EE Objective Paper I (Set - A)

1. The maximum space rate of change of the function which is in increasing direction of the function is known as

(A) curl of the vector function

(B) gradient of the scalar function

(C) divergence of the vector function

(D) Stokes theorem

Key: (B)

Exp: Gradient of the scalar function

The vector which gives both the magnitude and direction of the maximum spatial rate of change of a scalar is called the gradient of the scalar

2. The field strength at a point of finite distance from an infinitely long straight uniformly charged conductor is obtained by considering the radial (R) component and the longitudinal (L) component of the forces acting on a unit charge at the point, by the charges on the elemental length of the conductor.

The resultant field strength is

(A) The sum of R-components, when the sum of L-components is zero

(B) The sum of L-components, when the sum of R-components is zero

(C) The sum of both R- and L-components

(D) Average of the sum of R- and L-components

Key: (A)

Exp: The sum of R-components and the sum of L-components is zero.

3. Consider the following standard symbols for two-port parameters:

1. h_{12} and h_{21} are dimensionless.
2. h_{11} and B have dimensions of ohms
3. BC is dimensionless
4. C is dimensionless.

Which of the above are correct?

(A) 1, 2 and 3 only

(B) 1, 2 and 4 only

(C) 3 and 4 only

(D) 1, 2, 3 and 4

Key: (A)

Exp:

$$V_1 = h_{11}I_1 + h_{12}I_2 \quad \Big| \quad V_1 = AV_2 - BI_2$$
$$I_2 = h_{21}I_1 + h_{22}V_2 \quad \Big| \quad I_1 = CV_2 - DI_2$$

$$h_{12} = \frac{V_1}{V_2} \Rightarrow \text{Dimensionless}$$

$h_{21} = \frac{I_2}{I_1} \Rightarrow$ Dimensionless

$B = \frac{V_1}{I_2} \Rightarrow$ Ohms

$C = \frac{I_1}{V_2} \Rightarrow$ mho

$BC =$ Dimensionless

$h_{11} = \frac{V_1}{I_1} \Rightarrow$ ohms

4. A conductor having a cross-sectional area a sq m carrying current $I\vec{j}A,$ lies in a magnetic field

$$\vec{B} = B_0\left(\vec{i} + \vec{j}\right) Wb/m^2$$

The force density on the conductor is

(A) $\frac{B_0}{a} I\vec{k}$ (B) $-\frac{B_0}{a} I\vec{i}$ (C) $-\frac{B_0}{a} I\vec{k}$ (D) $\frac{B_0}{a} I\vec{j}$

Where $\vec{i}$, $\vec{j}$ and $\vec{k}$ are orthogonal unit vectors.

Key: (C)

Exp: $F = I\left(\overline{dl} \times \overline{B}\right)$

$$= I\left[\overline{J} \times B_0\left(\overline{i} + \overline{j}\right)\right]$$

$$F = -B_0 I\overline{k}$$

Force density

$$= \frac{-B_0 I\overline{k}}{a}$$

5. For electromechanical energy conversion, a magnetic field is employed as the medium rather than electric field because

(A) the stored energy density for practicable field strength is low in the electric field

(B) the electric field presents insulation problem.

(C) the specific magnetic loss is more than the specific dielectric loss

(D) None of the above

Key: (A)

Exp: As the energy storing capacity of the magnetic field is higher, magnetic field as coupling medium is most common in electromechanical energy conversion devices

6. The reliability of an instrument refers to

(A) the measurement of changes due to temperature variation

(B) the degree to which repeatability continues to remain within specified limits

(C) the life of an instrument

(D) the extent to which the characteristics remain linear

Key: (B)

7. If the current density inside a straight conductor is uniform over its cross-section, the flux density variation inside the conductor at different distance from its centre is

(A) linear

(B) square of the distance

(C) inverse of the distance

(D) exponential

Key: (A)

Exp: $\oint_L H.dl = \int_s \frac{I}{\pi R^2}.ds$

$H 2\pi r = \frac{I}{\pi R^2}\pi r^2$

$H = \frac{Ir}{2\pi R^2}$

$B = \mu H = \frac{\mu Ir}{2\pi R^2}$

$\boxed{B \propto r}$

8. The law which states that the line integral of the magnetic field around a closed curve is equal to the free current through a surface, is

(A) Gauss' law

(B) Tellegen's theorem

(C) Coulomb's law

(D) Ampere's law

Key: (D)

Exp: Ampere's law

9. In an electrodynamometer wattmeter

(A) The fixed coils providing magnetic flux are connoted across the power line

(B) The compensated wattmeter improves its accuracy by using windings with opposite currents with respect to series windings

(C) If the full-scale power measured is 100 W, the half-scale power will be 10W

(D) It can measure A.C power but is unsuitable for D.C. power

Key: (B)

10. $(\nabla \times H) = J$ is differential form of

(A) Gauss' law

(B) Ampere's circuital law

(C) Poisson's equation

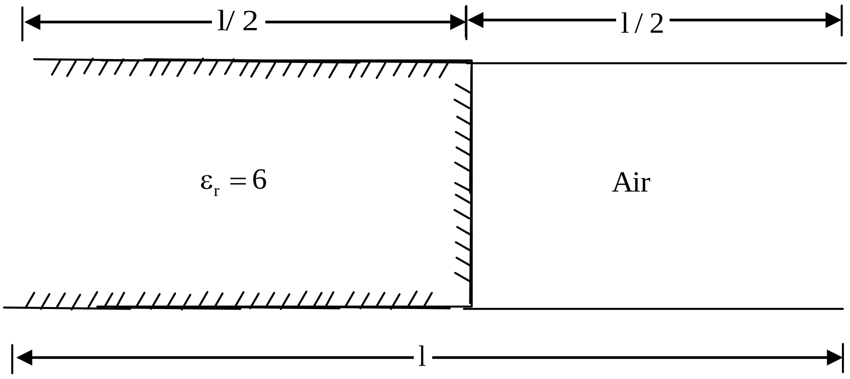
(D) Laplace's equation

Key: (B)

Exp: $\nabla \times H = J$

Ampere's law

11. A parallel-plate air capacitor as shown below has a total charge Q and a breakdown voltage V. A slab dielectric constant 6 is inserted as shown. The maximum breakdown voltage and the charge at this voltage respectively would be



(A) V and 3.5Q (B) 3.5V and Q

(C) V/6 and 3Q (D) 6V and 3Q

Key: (A)

Exp: Here the two capacitors are connected in parallel.

So, the breakdown voltage V.

$$C_1 = \frac{A6\varepsilon_0}{2d}$$

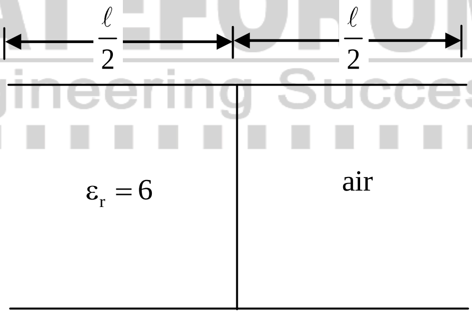
$$C_2 = \frac{A\varepsilon_0}{2d}$$

$$C_{eq} = c_1 + c_2 = \frac{7A\varepsilon_0}{2d}$$

$$Q_{eq} = C_{eq}.V$$

$$= \frac{7}{2}\left(\frac{A\varepsilon_0}{d}\right)V$$

$$\boxed{Q_{ed} = 3.5\,Q}$$



12. In a 4-bit R-2R ladder type digital-to-analog converter with $R_F = R$ and $V_R = 5V$, where R_F and R are the feedback and input resistances respectively to realize the gain of the inverting amplifier using an op-amp, the resolution and full-scale output respectively are

(A) -0.31 V and -4.7V (B) +0.31 V and -4.7V

(C) -0.31 V and +4.7V (D) +0.31 V and +4.7V

Key: (A)

Exp: For a n bit R-2R ladder N/W Resolution $\frac{V_r}{2^n}$ and since inverting amplifier it will be $\left(\frac{-V_r}{2^n}\right)$

$$\text{So Resolution} = \frac{-5}{2^4} = -0.31$$

$$\text{F.S.O} = \text{Resolution} \times \left(2^n - 1\right)$$

$$= -0.31 \times \left(2^4 - 1\right) = -0.31 \times 15 = -4.7$$

13. Two conductors of transmission line carry equal current I in opposite directions. The force on each conductor is proportional to

(A) I

(B) I^2

(C) The distance between the conductors

(D) I^3

Key: (B)

Exp: From Ampere's force law

$$F = \frac{\mu_0 I_1 I_2}{4\pi} \oint\oint \frac{dl_2 \times (dl_1 \times R)}{R^2}$$

$$F \propto I_1 I_2$$

$$\boxed{F \propto I^2} \; (\because I_1 = I_2)$$

14. Enameled wires are preferred to cotton-covered wires to

(A) withstand higher temperature

(B) Improve heat dissipation

(C) Reduce the resistivity

(D) Increase the mechanical strength

Key: (A)

15. A conductor of length 100 cm, moves at right angle to a uniform field flux density of $1.5 Wb/m^2$ with a velocity of 50 m/s, The e.m.f induced in the conductor will be

(A) 150V (B) 75V (C) 50V (D) 37.5V

Key: (B)

Exp: $V_{emf} = BlV \sin\theta$

$= 1.5 \times 100 \times 10^{-2} \times 50$

$V_{emf} = 75V$

16. Maxwell equations

1. are extension of the works of Gauss, Faraday and Ampere
2. help studying in the application of electrostatic fields only
3. can be written in integral form and point form
4. need not be modified depending upon the media involved in the problem

Which of the above statement are correct?

(A) 1 and 3 (B) 1 and 4 (C) 2 and 3 (D) 3 and 4

Key: (A)

Exp: → Maxwell's equations are extension of the works of Gauss's Faraday and Ampere's law.

→ Maxwell's equations can be expressed in integral & point form.

17. A phasor

1. may be scalar or a vector
2. is a time-dependent quantity
3. is a complex quantity

Which of the above statement are correct?

(A) 1, 2 and 3 (B) 1 and 2 only
(C) 1 and 3 only (D) 2 and 3 only

Key: (C)

Exp: Phasor

→ May be scalar or vector

→ Is a complex quantity

It is independent on time

18. Fermion particles obey

(A) Maxwell-Boltzmann statics
(B) Bose-Einstein statistics
(C) Pauli's exclusion principle
(D) Heisenberg's uncertainty principle

Key: (C)

Exp: Fermion:

Any of a class of particles having a spin that is half an odd integer and obeying the exclusion princ iple, by which no more than one identical particle may occupy the same quantum state.

The fermions include the baryons, quarks, and leptons.

Bosons differ from fermions, which obey Fermi–Dirac statistics

19. The complex permeability and resulting wave losses are due to

(A) free electrons or iron oscillation and dipole relaxation
(B) free electrons oscillation and relaxation of free space charge
(C) bound electrons oscillation and relaxation of free space charge
(D) bound electrons or ion oscillation and dipole relaxation

Key: (D)

Exp: Two important mechanisms that give rise to a complex permittivity (and thus result in wave losses) are bound electron or ion oscillations and dipole relaxation.

20. Consider the time response of a second order system with damping coefficient less than 1 to a unit step input:

1. It is over damped.
2. It is a periodic function
3. Time duration between any two consecutive values of 1 is the same.

Which of the above statement is/are correct?

(A) 1, 2 and 3 (B) 1 only (C) 2 only (D) 3 only

Key: (D)

21. A 10 GHz plane wave travelling in free space has amplitude of 15V/m. The propagation coefficient β is

(A) 209.4 rad/m (B) 173.6 rad/m
(C) 543.5 rad/m (D) $3.97\times10^{-2}\text{rad / m}$

Key: (A)

Exp: $V_p = \frac{\omega}{\beta}$

$$\beta = \frac{\omega}{V_p} = \frac{2\pi\times10\times10^9}{3\times10^8}$$

$$\beta = 209.4\text{rad / m}$$

22. Brewster angle is the angle when a wave is incident on the surface of a perfect dielectric at which there is no reflected wave and the incident wave is

(A) parallely polarized (B) Perpendicularly polarized
(C) normally polarized (D) None of the above

Key: (A)

Exp: Parallely polarized

23. In time domain specification, decay ratio is the ratio of the

(A) amplitude of the first peak and the steady-state value
(B) amplitudes of the first two successive peaks
(C) peak value to the steady-state value
(D) None of the above

Key: (B)

Exp: Decay Ratio: The ratio by which the oscillation is reduced during one complete cycle, or the ratio of successive peak heights. A "one quarter" decay ratio is a traditional standard

24. A lossless transmission line has a characteristic impedance of Z_0 and capacitance per unit length of C. The velocity propagation of the travelling wave on the line is

(A) Z_0C (B) $\frac{1}{Z_0C}$ (C) $\frac{Z_0}{C}$ (D) $\frac{C}{Z_0}$

Key: (B)

Exp: $Z_0 = \sqrt{\frac{L}{c}}$

$$V_p = \frac{1}{\sqrt{LC}}$$

$$Z_0V_o = \frac{1}{c}$$

$$V_p = \frac{1}{Z_0C}$$

25. A pair of high-frequency parallel transmission lines has distributed capacitance and inductance of 0.8μF and 9.8 mH respectively. What is the characteristics impedance of the line?

(A) 98.26 Ω (B) 110.68 Ω (C) 125 Ω (D) 128.2 Ω

Key: (B)

Exp: $Z_0 = \sqrt{\frac{L}{C}}$

$Z_0 = \sqrt{\frac{9.8\times10^{-3}}{0.8\times10^{-6}}}$

$Z_0 = 110.67\,\Omega$

26. The propagation constant of a transmission line is

$0.15\times10^{-3} + j1.5\times10^{-3}$

The wavelength of the travelling wave is

(A) $\frac{1.5\times10^{-3}}{2\pi}$ m

(B) $\frac{2\pi}{1.5\times10^{-3}}$ m

(C) $\frac{1.5\times10^{-3}}{\pi}$ m

(D) $\frac{\pi}{1.5\times10^{-3}}$ m

Key: (B)

Exp: $\beta = 1.5\times10^{-3}$

$\lambda = \frac{2\pi}{\beta} = \frac{2\pi}{1.5\times10^{-3}}$ m.

27. The skin effect in a transmission line is affected by

(A) the resistivity of the transmission line

(B) the current magnitude in the transmission line

(C) the cross-sectional area of the transmission line

(D) the voltage applied across the transmission line

Key: (D)

Exp: The skin effect in a transmission line is effected by the voltage applied across the transmission line.

28. Heat conduction in a semiconductor takes place

(A) by the mobility of the carriers

(B) due to energy gap between conduction band and valency band

(C) by the holes and thermal vibrations of atoms

(D) by the electrons and thermal vibrations of atoms

Key: (D)

29. The problems of the binary-weighted resistor digital-to-analog converter (DAC) can be overcome by using

(A) an 8-bit binary-weighted resistor DAC

(B) A flash DAC

(C) An R/2R ladder DAC

(D) A staircase DAC

Key: (C)

30. The resistivity of intrinsic germanium at $30^{o}C$ is $0.46\,\Omega-m$. what is the intrinsic carrier density at $30^{o}C$ if the electron mobility is $0.38m^{2}/V-s$ and the hole mobility is $0.18m^{2}/V-s$?

(A) $9.2\times10^{5}/m^{3}$ (B) $2.77\times10^{3}/m^{3}$

(C) $2.43\times10^{19}/m^{3}$ (D) $8.9\times10^{12}/m^{3}$

Key: (C)

Exp: Given $\rho_{ge}=0.46\Omega-m$

$$\mu_n=0.38m^2/V-s$$

$$\mu_p=0.18m^2/V-s$$

$$\sigma=n_iq(\mu_n+\mu_p)$$

$$n_i=\frac{1}{0.46\times1.6\times10^{-19}\times(0.38+0.18)}$$

$$=2.43\times10^{19}/m^3$$

31. For the intrinsic gallium-arsenide, the conductivity at room temperature $25^{o}C$ is $10^{-6}(ohm-m)^{-1}$, the electron and hole motilities are $0.85m^{2}/V-s$ and $0.04m^{2}/V-s$ respectively. What is the intrinsic carrier concentration at the room temperature?

(A) $7.0\times10^{12}m^{-3}$ (B) $7.0\times10^{-12}m^{-3}$ (C) $7.0\times10^{-12}m^{3}$ (D) $7.0\times10^{12}m^{3}$

Key: (A)

Exp: Given $\sigma=10^{-6}(ohm-m)^{-1}$

$$\mu_n=0.85m^2/V-s$$

$$\mu_p=0.04m^2/V-s$$

$$\sigma_{(GaAs)}=n_iq(\mu_n+\mu_p)$$

$$n_i=\frac{10^{-6}}{1.6\times10^{-19}\times(0.85+0.04)}$$

$$=7.022\times10^{12}m^{-3}$$

32. If μ_I and μ_P represent the impurity scattering and phonon scattering limited values of mobility of a semiconductor, the overall mobility would be

(A) $\mu_I+\mu_P$ (B) $\frac{\mu_I+\mu_P}{2}$ (C) $\sqrt{\mu_I\mu_P}$ (D) $\frac{\mu_I\mu_P}{\mu_I+\mu_P}$

Key: (D)

Exp: Net mobility is defined by

$$\frac{1}{\mu}=\frac{1}{\mu_I}+\frac{1}{\mu_p}$$

$$\mu=\frac{\mu_I\mu_p}{\mu_I+\mu_p}$$

33. An electrical breakdown of a p-n junction occurs if
(A) forward voltage increases up to the rating
(B) reverse voltage increases beyond the rating
(C) forward voltage decreasing below the rating
(D) reverse voltage decreases below the rating

Key: **(B)**

Exp: Electrical break down of any material (say metal, conductor, semiconductor or even insulator) can occur due to two different phenomena **in** under **reverse Bias applied above rating**

. Those two phenomena are

1) Zener breakdown and

2) Avalanche breakdown

34. The chief deterrent to the widespread application of superconducting materials is
(A) very difficult to form, machine or cast
(B) the difficulty in attaining and maintaining extremely low temperature
(C) the poor strength to weight ratio
(D) the lower oxidation rate at elevated temperatures

Key: **(B)**

Exp: The chief deterrent to the widespread application of these superconducting materials is the difficulty in attaining and maintaining extremely low temperatures. This problem will be overcome with the development of the new generation of superconductors will reasonably high critical temperatures.

35. Which one of the following properties is not observed in the carbon nanotubes?
(A) High stiffness and strengths
(B) Low densities
(C) Unusual electrical property
(D) Non-ductile

Key: **(D)**

Exp: Carbon Nano tubes show a

1. Unique combination of stiffness, strength, and tenacity compared to other fibre materials which usually lack one or more of these properties.

2. Thermal and electrical conductivity are also very high, and comparable to other conductive materials.

36. The evidence for the importance of electron-phonon interaction in super conductors comes from
(A) meissner effect
(B) Josephson effect
(C) Isotope effect
(D) Flux quantization experiments

Key: **(C)**

37. Which of the following materials is used for cable insulation?

(A) Phenol formaldehyde (B) Polytetrafluoroethylene

(C) Polyvinyl chloride (D) Acrylonitrile butadiene styrene

Key: (C)

Exp: Cable insulation materials are:

PE (Polyethylene)

PVC (Polyvinyl Chloride)

38. For high-speed reading and storing of information in a computer, the material used is

(A) ferrite (B) piezoelectric

(C) pyroelectric (D) ferromagnetic above $768^{o}C$

Key: (A)

39. The temperature above which an anti-ferromagnetic material becomes paramagnetic is called

(A) peak temperature (B) Neel temperature

(C) critical temperature (D) Weiss temperature

Key: (B)

Exp: The Neel temperature or magnetic ordering temperature, T_N, is the temperature above which an ant ferromagnetic material becomes paramagnetic that is, the thermal energy becomes large enough to destroy the macroscopic magnetic ordering within the material

40. Which effect is the converse of Peltier effect?

(A) Seebeck effect (B) Thomson effect (C) Hall effect (D) Joule effect

Key: (A)

Exp: Seebeck Effect: When two ends of a conductor are held at different temperatures electrons at the hot junction at higher thermal velocities diffuse to the cold junction

Peltier Effect: The reverse of the See beck effect is also possible: by passing a current through two junctions, you can create a temperature difference

41. Magnetic materials which may be readily magnetized in either direction are

(A) soft magnetic materials (B) hard magnetic materials

(C) high eddy current loss materials (D) high hysteresis loss materials

Key: (A)

42. Consider the following statements regarding a ferromagnetic material:

1. Below the ferromagnetic Curie temperature, the ferromagnetic materials exhibit hysteresis effect.

2. The coercive force is the field required to reduce the flux density to zero.

Which of the above statements is/are correct?

(A) Both 1 and 2 (B) Neither 1 nor 2 (C) 1 only (D) 2 only

Key: (A)

Exp: Coercive force is the opposing magnetic intensity that must be applied to a magnetized material to remove the residual magnetism

43. The impact ionization phenomenon in semiconductor may be viewed as the reverse process of

(A) radiative recombination (B) Auger recombination

(C) surface recombination (D) Shockley-Read-Hall recombination

Key: (B)

Exp: Auger recombination:

An electron and electron hole (electron-hole pair) can recombine giving up their energy to an electron in the conduction band, increasing its energy. The reverse effect is known as impact ionization.

44. Refractive index of a slice glass can be reduce by doping it with tiny amount of

(A) GeO_2 (B) B_2O_3 (C) P_2O_5 (D) Al_2O_3

Key: (D)

45. An iron-cored coil has an equivalent resistance of 5Ω. It draws 10 A when the applied voltage is 240 V, 50 Hz. Its inductance and power factor respectively are

(A) 7.5 mH and 0.1 (lag) (B) 74.7 mH and 0.1 (lag)

(C) 74.7 mH and 0.208 (lag) (D) 7.5 mH and 0.208 (lag)

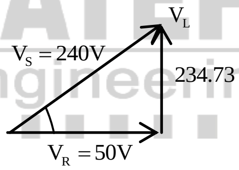
Key: (C)

Exp: $V_R = 50V$

$V_S = 240V$

$240^2 = 50^2 + V_L^2$

$\Rightarrow V_L = 234.73$



$\Rightarrow (I2\pi f)L = 234.73$

$\Rightarrow L = \frac{234.73}{10\times 2\pi\times 50} = 74.7\,mH$

$\text{Power factor} = \cos\phi = V_R/V_S = \frac{50}{240} = 0.208(\log)$

46. A voltage of 100V is applied to an impedance of $Z = (3+j4)\Omega$. what are the values of active power, reactive power and volt-amperes respectively?

(A) 1200 W, 1200 VAR and 2000 VA (B) 1600 W, 1600 VAR and 2200 VA

(C) 1200W, 1600 VAR and 2000 VA (D) 1600 W, 1200 VAR and 2200 VA

Key: (C)

Exp: $\text{Complex power}(S) = \frac{|V_{rms}|^2}{Z^*} = \frac{100^2}{(3+j4)^*}$

$S = P + jQ$

$= 1200 + 1600j$

$|S| = 2000$

Active power (P) = 1200watt

Reactive power (Q) = 1600 VAR

Volt ampere |S| = 2000 VA

47. The voltage across an impedance Z is $100\angle 15^{o}$ V and the current through Z is $20\angle -45^{o}$ A. The active and the reactive powers in Z respectively are

(A) 1000 W and 1732 VAR (B) 500 W and 1732 VAR

(C) 1000 W and 6000 VAR (D) 500 W and 6000 VAR

Key: (A)

Exp: S = VI*

$$=\left(100\angle 15^{\circ}\right)\left(20\angle -45^{\circ}\right)^{*}$$

$$=2000\angle 60^{\circ}$$

$$=1000+1732j$$

S = P+jQ

So P = 1000

Q = 1732

48. An a.c. source 200V r.m.s supplies an active power of 1200W and a reactive power of 1600 VAR to a load. The r.m.s current and the power factor of the load respectively are

(A) 10A and 0.6 (B) 8A and 0.8 (C) 10A and 0.8 (D) 8A and 0.6

Key: (A)

Exp: P = 1200

Q = 1600

|S| = 2000

$$\text{P.f} = \cos\phi = \frac{P}{|S|} = \frac{1200}{2000} = 0.6$$

$$P = V_{rm} I_{rm} \cos\phi$$

$$\Rightarrow I_{rms} = \frac{P}{V_{rms}\cos\phi} = \frac{1200}{200\times 0.6} = 10A$$

49. A shunt capacitor used for reactive power compensation is operated at 98% of its rated frequency and 95% of its rated voltage. The reactive power supplied by this capacitor (as compared to its rated capacity) is

(A) 7.9% lower (B) 11.5% lower (C) 11.5% higher (D) 7.9% higher

Key: (C)

50. Consider two nodes A and B connected by an impedance of $j5\Omega$. If the voltages at nodes A and B are $100\angle 30^{o}$ V and $100\angle 0^{o}$ V respectively, the real power that can be transferred from node A to B is

(A) 1120W (B) 2000W (C) 2769W (D) 276.9 W

Key: (*) No answer

51. None of the poles of a linear control system lies in the right-half of s-plane. For a bounded input, the output of this system

(A) is always bounded (B) could be unbounded

(C) always tends to zero (D) None of the above

Key: (A)

Exp: There would be a possibility of repeated poles on the imaginary axis.

52. If the diameter of copper wire is increased by two times keeping its terminal voltage same, then the drift velocity will
(A) become twice
(B) become half
(C) become four times
(D) remain unchanged

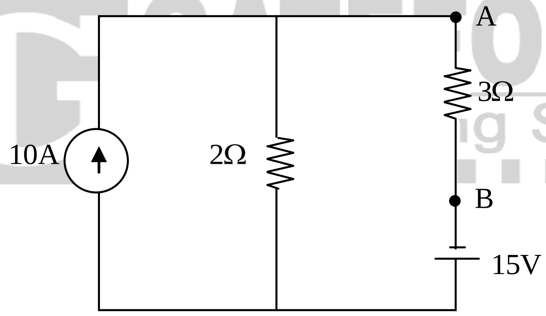
Key: (D)

$$V = \mu E = \frac{L}{t}$$

53. Phase lead compensation
(A) Increases bandwidth and increases steady-state error
(B) decreases bandwidth and decreases steady-state error
(C) will not affect bandwidth but decreases steady-state error
(D) increases bandwidth but will not affect steady-state error

Key: (D)

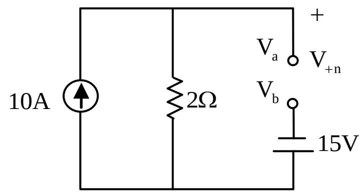
54. The Thevenin equivalent voltage and resistance across AB shown in the figure respectively are



(A) 5V and 5Ω
(B) 25V and 3Ω
(C) 35V and 2Ω
(D) 25V and 5Ω

Key: (C)

Exp: V_{th} calculation



$V_{th} = V_a - V_b$
$= 20-(-15) = 35V$

55. The theorem which states that in any linear, non-linear, passive, active, time variant and time-variant network, the summation of instantaneous powers is zero will be called as
(A) Tellegen's theorem
(B) Compensation theorem
(C) reciprocity theorem
(D) superposition theorem

Key: (A)

56. Transients are causes because

1. The load is suddenly connected to or disconnected from the supply
2. of the sudden change in applied voltage from one finite value to the other
3. of the change in stored energy in inductors and capacitors

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

Key: (D)

57. A unit impulse function is defined as

1. a pulse of area 1
2. a pulse compressed along horizontal axis and stretched along vertical axis keeping the area unity
3. $\frac{du}{dt}$
4. $\delta(t) = 0, t \neq 0$

Which of the above statements are correct?

(A) 1, 2 and 3 only (B) 1, 3 and 4 only
(C) 2, 3 and 4 only (D) 1, 2, 3 and 4

Key: (D)

58. The derivative of a parabolic function becomes

(A) a unit-impulse function (B) a ramp function
(C) a gate function (D) a triangular function

Key: (B)

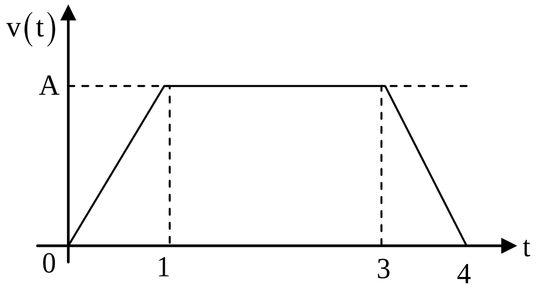
59. Which of the following can produce maximum induced voltage?

(A) 1 A d.c. current
(B) 50 A d.c. current
(C) 1 A, 60 Hz a.c. current
(D) 1A, 490 Hz a.c. current

Key: (D)

If we apply a high frequency supply of the same peak voltage to the coil, the current still is being delayed by 90° but the time it requires to reach its maximum value has been reduced due to the increase in frequency. Because the frequency is inversely proportional to time (T). Hence, the rate of change of the flux within the coil has also increased due to the increase in frequency. Hence, the induced EMF is maximum in case of 1 amp 490 Hz supply source in the coil.

60. The Laplace transform of the waveform of the following figure is

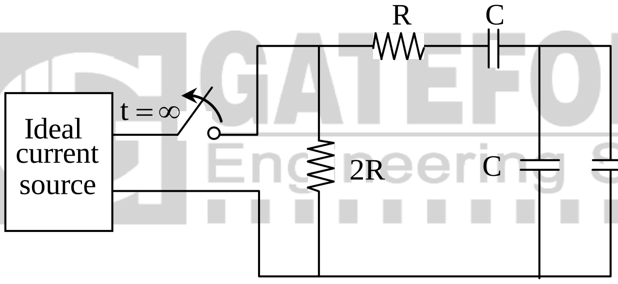


(A) $\frac{A}{s^2}\left(1+e^{-s}+e^{-3s}+e^{-4s}\right)$ (B) $\frac{A}{s^2}\left(1-e^{-s}-e^{-3s}-e^{-4s}\right)$

(C) $\frac{A}{s^2}\left(-1-e^{-s}-e^{-3s}-e^{-4s}\right)$ (D) None of the above

Key: (D)

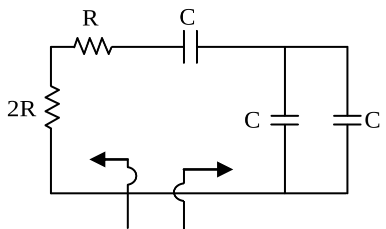
61. An ideal current source is connected to the disconnected circuit shown in the figure at t = 0. The time constant of the circuit is



(A) $\frac{RC}{2}$ (B) RC (C) 2RC (D) $\frac{9RC}{2}$

Key: (C)

Exp:



$R_{eq} = 3R$ $C_{eq} = \frac{(2C)C}{3C} = \frac{2C}{3}$

$\tau = R_{eq}C_{eq} = 2RC$

62. If the Q-factor of a coil at resonant frequency of 1.5 MHz is 150 for a series resonant circuit, then the corresponding bandwidth is

(A) 225 MHz (B) 1.06 MHz (C) 50 kHz (D) 10 kHz

Key: (D)

Exp:

$$B.W = \frac{f_0}{Q} = \frac{1.5\times10^6}{150} = 10\,kHz$$

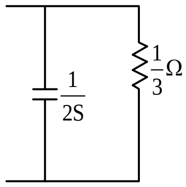
63. A one-part network consists of a capacitor of 2F in parallel with a resistor of $\frac{1}{3}\Omega$. Then the input admittance is

(A) 2s + 3 (B) 3s + 2 (C) $\frac{2}{s}+\frac{1}{3}$ (D) $\frac{s}{2}+3$

Key: (A)

Exp: $Y = \frac{1}{1/2S} + \frac{1}{1/3}$

$= 2S + 3$



64. In a two-wattmeter method of measuring power in a balanced 3-phae circuit, the ratio of the two wattmeter readings is 1: 2. The circuit power factor is

(A) 0.707 (B) 0.5 (C) 0.866 (D) indeterminate

Key: (C)

$\tan\phi = \sqrt{3}\,\frac{W_2 - W_1}{W_2 + W_1}$

65. A balanced delta-connected load $(16 + j12)\Omega/\text{phase}$ is connected to a 3-phase 230 V balanced supply. The line current and the real power drawn respectively are

(A) 19.9 A and 3.17 kW (B) 11.5 A and 6.34 kW

(C) 19.9 A and 6.34 kW (D) 11.5 A and 3.17 kW

Key: (C)

66. The servomotor differs from the standard motors principally in that, it has

(A) entirely different construction (B) high inertia and hence high torque

(C) low inertia and low torque (D) low inertia and higher starting torque

Key: (D)

67. A balanced load of 5 + j4 is connected in delta. What is the impedance per phase of the equivalent star connection?

(A) 5 + j4 (B) 1.66 + j 1.33 (C) 15 + j12 (D) 2.5 + j2

Key: (B)

Exp: $Z_* = \frac{Z_\Delta}{3} = \frac{5+j4}{3} = 1.66 + j1.33$

68. The vector $\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$ is an eigenvalue of $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

One of the eigenvalues of A is

(A) 1 (B) 1 (C) 5 (D) 7

Key: (B)

69. In an electric circuit, the number of independent meshes M is

(A) $2B-N+1$ (B) $B-N+1$ (C) $2B-N-1$ (D) $B-N-1$

Where B is number of branches and N is number of nodes.

Key: (B)

Exp: B-(N-1) = B-N+1

70. Frequency counter can be used to measure

1. Fundamental frequency of input signal
2. Fundamental and harmonic frequencies of input signal
3. Time interval between two pulses
4. Pulse width

Which of the above statements are correct?

(A) 1, 2, 3 and 4 (B) 1, 2 and 3 only

(C) 2, 3 and 4 only (D) 1, 3 and 4 only

Key: (D)

Exp:

71. In vector impedance meter, the coverage of the instrument can be obtained with

(A) V-I characteristics of the test system

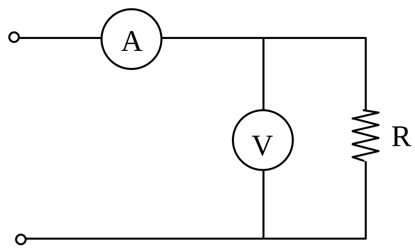
(B) Power-frequency plot

(C) Sweep frequency plots of impedance and phase angle versus frequency

(D) voltage-angle plot

Key: (C)

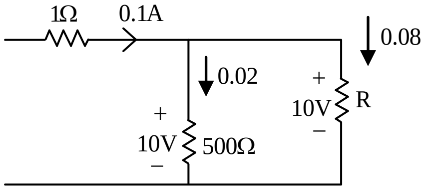
72. In the circuit shown below, the ammeter reads 0.1A and the voltmeter reads 10V. The internal resistance of the ammeter is 1Ω and that of the voltmeter is $500\,\Omega$. what the value of R is?



(A) 100Ω (B) 125Ω (C) 90Ω (D) 120Ω

Key: (B)

Exp:



$$R=\frac{10}{0.08}=125\Omega$$

73. The open-loop transfer function of a feedback control system is given by

$$G(s)H(s)=\frac{K(s+8)}{s(s+4)(s^2+4s+8)}$$

In the root locus diagram of the system, the asymptotes of the root loci for large values of K meet at a point in the s-plane. Which one of the following is the set of coordinates of that point?

(A) $(-1,0)$ (B) $(-2,0)$ (C) $(1,0)$ (D) $(2,0)$

Key: (B)

74. A 1 mA galvanometer with internal resistance of 50Ω is to be converted to measure 5A (full-scale). What is the value of shunt resistance required for this conversion?

(A) 1Ω (B) 0.01Ω (C) $1k\Omega$ (D) 10Ω

Key: (B)

Exp: $R_{Sn}=\frac{R_m}{m-1}$

R_m: meter resistance $=50\Omega$

M: multiplying factor $=\frac{5}{1mA}=5000$

$R_{sn}=\frac{50}{5000-1}=0.01\Omega$

75. A $50\mu A$ basic d'Arsonval movement with an internal resistance of 500Ω is to be used as a voltmeter. The value of the multiplier resistance required to measure a full-scale voltage range of 0-5 volts is

(A) $999.5\,k\Omega$ (B) $99.5\,k\Omega$ (C) $9.99\,k\Omega$ (D) $0.99\,k\Omega$

Key: (B)

Exp: $R_{se} = R_m\,(m-1)$

R_m: meter resistance $=500\Omega$

M: multiplying factor $=\frac{5V}{50\times10^{-6}\times500}=200$

$R_{se} = 500\,(200-1) = 99.5\,k\Omega$

76. The power factor of a circuit in which voltage and current waves are non-sinusoidal is defined as

(A) it is the cosine of the angle of phase difference between the voltage and current waves

(B) It is the cosine of the angle of phase difference between the two complex waves

(C) It is the cosine of the angle of phase difference between two equivalent sine waves having respectively r.m.s values equal to those of the voltage and current in the circuit.

(D) it is the sine of the angle of phase difference between the two complex waves

Key: (A)

77. The maximum power demand of a consumer is 2 kW and the corresponding daily energy consumption is 30 units. What is corresponding load factor?

(A) 0.25 (B) 0.5 (C) 0.625 (D) 0.75

Key: (C)

78. Time response of an indicating instrument is decided by which of the following systems?

(A) Mechanical system provided by pivot and jewel bearing
(B) Controlling system
(C) Deflecting system
(D) Damping system

Key: (D)

79. What happens to the resistance of a conductor if its length is increased three times and diameter is halved?

(A) Resistance remains the same (B) Resistance is increased 3 times
(C) Resistance is increased 6 times (D) Resistance is increased 12 times

Key: (D)

Exp: $$R' = \rho\left(\frac{L'}{A'}\right) = \rho\left(\frac{3L}{\pi\frac{(d/2)^2}{4}}\right) = 2R$$

80. An integrator type DVM (digital voltmeter) contains a $100\,k\Omega$ and $1\mu F$ capacitor. If the voltage applied to the integrator input is 1 volt, what voltage will be present at the output of the integrator after 1 second?

(A) 1.1V (B) 1V (C) 10V (D) 100V

Key: (C)

Exp: $$V_0 = \frac{1}{RC}\int_0^t V_i dt = \frac{1}{RC}V_i(t) = \frac{V_i}{RC}$$

$$= \frac{1}{100\times10^3\times10^{-6}} = \frac{1}{0.1} = 10V$$

81. In measuring resistance by voltmeter ammeter method, the voltmeter can be connected either across supply or across the resistance. If the resistance is low, the voltmeter should be connected

(A) across the supply
(B) across the resistance
(C) either across the supply or across the resistance
(D) neither across the supply nor across the resistance

Key: (B)

82. A bridge circuit works at a frequency of 2 kHz. Which of the following can be used as detectors for detection of null conditions in the bridge?
(A) Vibrations galvanometers and head phones
(B) Headphones and tunable amplifiers
(C) Vibrations galvanometers and tunable amplifiers
(D) Vibration galvanometers, head phones and tunable amplifiers

Key: (B)

83. A dual-beam CRO
(A) has one set of vertical deflection plates
(B) has two sets of horizontal deflection plates
(C) has two separate electron beams
(D) None of the above

Key: (C)

84. If the bandwidth of an oscilloscope is 10 MHz, what is fastest rise time a square wave can have to be accurately reproduced by the instrument?
(A) 10 ns (B) 35 ns (C) 28 ns (D) 100 ns

Key: (B)

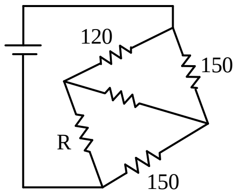
Exp: $B.W \times t_r = 0.35$

$$t_r = \frac{0.35}{10\times10^6} = 35\,n.sec$$

85. A Wheatstone bridge has got three resistances taken in clockwise direction as 120Ω, 150Ω and 150Ω. The value of the fourth resistance for null balance would be
(A) 150Ω (B) 120Ω (C) 300Ω (D) 750Ω

Key: (B)

Exp:



$$150R = 150\times120$$
$$R = 120$$

86. A capacitive transducer consists of two parallel plates of diameter 2 cm each and separated by an air gap of 0.25 mm. What is the displacement sensitivity?
(A) +200 pF/cm (B) –300 pF/cm (C) –444 pF/cm (D) +44.4 pF/cm

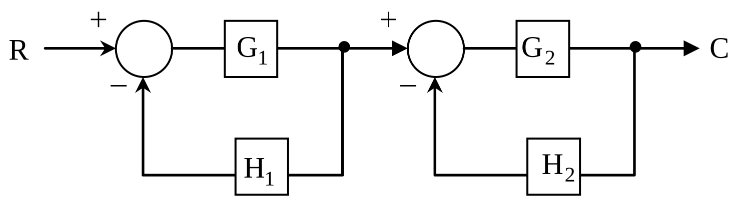
Key: (C)

87. An analog transducer with a 0-10 V input is able to distinguish a charge of 10 mV in its input signal. What is the number of bits of an A/D converter in binary code so that the digital output has almost the same resolution as the transducer?

(A) 8 (B) 10 (C) 12 (D) 4

Key: (B)

88. The transfer function C/R of the system shown in figure is

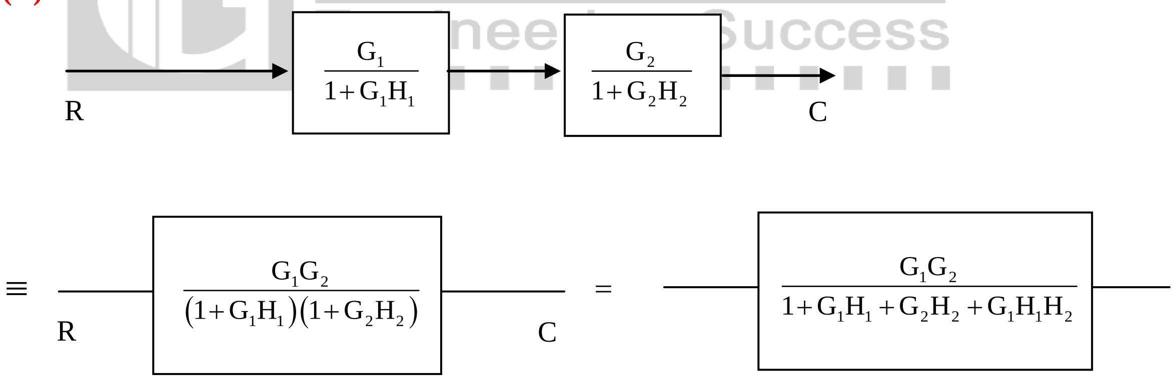


(A) $\dfrac{G_1G_2}{1+G_1H_1+G_2H_2}$ (B) $\dfrac{G_1H_1G_2H_2}{(1+G_1H_1)(1+G_2H_2)}$

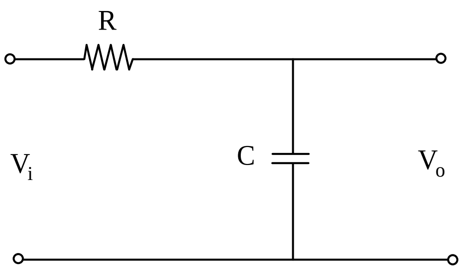
(C) $\dfrac{G_1G_2}{1-G_1-G_2+G_1G_2H_1H_2}$ (D) $\dfrac{G_1G_2}{1+G_1H_1+G_2H_2+G_1G_2H_1H_2}$

Key: (D)

Exp:



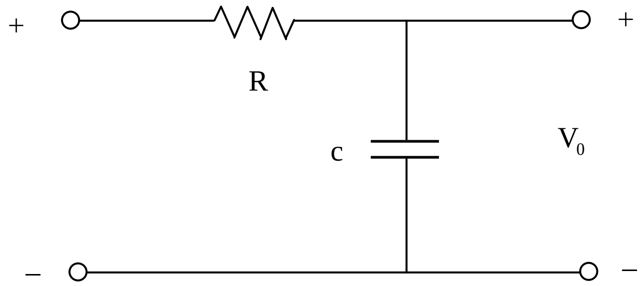
89. The transfer function of the circuit as shown in figure is expressed as



(A) $\dfrac{R}{1+sRC}$ (B) $\dfrac{s}{1+sCR}$ (C) $\dfrac{1}{1+sRc}$ (D) $1+sCR$

Key: (C)

Exp:



$$\frac{V_0(s)}{V_i(s)} = \frac{\left(\frac{1}{cs}\right)}{\left(\frac{1}{cs}+R\right)}$$

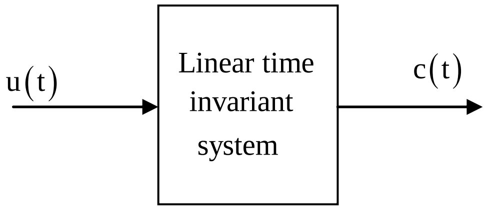
$$\frac{V_0(s)}{V_i(s)} = \frac{1}{1+R(s)}$$

90. A 3-turn 100kΩ potentiometer with 1% linearity uses 30 V supply. What is the potentiometer constant?

(A) 0.1 V/turn (b) 10 V/turn (C) 33.33 V/turn (D) 0.3 V/turn

Key: (B)

91. A quiescent linear time-invariant system subjected to a unit step input u(t) has the response $c(t) = te^{-t}, t \geq 0$. Then $\frac{C(s)}{R(s)}$ would be



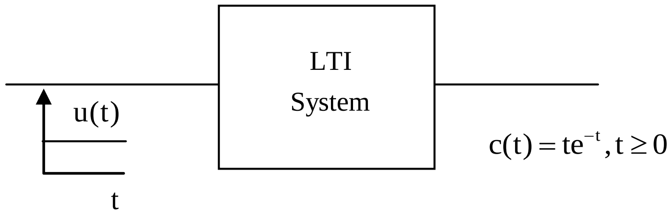
(A) $\frac{1}{s(s+1)}$ (B) $\frac{1}{s+1}$

(C) $\frac{1}{(s+1)^2}$ (D) None of the above

Key: (D)

Exp:

$$\frac{C(s)}{R(s)} = \frac{1}{(s+1)^2 \times \left(\frac{1}{s}\right)} = \frac{s}{(s+1)^2}$$



92. The characteristic equation of a closed loop system is $s^2 + 4s + 16 = 0$. The natural frequency of oscillation and damping constant respectively are

(A) $2\ \text{rad/s}$ and $\frac{1}{2}$

(B) $2\sqrt{3}\ \text{rad/s}$ and $\frac{1}{\sqrt{3}}$

(C) $4\ \text{rad/s}$ and $\frac{1}{2}$

(D) $4\ \text{rad/s}$ and $\frac{1}{\sqrt{2}}$

Key: (C)

Exp: $s^2 + 4s + 16 = 0$

Comparing with standard form

$s^2 + 2\xi w_n s + w_n^2 = 0;$

$\omega_n^2 = 16;\ \omega_n = \frac{ur}{s}$

$2\xi\omega_n = 4$

$\xi = \frac{1}{2}$

93. Consider the following input and system types:

Input type	System type
Unit step	Type ‘0’
Unit ramp	Type ‘1’
Unit parabolic	Type ‘2’

Which of the following statements are correct?

1. Unit step input is acceptable to all the three types of system
2. Type ‘0’ system cannot accept unit parabolic input
3. Unit ramp input is acceptable to Type ‘2’ system only

(A) 1 and 2 only

(B) 1 and 3 only

(C) 2 and 3 only

(D) 1, 2 and 3

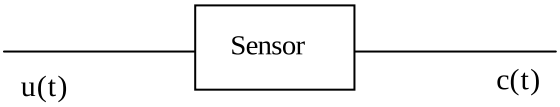
Key: (D)

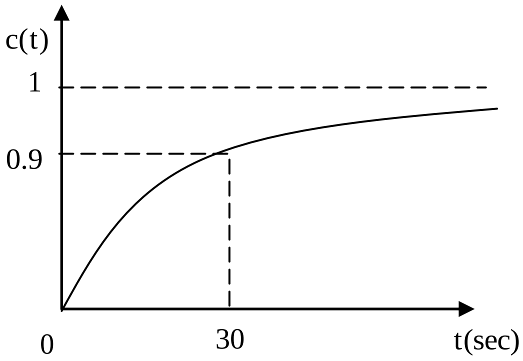
94. A sensor requires 30 s to indicate 90% of the response to a step input. If the sensor is a first-order system, the time constant is [given, $\log_e(0.1) = -2.3$]

(A) 15 s (B) 13 s (C) 21 s (D) 28 s

Key: (B)

Exp:





As sensor is first order.

$c(t) = c(\infty) + \left[c(0^+) \ - c(\infty)\right] e^{-t/\tau}$

$c(t) = 1 + [0 - 1]e^{-t/\tau}$

but $c(t) = 0.9$, at $t = 30\,sec$

$0.9 = 1 - e^{-30/\tau}$

$e^{-30/\tau} = 0.1$

$\boxed{\tau = 13 sec}$

95. A unity feedback system has open-loop transfer function

$$G(s) = \frac{K(s+4)}{(s+1)(s+2)}$$

The portions of the real axis that lie on the root loci are between

(A) $s = -2$ and $s = -4$; $s = -1$ and $+\infty$

(B) $s = -1$ and $s = -2$; $s = -4$ and $-\infty$

(C) $s = 0$ and $s = -2$; beyond $s = -4$

(D) $S = 0$ and $s = -1$

Key: (B)

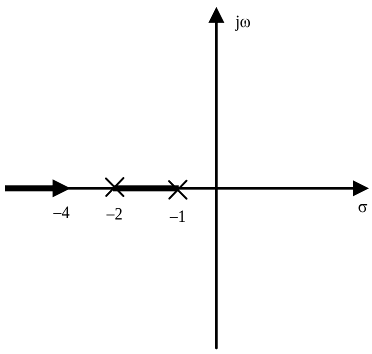
Exp:

using root locus rules root locus would be

from $-\infty$ to -4 and

from -2 to -4 on

Real axis



96. If V_1 is the fundamental voltage, V3 and V5 are the amplitudes of the 3[rd] and 5[th] harmonic and

$$\frac{V_3}{V_1} = x\%, \frac{V_5}{V_1} = y\%$$

Then the total harmonic distortion of the system will be

(A) $\sqrt{x^2 + y^2}$ (B) $\frac{y}{x}$ (C) $x + y$ (D) $\frac{1}{\sqrt{x^2 + y^2}}$

Key: (A)

97. The characteristic equation of a feedback system is $s^3 + Ks^2 + 5s + 10 = 0$. For a stable system, the value of K should be less than

(A) 1 (B) 2 (C) 3 (D) 4.5

Key: (D)

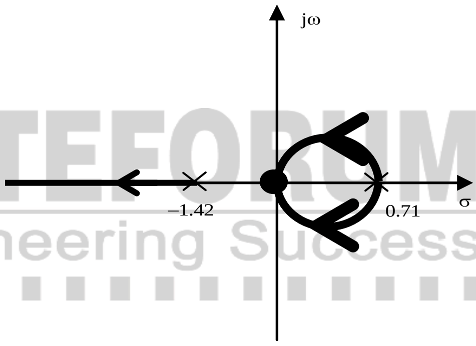
Exp: $s^3 + ks^2 + 5s + 10 = 0$

$ks^2 + (s^3 + 5s + 10) = 0$

$\frac{ks^2}{(s^3 + 5s + 10} + 1 = 0$

$GH = \frac{k.s^2}{(s^3 + 5s + 10)};$

Unstable system.



98. Consider the following statements with respect to Routh-Hurwitz criterion

1. It can be used to determined relative stability
2. It is valid only for real coefficients of the characteristic equation
3. It is applicable only for non-linear systems
4. It does not provide the exact location of closed-loop poles in left-or right-half of s-plane.

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

Key: (C)

99. The first element of each of the rows of a Routh-Hurwitz stability test showed the signs as follows:

Row	I	II	III	IV	V
Sign	+	+	-	+	-

Consider the following statements

1. The system has three roots in the right-half of s-plane
2. The system has three roots in the left-half of s-plane

3. The system is stable
4. The system is unstable

Which of the above statement about the system are correct?

(A) 1 and 3 (B) 1 and 4 (C) 2 and 3 (D) 2 and 4

Key: (B)

Exp: Three sign changes

$\therefore$ Three roots in the right half of s-plane.

The system is unstable as sign changes are present

100. Consider the following statements about root locus:

1. The roots locus is symmetrical about real axis.
2. If a root branch moves along the real axis from an open loop pole to zero or to infinity, this root locus branch is called real root branch.
3. The breakaway points of the root locus are the solutions of $\frac{dK}{ds} = 0.$

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

Key: (D)

101. The low-frequency circuit impedance and the high-frequency circuit impedance for a series resonant circuit respectively are

(A) capacitive and inductive

(B) inductive and capacitive

(C) resistive and inductive

(D) capacitive and resistive

Key: (A)

102. The state-variable formulation of a system is

$\dot{x} = Ax + Bu; \; y = [1 0]x$

Where

$$A = \begin{bmatrix} -3 & 1 \\ 0 & -2 \end{bmatrix}, B = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

The system transformation would be

(A) $\frac{s+2}{s^2+5s-6}$ (B) $\frac{2s+5}{s^2+5s+6}$ (C) $\frac{2s-5}{s^2+5s-6}$ (D) $\frac{s+1}{s^2+5s-6}$

Key: (B)

Exp: $T.F = c(sI - A)^{-1} B + D$

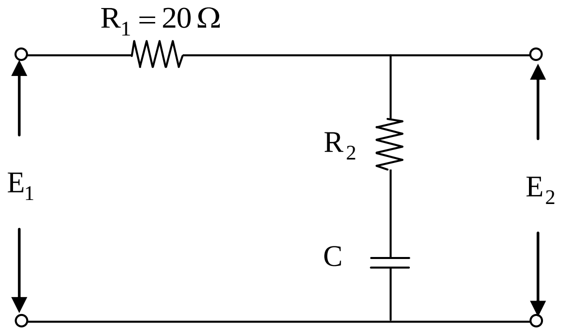
$$= [1 \;\; 0]\begin{bmatrix} s+3 & -1 \\ 0 & s+2 \end{bmatrix}\begin{bmatrix} 2 \\ 1 \end{bmatrix} + 0$$

$$= [1 \;\; 0]\frac{1}{(s+3)(s+2)}\begin{bmatrix} s+2 & 1 \\ 0 & s+3 \end{bmatrix}_{2\times 2}\begin{bmatrix} 2 \\ 1 \end{bmatrix}_{2\times 1} + 0$$

$$= \frac{1}{(s+3)(s+2)}[1\ \ 0]\begin{bmatrix} 2s+5 \\ s+3 \end{bmatrix}$$

$$= \frac{(2s+5)}{(s^2+5s+6)}$$

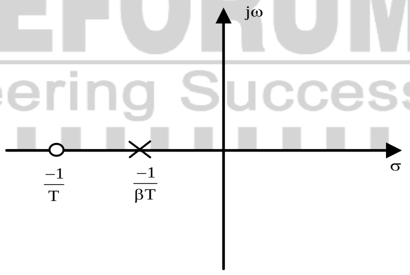
103. For the following network to work as lag compensator, the value of R_2 should be



(A) $R_2 \geq 20\Omega$ (B) $R_2 \leq 10\Omega$ (C) $R_2 C \leq \frac{R_1^2 C}{2}$ (D) Any value of R_2

Key: (D)

Exp: For lag compensator



$$\left|\frac{1}{\beta T}\right| < \left|\frac{1}{T}\right|$$

$$\beta > 1$$

$$\text{where } \beta = \frac{R_2 + R_1}{R_1}$$

$$\therefore R_2 + R_1 > R_1$$

$$\boxed{R_2 > 0}$$

104. The z-transform X(z) of the signal

$$x[n] = a^n u(n)$$

Where u(n) is sequence of unit pulses, is

(A) $\frac{\alpha}{z-1}$ (b) $\frac{z}{z-1}$ (C) $\frac{z}{z-\alpha}$ (D) $\frac{1}{z-\alpha}$

Key: (C)

105. How many roots of the following equation lie in the right-half of s-plane?

(A) 1 (B) 2 (C) 3 (D) 4

Key: (B)

Directions: Each of the next **fifteen (15)** items consists of two statements, one labeled as 'Statement (I)' and the other as 'Statement (II)'. Examine these two statements carefully and select the answers to these items using the codes given below.

Codes:

(A) Both statements (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

(B) Both statements (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

106. Statement (I): Cold working of a conductor material results in a decrease in the electrical conductivity of the metal because the localized strains interface with the electron movement.

Statement (II): Subsequent annealing of the conductor material restores the electrical conductivity by establishing greater regularity in the crystal lattice.

Key: (B)

107. Statement (I): A large number of metals become 'superconducting' below a temperature which is characteristic of the particular metal.

Statement (II): Superconducting compounds and alloys should necessarily have components which are themselves superconducting.

Key: (C)

Exp: Superconductivity is a phenomenon observed in several metals and ceramic materials. When these materials are cooled to temperatures ranging from near absolute zero (0 degrees Kelvin, -273 degrees Celsius) to liquid nitrogen temperatures (77 K, -196 C), their electrical resistance drops with a jump down to zero

108. Statement (I): In a R-L-C series circuit, excited from a variable frequency voltage source, the circuit behaves like a 'resistive' one at a particular frequency.

Statement (II): The frequency at which an R-L-C series circuit becomes 'resistive' in character, a part of the input energy oscillates between the inductive and the capacitive elements of the circuit.

Key: (A)

109. Statement (I): If a ramp input is applied to a second-order system, the steady-state error of the response can be reduced by reducing damping and increasing natural frequency of oscillation.

Statement (II): In the frequency response of a second-order system, the change in slope at one of the corner frequencies is of ± 40 dB/decade.

Key: (D)

110. Statement (I): The ammeter loading effect is due to the high resistance of the ammeter.

Statement (II): Increasing the resistance of voltmeter will reduce the voltmeter loading effect.

Key: (B)

111. Statement (I): In instruments where spring control is used for providing controlling torque, the scale is uniform, and where gravity control is used, the scale is non uniform.

Statement (II): In instruments where controlling torque is provided by spring control, the current is proportional to the deflection, and where the controlling torque is provided by gravity control, the current is proportional to sine of the deflection.

Key: (A)

112. Statement (I): Ammeter and voltmeter method is used for measurement of low as well as medium resistances.

Statement (II): Carey-Foster slide Wire Bridge is a modification of the Wheatstone bridge.

Key: (B)

113. Statement (I): In the Kelvin double-bridge method, provision has been made to eliminate the errors due to contact and lead resistances.

Statement (II): The Schering bridge is used for measuring small capacitance at low voltages with very high precision.

Key: (B)

114. Statement (I): A ‘strain gauge’ is an example of a ‘Transducer’ or an electromechanical transformer.

Statement (II): In the ‘strain gauge’ displacement is used to vary the resistance of a circuit component and the ‘strain’ is measured in terms of the change in the resistance.

Key: (A)

115. Statement (I): The principle of the resistance strain gauge is that if gauge factor is known, the measurement of $\frac{dR}{R}$ allows the measurement of strain $\frac{dL}{L} = \varepsilon$

Statement (II): The output of an LVDT is of the order of mill volt.

Key: (C)

LVDT measurement are typically in **mV**/V/mm or **mV**/V/in.

116. Statement (I): Inverse root locus is the image of the direct root locus

Statement (II): Root locus is symmetrical about the imaginary axis.

Key: (C)

117. Statement (I): Centroid is the point where the root loci break from the real axis.
Statement (II): Centroid is the point on the real axis where all asymptotes intersect.

Key: (D)

Exp: Centroid is the point of concurrency of asymptotes.

118. Statement (I): At breakaway point, the system is critically damped.
Statement (II): At the point where root loci intersect with the imaginary axis, the system is marginally stable.

Key: (B)

Exp: Critically damped systems are stable systems

119. Statement (I): A root locus is obtained using the closed-loop poles.
Statement (II): A root locus is plotted using the open-loop poles.

Key: (D)

120. Statement (I): Inductor is not used to realize a lag network
Statement (II): Inductor produces time delay and hysteresis loss.

Key: (A)