\Delta f_{eq} = \frac{d(f_m)}{d(\Delta\phi)}$

(d) $\Delta f_{eq} = \frac{\Delta\phi \cdot f_m}{2}$

93.

The noise voltage at temperature T K at the input of a television RF amplifier is V volt. What will be the noise at temperature $2T$ K?

(a) $2V$

(b) $\frac{V}{2}$

(c) $V\sqrt{2}$

(d) $\frac{V}{\sqrt{2}}$

94.

If the bandwidth of an amplifier is reduced, the thermal noise in the amplifier will

(a) Increase

(b) Decrease

(c) Not be affected at all

(d) Become random in nature

95.

The compander in a digital communication system serves to

- (a) Equalize the SNR for both weak and strong PAM signals
- (b) Increase the amplification of the signals
- (c) Improve A/D conversion
- (d) Improve multiplexing

96.

PDM is generated by employing

- (a) Schmitt Trigger
- (b) Astable multivibrator
- (c) Monostable multivibrator
- (d) JK flip-flop

97.

Mean-square signal-to-quantization noise ratio $\left(\frac{S}{N}\right)_q$ for PCM (with L = total number of levels and ΔV = quantization error range) is

- (a) $\frac{L^2}{\Delta V}$
- (b) L^2
- (c) $\frac{L^2}{12 \Delta V}$
- (d) $\frac{L^2}{12}$

98.

The image frequency of a super heterodyne receiver in TV receivers, is

- (a) Created within the receiver itself
- (b) Due to insufficient adjacent channel rejection
- (c) Not rejected by the IF tuned circuits
- (d) Independent of the frequency to which the receiver is tuned

99.

A varactor diode can be used to generate modulating signal for

- (a) FM generator
- (b) AM generator
- (c) PM generator
- (d) AM and PM generators

100.

The input to a steam turbine is

- (a) Water close to boiling point
- (b) Superheated steam
- (c) Dry and superheated steam
- (d) Superheated and saturated steam