TEST ID: 204

ESE- 2020 (Prelims) - Offline Test Series Test-7

ELECTRICAL ENGINEERING

SUBJECT: Electrical & Electronic Measurements and Power SYSTEMS SOLUTIONS

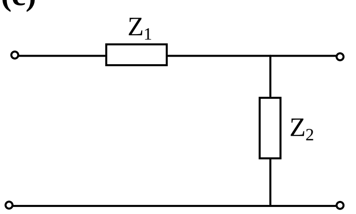
01. Ans: (b)

Sol: In a pumped storage plant, the turbine will act as Synchronous motor during pumping operation and as a Synchronous condenser during off peak loads for power factor correction.

A pumped storage plant is a peak load plant but not base load plants. This plant operates as source of electrics energy during system peak hours and a sink during off-peak hours. The modern trend is to use a reversible pump turbine unit. While generating the turbine drives the generator and in reverse operation, the generator runs as a motor driving the turbine, which, now acts as a pump. The starting time of a pumped storage plant is very short compared to other.

02. Ans: (c)

Sol:



ABCD of the cascaded network

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} 1 & Z_1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 1/Z_2 & 1 \end{bmatrix}$$

From this multiplication,

$$C = \frac{1}{Z_2},\ Z_2 = \frac{1}{C}$$

as it is given that $C = 0.2\angle 90°$

$$Z_2 = \frac{1}{0.2\angle 90°} = 5\angle -90° = -j5\ \Omega$$

03. Ans: (a)

Sol: The load frequency control objective is to regulate the frequency of each area and to simultaneously regulate the tie-line power as per inter-area contracts. As in the case of frequency, proportional plus integral controller will be installed so as to give zero steady state error in tie time power flow.

04. Ans: (a)

Sol: $$\frac{\text{plant capacity factor}}{\text{plant load factor}} = \frac{Max.\,load\,(ML)}{Installed\ capacity\,(IC)}$$

$$IC = 20000 \times \frac{0.5}{0.4} = 25000\text{ kW}$$

Reserve Capacity = IC − ML

= 25000–20000

= 5000 kW

05. Ans: (c)

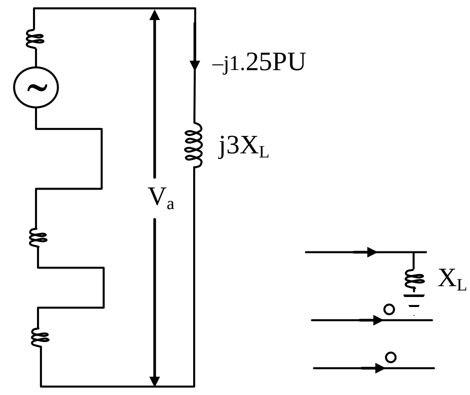
Sol: Load flow study in power system is the steady state solution of the power system network. (i.e. steady state limit.) and the main information obtained from the load flow study comprises of magnitudes and phase angles of load bus voltages, reactive powers and voltage phase angles at generator buses, real and reactive power flow on transmission lines together with power at reference bus. Total power losses in the network. This information is essential for the continuous monitoring of the current state of the system.

06. Ans: (c)

Sol: Load flow studies must be made on a power system before making both short circuit and transient stability studies on the power system.

07. Ans: (c)

Sol:



$$V_a = V_{a_0} + V_{a_1} + V_{a_2}$$

$$= 0.75 – 0.25 – 0.125 \qquad = 0.375\text{ PU}$$

$$I_a = 3I_{a_0} = -j3.75\,\text{PU}$$

$$X_L = \frac{V_a}{I_a} = \frac{0.375}{3.75} = 0.1\,\text{PU}$$

08. Ans: (b)

Sol: At point 1, electrical power input P_e and mechanical power output P_0 are equal. Hence, there is no acceleration and deceleration at this point, it maintains synchronous speed.

At point 2, while oscillating from 1 towards 3 output power is more than input power. Hence, it decelerates and the speed will be $\omega < \omega_s$.

At point 2, while oscillating from 3 towards 1, output power is less than input power. Hence, it decelerates and the speed will be $\omega > \omega_s$.

09. Ans: (a)

Sol: the voltage induced in the communication line in longitudinal and lateral directions by the power line are due to magnetic induction and electric induction respectively.

10. Ans: (b)

Sol: Corona is ionization of air near the surface of the power conductor at certain point corona is electric discharge due to electric field, it generates 3rd harmonics. Capacitance between line & earth allows 3rd harmonic currents.

11. Ans: (a)

Sol: Inertia constant (H)

$$= \frac{\text{Kinetic energy stored in rotor (MJ)}}{\text{MVA rating of alternator (S)}}$$

Kinetic energy stored in rotor = $\frac{1}{2} I\,\omega^2$

$$\omega = \frac{2\pi N_S}{60}$$

$$N_S = \frac{120 \times 50}{2} = 3000 \text{ rpm}$$

$$\omega = \frac{2\pi \times 3000}{60} = 314.15 \text{ rad/sec}$$

$$\therefore \text{ K.E} = \frac{1}{2} \times 27.5 \times 10^3 \times (314.15)^2$$

$$= 1357 \text{ MJ}$$

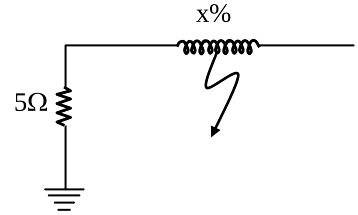
$$H = \frac{1357}{\left(\frac{400}{0.8}\right)} = 2.714 \text{ MJ/MVA (or) sec.}$$

12. Ans: (c)

Sol: $I_{f_2} = \frac{V_{pf}}{Z_{22}} = \frac{1}{j0.4} = -j2.5$ pu

13. Ans: (d)

Sol:



Let x% be the winding that remains unprotected

The phase voltage will be $\frac{6600}{\sqrt{3}} = 3810$ V

The voltage of the unprotected portion = $3810 \frac{x}{100}$

Fault current = $3810\ \frac{x}{500}$ A

The full load current = $\frac{5000}{\sqrt{3} \times 6.6}$ = 437.37 A

The out of balance current required for the operation of the relay = 437.37 × 0.2

$$\frac{3810\,x}{500} = 0.2 \times 437.37$$

x = 11.479%

The percentage of winding remains protected = 100 – 11.479

= 88.521%

14. Ans: (b)

Sol: Impulse ratios of insulators and lightning arrestors should be high and low respectively.

15. Ans: (b)

Sol: If P = 100 MW, P_L = 10 MW

$$I.T.L = \frac{10}{100} = 0.1$$

$$L = \frac{1}{1 - I.T_L} = \frac{1}{1-0.1} = 1.11$$

A = 100 Rs/MW hr

$\lambda = LI_C \Rightarrow 100 = (1.11)\,(0.1P+10)$

$$0.1P+10 = \frac{100}{1.11} = 90$$

$$P = \frac{90-10}{0.1} = 800 \text{ MW}$$

16. Ans: (a)

Sol: The 'A' parameter of the transmission line is, $A = 1 - \frac{\omega^2\ell^2 LC}{2}$

As length decreases 'A' parameter increases

'B' parameter is the series reactance of the transmission line

As length decreases 'B' parameter decreases

17. Ans: (b)

Sol: $$\Delta f_{ss} = \frac{-\Delta P_L}{\left(D + \frac{1}{R}\right)}$$

Since there is no speed control action

$$\Delta f_{ss} = \frac{-\Delta P_L}{D}$$

New load = 2060 – 60 = 2000 MW

$$D = \left(\frac{2\times 2000}{100}\right)\left(\frac{100}{1\times 50}\right) = 80 \text{ MW/Hz}$$

Δp_L = – 60 MW

(negative sign because load is decreases)

$$\Delta f_{ss} = \frac{-\Delta P_L}{D} = \frac{-(-60)}{80} = \frac{3}{4} \text{ Hz}$$

$= 0.75$ Hz

18. Ans: (b)

Sol: For two-plant system

$$P_L = P_1^2 B_{11} + 2P_1P_2 B_{12} + P_2^2 B_{22}$$

Here $B_{12} = B_{21} = 0$and $B_{22} = 0$ because the load is at plant 2. Therefore line loss will not be changed with variation of P_2 but changed with variation of P_1.

$$P_L = P_1^2 B_{11}$$

$$\frac{dP_L}{dP_1} = 2P_1 B_{11} = 2\times 250\times 10^{-3}$$

$$L_2 = \frac{1}{1 - \frac{dP_L}{dP_2}} = \frac{1}{1.0} = 1.0$$

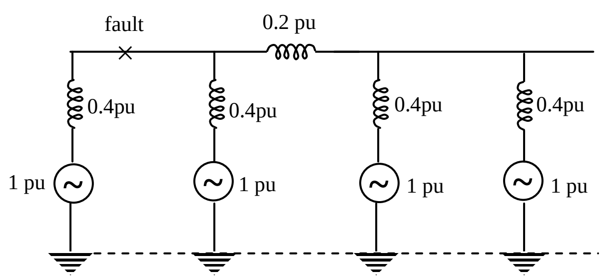
($\because$ Load is at plant 2, transmission loss $\frac{dP_L}{dP_2} = 0$)

$$L_1 = \frac{1}{1 - \frac{dP_L}{dP_1}} = \frac{1}{1 - 2\times 10^{-3}\times 250}$$

$$= \frac{1}{1-0.5} = \frac{1}{0.5} = 2$$

19. Ans: (a)

Sol: Generator is represented with voltage source in series with reactance.



Equivalent reactance with respect to fault point $X_{eq} = \frac{0.4\times0.2}{0.6}$

steady state symmetrical fault current

$(I_f) = \frac{E_{R1}}{X_{eq}}$

$$= \frac{1.0\times0.6}{0.4\times0.2} = 7.5 \text{ pu.}$$

20. Ans: (a)

Sol: Overall efficiency $\eta = 0.4 \times 0.86$

$= 0.344$

Coal consumption in 1 year $= \frac{25\times10^5}{500}$

$= 5000$ ton

$= 5 \times 10^6$ kg

Heat of combustion = Coal consumption per year × heating value of coal

$= 5 \times 10^6 \times 5000$

$= 25 \times 10^9$ kcal

Heat output = η × heat of combustion

$= 0.344 \times 25 \times 10^9$

$= 8.6 \times 10^9$ kcal

Annual unit generated (kWh) $= \frac{8.6\times10^9}{860}$

$= 10^7$ kWh

21. Ans: (b)

Sol: The VAR injection in a power system is obtained by

(i) Shunt capacitors

(ii) Series capacitors

(iii) Synchronous capacitors (or) synchronous condensers

(iv) Tap changing transformers

22. Ans: (a)

Sol: As per the question

$V_s = V_R = 110$ kV

$A = D = 0.98\angle0°$, $B = 82.5\angle90°$

$$P_{max} = \frac{|V_s||V_R|}{|B|} - \frac{|A||V_R|^2}{|B|}\cos(\beta-\alpha)$$

$$= \frac{110\times110}{82.5} - (0.98)\times\frac{110^2}{82.5}\cos(90° - 0°)$$

$P_{max} = 146.6$ MW

23. Ans: (a)

Sol: $P_a = P_m - P_e = 25 - 24 = 1$ MW

$$H = \frac{KE}{\text{rating in MVA}} = \frac{150}{5}$$

= 3 MJ/MVA

$$M = \frac{SH}{\pi f} = \frac{50 \times 3}{\pi \times 50} = 0.955 \text{ MJ sec/rad}$$

Using swing equation

$$M\frac{d^2\delta}{dt^2} = P_a$$

$$\frac{d^2\delta}{dt^2} = \frac{P_a}{M} = \frac{1}{0.955} \approx 1\,\text{rad}/\text{sec}^2$$

After integration, we find

$$\frac{d\delta}{dt} = t + \text{constant}$$

$= t$ ($\because$ constant = 0)

$$\delta = \frac{t^2}{2} + \delta_0$$

t = 10 cycles

= 0.2 sec

$$\delta = \frac{(0.2)^2}{2} + \delta_0$$

$= 0.02 + \delta_0$

$= 0.02 \times \frac{180}{\pi} + 30^\circ = 31.14^\circ$

24. Ans: (c)

Sol: In a ring main distribution system, the supply reliability is more and there is minimum voltage drop in the feeder and power factor is not affected because it is affected by the type of system.

25. Ans: (b)

Sol: **Under reach:** when impedance seen by the relay due to presence of arc resistance, the impedance seen by the relay appears to be more than the actual value of the impedance up to the fault point and the relay lends to under reach.

Over reach: When impedance seen by the relay is less than the set value the distance relay is prone to over reach on a transient fault consisting of a dc offset. All high speed distance relay tends to see more current due to the presence of dc offset.

26. Ans: (b)

Sol: When single conductor system is converted into bundle conductor system, GMR increases corona decreases, skin effect also decreases.

27. Ans: (d)

Sol: MCB is used for interrupting low currents and MCCB is used for interrupting high currents. ELCB is a safety device used in electric installations to prevent shocks. Isolator is an off load mechanical switch. A Fuse element should has low melting point.

28. Ans: (a)

Sol: ARV = $K_1K_2\,V_{max}\sin\phi$

Given $\cos\phi = 0.8$

$\sin\phi = 0.6$

Take $K_1 = 1$, K_2

= 1.5 for ungrounded fault

$$V_{max} = \frac{220}{\sqrt{3}} \times \sqrt{2}$$

$$ARV = 1 \times 1.5 \times \frac{220}{\sqrt{3}} \times \sqrt{2} \times 0.6$$

= 161.66 kV

29. Ans: (c)

Sol: A micro grid is a group of inter connected loads and distributed energy resources within clearly defined electrical boundaries.

30. Ans: (a)

Sol: The master components of the SCADA network are master terminal unit, remote terminal unit and human machine interface.

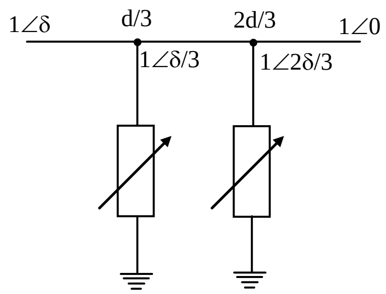
RTU provides an interface between the sensors and SCADA network.

MTU issues the commands to the RTU

Human machine interface allows the interaction between human operators and machines.

31. Ans: (a)

Sol:



The steady state power transfer limit is

$$P_m = \frac{1 \times 1}{0.1} = 10 \text{ pu}$$

32. Ans: (c)

Sol: Unified power flow controller is a combination of STATCOM and SSSC.

33. Ans: (c)

Sol: AC side harmonics of the order $nP \pm 1$ where 'n' is an integer and 'P' is pulse number.

For 12-pulse converter, order of harmonics are $12n \pm 1$.

So, the harmonics order will be 11, 13, 23, 25 ....In which 11th and 13th are dominant harmonics.

34. Ans: (a)

35. Ans: (b)

Sol: Power loss = I^2R

1. Constant 'I' load means power loss is constant

2. In constant impedance load

$$I = \frac{V}{R + jX + Z_{load}}$$

$$P_{loss} \propto I^2 \propto V^2$$

3. In constant complex power load

$$P_{loss} \propto \frac{1}{V^2}$$

So, statements 1 & 2 only correct.

36. Ans: (a)

Sol: We know : $C_d = \dfrac{C_1 - n^2 C_2}{n^2 - 1}$

And given that C_1 = 200 PF, f_1 = 1MHz

C_2 = ? , f_2 = 2MHz , C_d = 40 PF

$\therefore n = \dfrac{f_2}{f_1} = 2$

$$\Rightarrow 40PF = \frac{200PF - 4 \times C_2}{3}$$

$$\Rightarrow 120PF = 200PF - 4 \times C_2$$

$$\Rightarrow C_2 = \frac{200PF - 120PF}{4}$$

$$= \frac{80PF}{4}$$

= 20 PF

37. Ans: (b)

Sol: we know % error due to $C_d = \dfrac{-C_d}{C + C_d} \times 100$

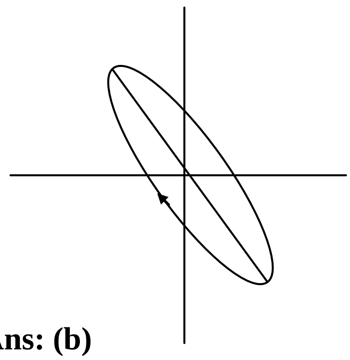
$$\therefore |\%\ \text{error}| = \frac{C_x}{C_x + C_y} \times 100$$

38. Ans: (c)

Sol: The CRO uses electrostatic focusing instead of electromagnetic focusing which is used in a TV picture tube.

39. Ans: (d)

Sol:



40. Ans: (b)

Sol: 2 & 4 are correct.

41. Ans: (b)

Sol: Let say n = number of steps required to be taken to reach to 428 mV

resolution = 10mV in 20volt range of operation

$$n = \frac{428mV}{10\,\frac{mV}{step}}$$

= 42.8 steps

= 42 steps

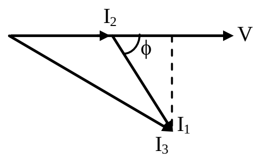
= 42 clocks

$\therefore$ if 42 clock pulses are counted, then displayed as $\underline{0}\ \underline{0}.\ \underline{4}\ \underline{2}$ V

20VR

42. Ans: (a)

Sol:



$$\bar{I}_3 = \bar{I}_1 + \bar{I}_2$$

$$\Rightarrow I_3^2 = I_1^2 + I_2^2 + 2I_1I_2\cos\phi$$

$$\cos\phi = \frac{I_3^2 - I_1^2 - I_2^2}{2I_1I_2}$$

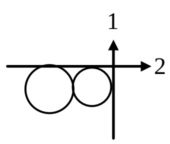
43. Ans: (a)

Sol: Heaviside bridge measures mutual inductance interms of standard inductance.

Campbell modification of Heaviside bridge (standard 'L' interns of mutual inductance).

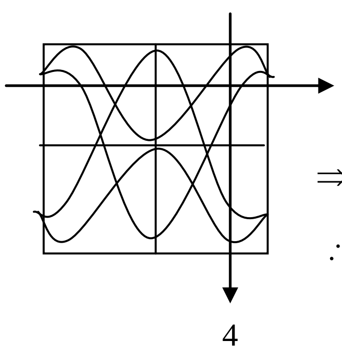
44. Ans: (a)

Sol:



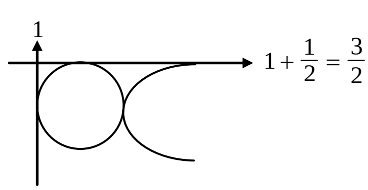
$\Rightarrow 2:1$

$\therefore$ A – Q.



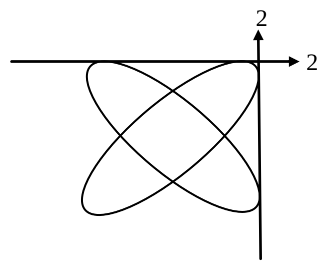
$\Rightarrow \dfrac{6}{4} = 3:2$

$\therefore$ B – P



$\Rightarrow \dfrac{3/2}{1} \Rightarrow 3:2$

$\therefore$ C – S



$\Rightarrow \dfrac{2}{2} \Rightarrow 2:2 \Rightarrow 1:1$

$\therefore$ D – R.

45. Ans: (c)

Sol: f = 1 MHz

Given time taken to increase voltage from 0 to 1.5 V is 100 ms

$\Rightarrow V_1 = 1.5$ V

$t_1 = 100$ms

$V_1 \propto t_1$

$$\Rightarrow \frac{V_1}{V_2} = \frac{t_1}{t_2}$$

$$\Rightarrow \frac{1.5}{0.75} = \frac{100\text{ms}}{t_2}$$

$$t_2 = \frac{100\text{ms}}{2} = 50 \text{ ms}$$

$\therefore$ n = $t_2 f = 50 \times 10^{-3} \times 10^6 = 50{,}000$

$\therefore$ n = 50,000 pulses.

46. Ans: (b)

Sol: PMMC meter measures average value of current

$\therefore I_{avg} = 1A$

For full wave rectifier circuit,

$$I_{avg} = \frac{2I_m}{\pi} = 1$$

$$I_m = \frac{\pi}{2}$$

Also $I_{RMS} = \frac{I_m}{\sqrt{2}} = \frac{\pi}{2\sqrt{2}} = 1.11A$

47. Ans: (b)

Sol: (ii) True (i) False

i.e the compensating coil is designed to compensate the pressure coil current existing in the current coil.

$\therefore$ Compensates the effect of the Impedance of the voltage coil (or) potential coil circuit.

48. Ans: (c)

Sol: Given E = 2.5 V, L = 10m, ℓ = 1mm

Voltage resolution= $\frac{E\times\ell}{L}$

$$= \frac{2.5\times10^{-3}}{10}V$$

$$= 2.5\times10^{-4}V.$$

49. Ans: (c)

Sol: Springs of PMMC meter are in series with the coil and provide controlling torque. Aluminium former holds the coil and provide damping torque.

50. Ans: (c)

Sol: Relative errors gets added during multiplication and division

(a) total relative error = 2%+2%+2% = 6 %

(b) total relative error = 2%+2%+2% = 6 %

(c) total relative error = 2%+2% = 4 %

Option (c) has minimum relative error. therefore VI is chosen for power calculation.

51. Ans: (c)

Sol: PMMC $\rightarrow$ DC only

Rectifier $\rightarrow$ both AC and DC

MI with current T/F $\rightarrow$ AC only

Electrodynamometer $\rightarrow$ both AC and DC

52. Ans: (a)

Sol: Error = measured value – true value

– 0.5 = 120.5 – true value

$\therefore$ True value = 120.5 + 0.5 = 121.0

53. Ans: (b)

Sol: For the given voltmeter,

Guaranteed accuracy is ±2% of full scale reading.

$= \pm 0.02 \times 300 = \pm 6$ V

$\therefore$% Limiting error = $\frac{\pm6}{360}\times100$

= ± 1.66%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AIR 8 YOGESH KUMAR CE
AIR 9 DEEPITA ROY EE
AIR 9 SHUBHAM KARNANI E&T
AIR 9 D SABAPARA ME
AIR 9 ANKIT KUMAR CE
AIR 10 ANKITA SHARMA EE
AIR 10 GAURAV SRIVASTAVA E&T
AIR 10 SUMIT BHAMBOO ME
and many more...
TOTAL SELECTIONS in Top 10: 33
(EE: 9, E&T: 8, ME: 9, CE: 7) and many more...


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54. Ans: (b)

Sol: Creeping can be prevented by drilling two diametrically opposite holes in the disc.

In some cases a small piece of iron is attached to the edge of the disc. The force of attraction exerted by the brake magnet on the iron piece is sufficient to prevent creeping of disc.

55. Ans: (d)

Sol: To balance a bridge angle and magnitude condition must be satisfied.

The angle condition is $\theta_1 + \theta_4 = \theta_2 + \theta_3$

(i)) (0° to –90°)+0° = (0° to – 90°)+0°

(ii) –90° +(– 90°) $\neq$ 0°+0°

(iii) 0°+0°=–90° + 90°

(iv) (0° to –90°) +0°$\neq$(0° to + 90°)+0°

56. Ans: (b)

Sol: $P_1 = 2000$ W

$P_2 = 0$ W

$$\therefore\ \theta = \tan^{-1}\left(\sqrt{3}\,\frac{P_1 - P_2}{P_1 + P_2}\right)$$

$$= \tan^{-1}\left[\sqrt{3}\left(\frac{P_1}{P_1}\right)\right] = 60°$$

$P = P_1 + P_2 = 2000 + 0 = 2000$ W

$$\tan\theta = \frac{Q}{P} \Rightarrow \tan 60° = \frac{Q}{2000}$$

$$\Rightarrow Q = \sqrt{3} \times 2000 = 3464.1$$

57. Ans: (b)

Sol: Meter constant to given data

$$K = \frac{30x3600}{10x50} = 216 \text{ rev/kWh}$$

But it is given that meter constant is 200.

Therefore % error in meter constant

$$= \frac{216 - 200}{200} \times 100 = 8\%$$

58. Ans: (c)

Sol: Poynting vector wattmeter is works on the principle of Hall-effect. This wattmeter used for measuring the power loss density at the surface of a magnetic material.

59. Ans: (a)

Sol: Given system voltage i.e., primary voltage = 11000V

turn's ratio = 104

$$\Rightarrow \text{Actual secondary voltage} = \frac{11000}{104}$$

$$= 105.77\text{V}$$

Measured secondary voltage = 98V

$\therefore$% error

$$= \frac{\text{measured value} - \text{actual value}}{\text{actual value}} \times 100$$

$$= \frac{98 - 105.77}{105.77}$$

$$= -7.346 \cong -7.35$$

$\therefore$ The magnitude of error is 7.35

60. Ans: (c)

Sol: Given

$g = 12\times10^{-3}$ Vm/N

$F/A = 0.5 MN/m^2$

t = 2mm

we know voltage sensitivity $g = \dfrac{E/t}{F/A}$

so, $E = g \times F/A \times t$

$= 12\times10^{-3}\times0.5\times10^{6}\times2\times10^{-3}$

= 12V.

61. Ans: (b)

Sol: We know for the linear approximation of RTD.

$$\alpha_T = \frac{1}{R_T}\times\frac{R_{T_2}-R_{T_1}}{T_2-T_1} \quad \text{—— (1)}$$

Given

T_1 = 30° C, T_2 = 60°C,

R_{T_1} = 5Ω, R_{T_2} = 6.5Ω,

so $R_T = \dfrac{5+6.5}{2} = 5.75\Omega$

$T = \left(\dfrac{30+60}{2}\right) = 45^\circ C$

By putting the above values in equation (1) we go

$$\alpha_{45^\circ C} = \frac{1}{5.75\Omega}\times\frac{(6.5-5)\Omega}{30^\circ C}$$

$$= \frac{1}{5.75\Omega}\times\frac{1.5\Omega}{30^\circ C}$$

$= 8.69 \times 10^{-3}$/ °C

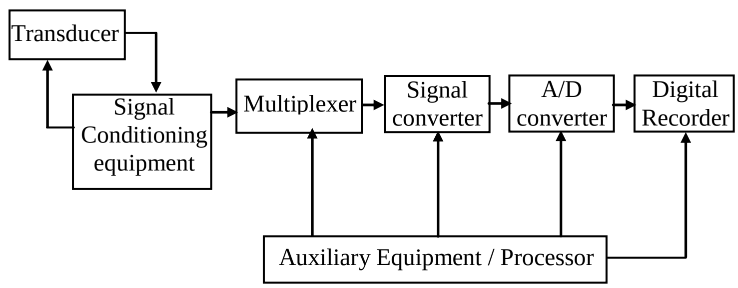
= 0.00869 /°C

≈ 0.0087 /°C.

62. Ans: (b)

63. Ans: (c)

Sol: A typical digital data acquisition system is as shown below



64. Ans: (c)

Sol: In semiconductor strain gauges, the change in resistance is mainly due to change in resistivity due to applied strain.

65. Ans: (b)

Sol: 1. When capacitance of capacitance transducers is varied by varying area then

$$C = \frac{\varepsilon \ell x}{d}$$

$\therefore \dfrac{\partial C}{\partial x} = S_x = \dfrac{\varepsilon\ell}{d}$ = constant

2. When capacitance is varied by changing the distance between the plates

$$C = \frac{\varepsilon_0 A}{d}$$

$$S_d = \frac{\partial C}{\partial d} = \frac{-\varepsilon_0 A}{d^2}$$

$\therefore$ Sensitivity is high for small values of d

3. Piezoelectric transducers are used for dynamic measurements and are not used for static measurements.
4. In piezoelectric transducers the capacitance of amplifier has to be low to avoid loading effects. So a low capacitance of amplifier means that impedance is high.

66. Ans: (a)

Sol: In Hydro electric power station having long penstock, a surge tank is located near the turbine to provide better regulation of flow of water when load on the system fluctuates and to avoid water hammer.

67. Ans: (c)

Sol: Vacuum interrupter is generally used in HVDC circuit breakers. A series LC circuit is connected in parallel with the vacuum interrupter in HVDC circuit breakers.

68. Ans: (a)

Sol: Over current relays cause security dependability problems, these are not acceptable in transmission system. Hence, over current relays are not preferred for transmission lines.

69. Ans: (a)

Sol: Positive sequence components are available before fault and also during fault any type of fault. Therefore, relay pickup current and circuit breaker ratings are based on positive sequence components.

70. Ans: (d)

Sol: The resistance of a conductor is affected by the frequency of current carried by it due to skin effect. As the operating frequency increases, resistance of the conductor increases.

71. Ans: (a)

72. Ans: (a)

Sol: The signals usually to be examined are applied to the vertical deflection plates through attenuator and vertical amplifier to produce measurable deflection on the CRT screen. The horizontal deflection plates are fed by a sweep voltage that provides a time base. They can be fed directly when voltages of sufficient magnitude are used. So the variation in signal is obtained through vertical deflecting plate so it should have high sensitivity compared to horizontal plate.

73. Ans: (c)

Sol: PMMC instrument does not work satisfactorily when the frequency of the signal is high.

In PMMC instrument torque reverses if the current reverses. If this instrument is connected to ac supply having high frequency, the pointer cannot follow the rapid reversals and the deflection corresponds to mean torque which is zero. Hence these instruments cannot be used for ac.

74. Ans: (c)

Sol: Self-braking torque, which is caused by the revolution of disc in the field of series magnet under load conditions, is proportional to **square** of load current.

75. Ans: (a)

Sol: A optical pyrometer is a type of remote sensing thermometer used to measure the temperature of a surface. It is a device that from a distance determines the temperature of a surface from the amount of the thermal radiation it emits. Non-invasive method like optical pyrometer are suitable for flame temperature measurement in a boiler. So both statements are true and also they are related.