Electronics/Sem-III-(CBSGS)/Applied Mathematics-III
NOV-2017

Q.P. Code : 13606

(3 Hours) **[Total marks : 80**

Note :-
1) Question number **1** is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the angle between the surfaces 05
$x \log z + 1 - y^2 = 0, \quad x^2y + z = 2$ at $(1, 1, 1)$.

b) Show that the functions $f_1(x) = 1$, $f_2(x) = x$ are orthogonal on 05
$(-1, 1)$. Determine the constants a and b such that the function
$f_3(x) = -1 + ax + bx^2$ is orthogonal to both f_1 and f_2 on that interval.

c) Find the Laplace transform of $\int_0^t u^{-1}e^{-u} \sin u \, du$. 05

d) Prove that $f(z) = (x^3 - 3xy^2 + 2xy) + i(3x^2y - x^2 + y^2 - y^3)$ 05
is analytic and find $f'(z)$ and $f(z)$ in terms of z.

Q.2 a) Obtain half- range sine series of $f(x) = x(\pi - x)$ in $(0, \pi)$ and hence, 06
find the value of $\sum \frac{(-1)^n}{(2n-1)^3}$.

b) Prove that 06
$\bar{F} = (y^2 \cos x + z^3)\, i + (2y \sin x - 4)\, j + (3xz^2 + 2)\, k$
is a conservative field. Find the scalar potential for $\bar{F}$.

c) Find the inverse Laplace transform of 08

(i) $\dfrac{s+2}{s^2 - 4s + 13}$

(ii) $\dfrac{1}{(s-a)(s-b)}$

Q.3 a) Prove that $J_{5/2}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{3-x^2}{x^2} \sin x - \frac{3}{x} \cos x\right)$. 06

b) Find the analytic function $f(z) = u + iv$ if 06
$3u + 2v = y^2 - x^2 + 16xy$.

TURN OVER

c) Expand $f(x) = \begin{cases} \pi x, & 0 < x < 1 \\ 0, & 1 < x < 2 \end{cases}$ period 2 into a Fourier Series. 08

Q. 4 a) Prove that 06
$\int x^3 \cdot J_0(x)\, dx = x^3 \cdot J_1(x) - 2x^2 \cdot J_2(x).$

b) Use Stoke's Theorem to evaluate $\int_C \bar{F} \cdot d\bar{r}$ 06
where $\bar{F} = yz\, i + zx\, j + xy\, k$
and C is the boundary of the circle $x^2 + y^2 + z^2 = 1,\ z = 0.$

c) Solve using Laplace transform $(D^2 - 3D + 2)\, y = 4e^{2t}$ with 08
$y(0) = -3$ and $y'(0) = 5.$

Q. 5 a) Prove that $2\, J_0''(x) = J_2(x) - J_0(x).$ 06

b) Use Laplace transform to evaluate 06
$\int_0^\infty e^{-t} \left(\int_0^t u^2 \sin hu \cos hu\ du \right) dt.$

c) Obtain complex form of Fourier Series for $f(x) = e^{ax}$ in $(-\pi, \pi)$ 08
where a is not an integer. Hence deduce that when α is a constant other than an integer

$$\cos \alpha x = \frac{\sin \pi\alpha}{\pi} \sum \frac{(-1)^n \alpha}{(\alpha^2 - n^2)}\, e^{inx}$$

Q. 6 a) Express the function 06

$$f(x) = \begin{cases} -e^{kx} & for\ x < 0 \\ e^{-kx} & for\ x > 0 \end{cases}$$

as Fourier Integral and hence, prove that

$$\int_0^\infty \frac{\omega \sin \omega x}{\omega^2 + k^2}\, d\omega = \frac{\pi}{2}\, e^{-kx} \quad if \quad x > 0, k > 0.$$

b) Using Green's theorem evaluate 06

$$\oint_C \left(e^{x^2} - xy\right) dx - \left(y^2 - ax\right) dy$$

where C is the circle $x^2 + y^2 = a^2.$

c) Under the transformation $w = \frac{z-1}{z+1}$, show that the map of the straight 08
line $y = x$ is a circle and find its center and radius.

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SE/SEM-III (CBSGS)/ETRX/Electronics Devices/Nov 2017

Q.P. Code :10592

[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. **Question -1 is compulsory.**
2. **Solve any THREE from remaining questions.**
3. Assume suitable data it necessary.

1 a) Explain two terminal Mos structure. (05)
b) Calculate width of the space charge region in a PN junction when a reverse bias voltage is applied consider a P-N junction at T = 300 k, Na = $10^{16}cm^{-3}$ and Nd = $10^{15}cm^{-3}$, ni = $1.5x10^{10}cm^{-3}$ and VR = 5V; Vbi = 0.635V, Vbi is the built in potential barier voltage. (05)
c) Write note on HBT. (05)
d) Explain differences between FET and MESFET. (05)

2 a) Explain construction working and characteristics of Tunnel diode. (10)
b) Draw and explain hybrid π (pi) model of BJT (10)

3 a) Calculate Vbi in a silicon P–N junction at T = 300 K for Nd = $10^{15}cm^{-3}$ and Na = $10^{15}cm^{-3}$ and ni = $1.5 \times 10^{10}cm^{-3}$. (10)
b) Explain constructions working and characteristics of E MOSFET (10)

4 a) Explain construction, working and characteristics of FET (10)
b) Explain following effects in FET – (1) Channel length modulation (10)
(2) Velocity saturation effects.

5 a) Draw and explain energy band diagram for MOSFET for different gate bias conditions. (10)
b) Explain working and characteristics of SCR. (10)

6 Write notes on any four of the following (20)
a) Zener diode voltage regulator.
b) Triac
c) Solar Cell
d) Photo diode
e) UJT relaxation oscillator

06

08

Electronics / Sem: III - (CBSGS) / Digital Circuits & Design / Dec-2017

QP CODE : 22982

(**3 Hours**) Marks : **80**

NB : (1) Question **No.1** is **compulsory.**
(2) Out of remaining questions, attempt **any three** questions.
(3) Assume suitable data, wherever necessary.

1. (a) Draw Master slave JK flip flop **5**
(b) Describe ring counter operation with the help of logical diagram **5**
(c) Use half subtractors and gates to realize the Full Subtractor **5**
(d) Compare Moore and Melay machines **5**

2. (a) Design 2 bit comparator and draw its logical diagram **10**
(b) Design 1 digit BCD adder using IC 7483 and perform $(0011)_{BCD} + (1100)_{BCD}$ **10**

3. (a) Use 4:1 MUX and gates to implement the following function **10**
$Y(P,Q,R,S) = \sum m\,(0,3,4,6,9,11,12,14,15)$
(b) Explain the working of shift register IC 74194 in detail with applications. **10**

4. (a) Design a mealy sequence detector to detect ---1001--- using D flip-flops and logic gates **10**
(b) Design a circuit with optimum utilization of PLA to implement the following functions . **10**
$A = \sum m\,(1, 2, 6, 8, 11, 13, 15)$
$B = \sum m\,(0, 3, 5, 8, 9, 12, 14)$
$C = \sum m\,(0, 2, 4, 7, 10, 11)$

5. (a) Use K-map to reduce following function and then implement it by NOR gates. **10**
$F = \pi M\,(1, 2, 4, 7, 8, 11, 13, 15) + d\,(0, 5, 9)$
(b) Eliminate redundant states and draw the reduced state diagram. **10**

Present State	Next State		Output
	X = 0	X = 1	Y
A	B	D	1
B	C	E	0
C	E	F	1
D	E	B	0
E	D	C	0
F	B	D	1

6. Write short notes : **20**
(a) Universal shift register
(b) Johnson 4-bit counter
(c) Stuck at '0' and '1' faults
(d) Explain the characteristics parameters of logic families.

E/Sem-III(CBSGS)/ETRX/Circuit Theory/NOV-17.

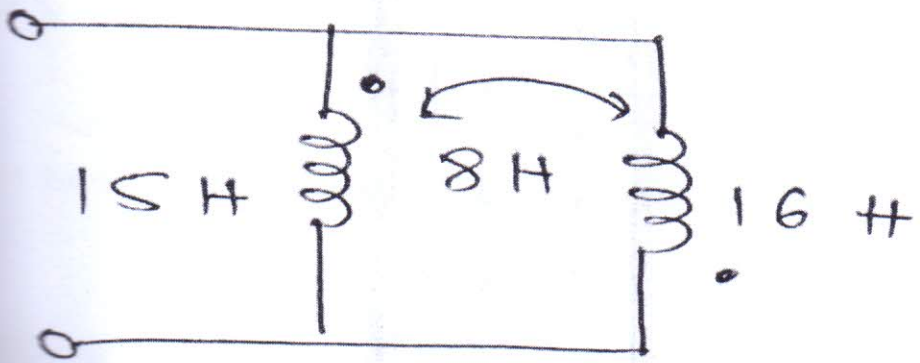
Q.P. Code :22709

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Solve any three questions out of remaining five questions.
3. Figures to the right indicate full marks.

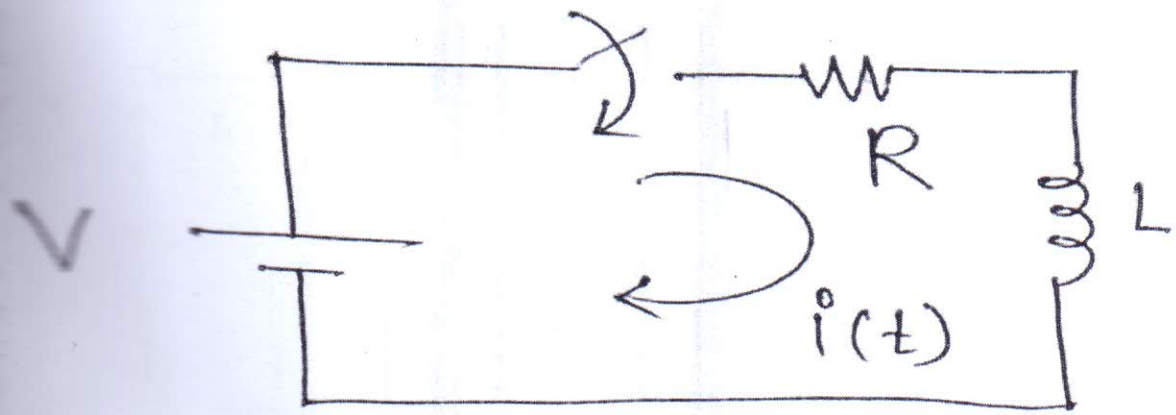
Q.1 a) Find the equivalent inductance of the network shown. 05



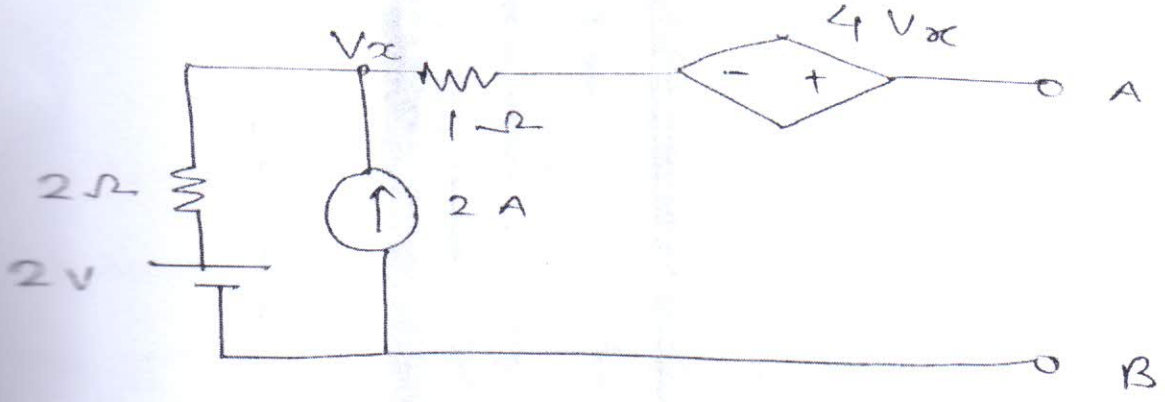
b) Test whether the polynomial $P(S) = S^4 + 7S^3 + 6S^2 + 21S + 8$ is Hurwitz. Use continued fraction method 05

c) State and prove the condition for reciprocity in terms of Z parameters. 05

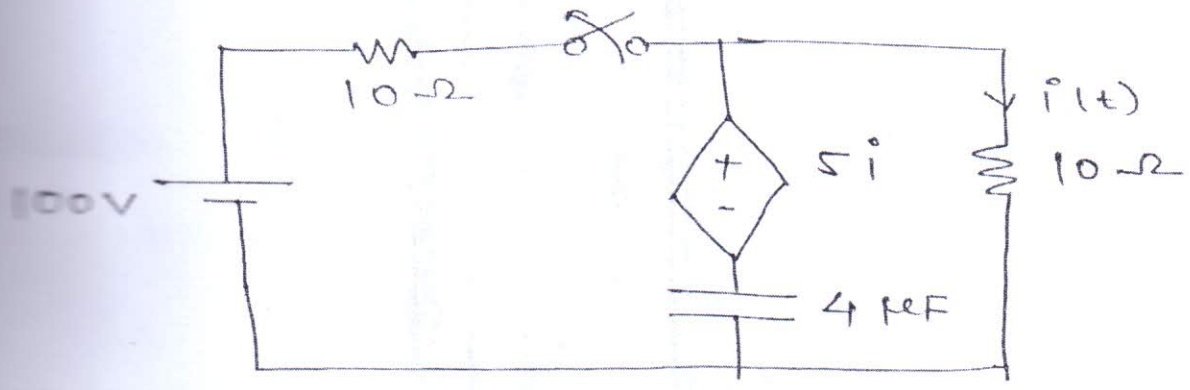
d) Obtain expression for current in the following circuit. 05



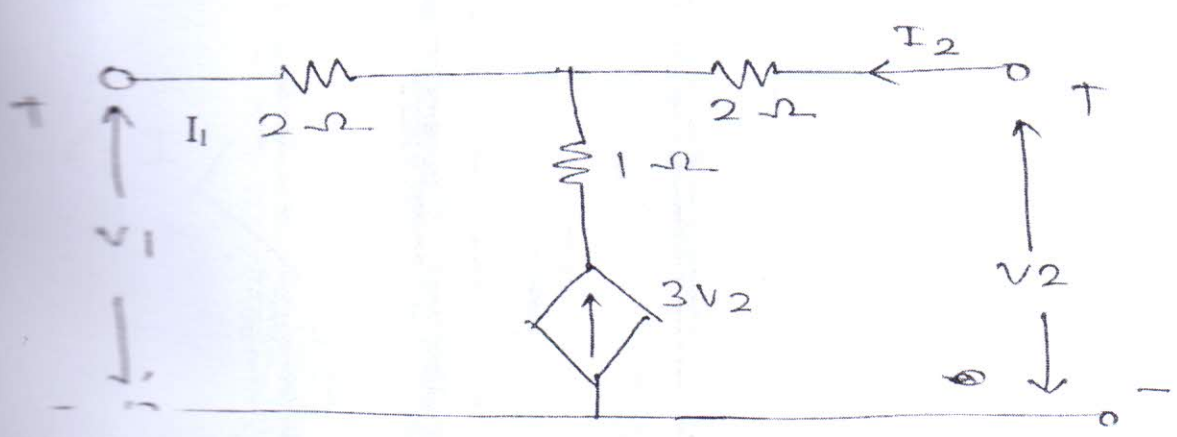
Q2 a) Obtain Thevenin's equivalent network in the circuit given below for the terminals A and B. 10



b) For the network shown find the current i(t) when the switch is opened at t = 0 10



Q3 a) Find Y parameter of the network shown in below figure. 10

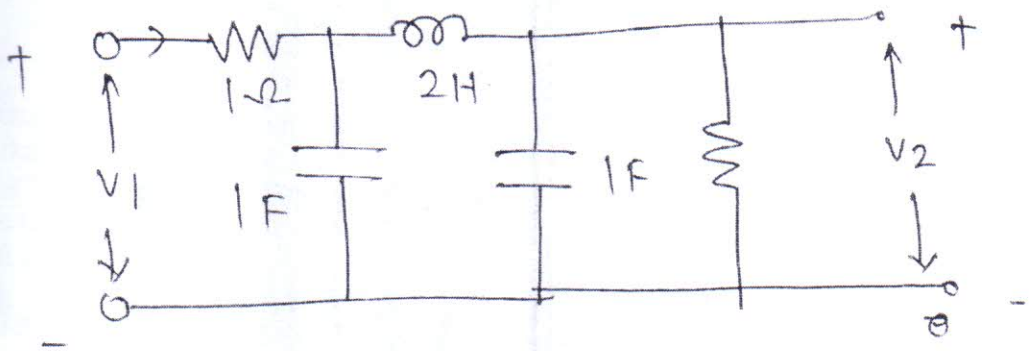


b) Realise foster-I and caur- II of the following impedance function 10

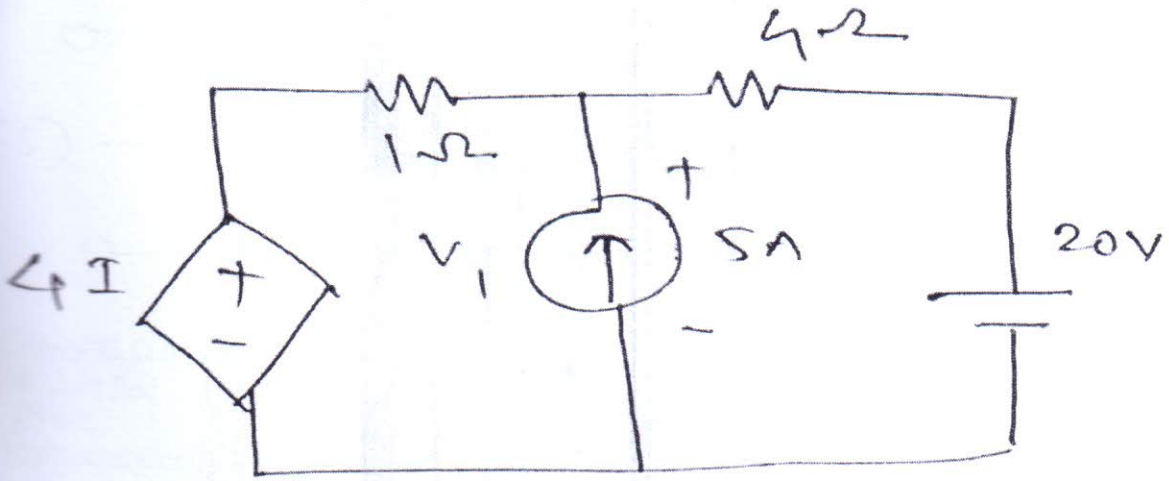
$$z(s) = \frac{(S+1)(S+3)}{S(S+2)}$$

Q4 a) Test whether $F(S) = \frac{S(S+3)(S+5)}{(S+1)(S+4)}$ is positive real function. 05

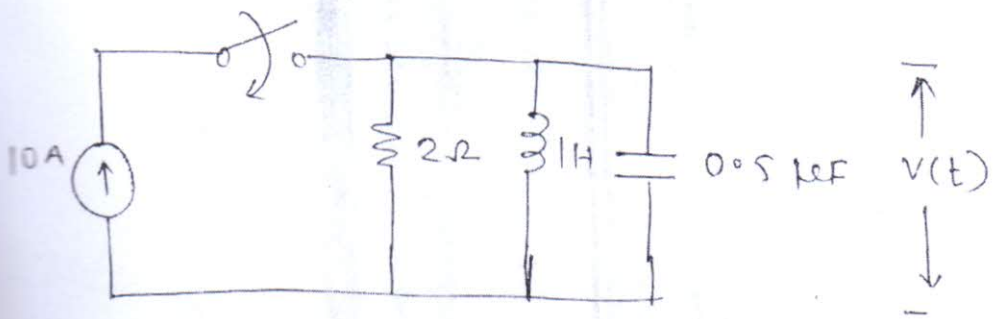
b) Determine the voltage transfer function $\frac{V2}{V_1}$ for the network given 10



c) Find The voltage V_1 in given figure below 05



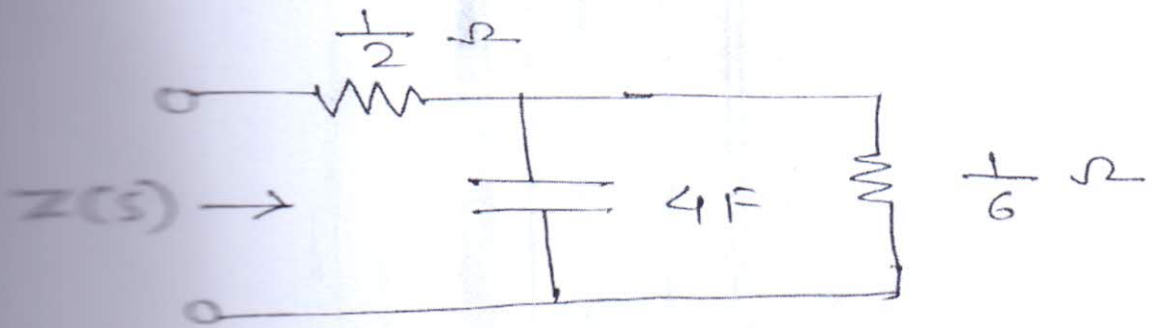
Q5 a) For the network shown the switch is closed at t = 0 Determine V, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at t = 0^+ 10



05

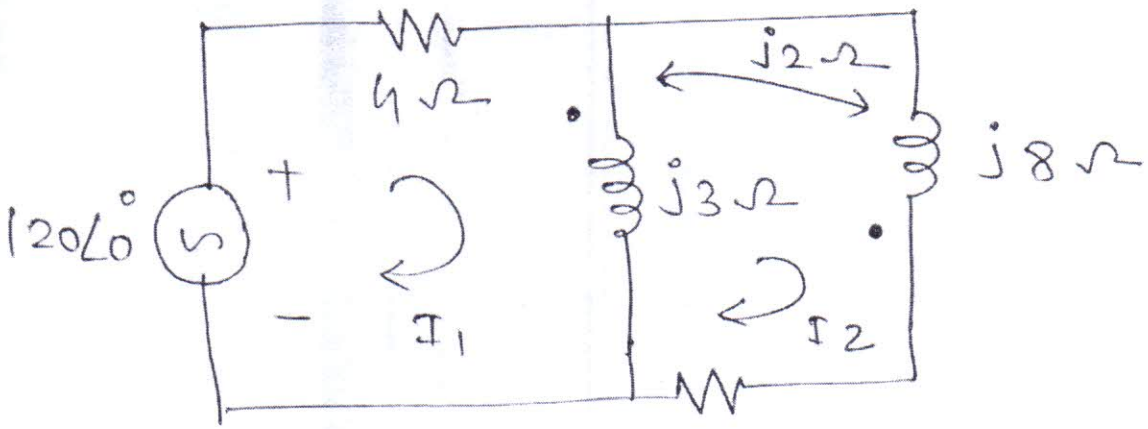
b) The constants of a transmission line are
R = 6 Ω /km L = 2.2 MH/km
G = 0.25 ×10^{-6} ℧ /km C = 0.005 ×10^{-6} F/km
Determine the characteristics impedance and propagation constant, attenuation constant and phase shift constant at 1 kHz

c) Determine the poles and zeros 0+ the impedance function Z(S) in the network shown. 05



d) A lossless 75 Ω transmission line is terminated by an impedance of 150 + j150 Ω. Using Smith chart find 05
a) VSWR
b) Reflection Coefficient

b) Find the Current through 6 Ω resistor using mesh analysis in the circuit given below. 10



c) Write short note on initial conditions and final conditions of R, L, C, Components 05

Electronics/Sem-III-CCBS(RS)/Electronic Instruments and Measurements/Dec-2017

Q.P. Code: 23747

Max Marks: 80 **Duration : 3Hrs**

N.B.-1] Question no.1 is compulsory
2] Attempt any three from remaining

Q 1.Attempt any four questions **[20]**

a) Define Accuracy, Precision, Linearity, Sensitivity, Resolution
b) Write applications of Q-Meter
c) Explain Role of Delay Line in CRO
d) Write Selection Criteria of Transducers.
e) Write brief information of Programmable Logic Controller
f) List pressure, level and flow transducers

Q 2.Attempt the following questions **[20]**

a) Draw and Explain Measurement of Inductance using Maxwell Bridge
b) Draw and Explain Measurement of Low and High Resistance using, Kelvin's Double Bridge and Mega ohm Bridge

Q 3.Attempt the following questions **[20]**

a) Draw and Explain Digital Storage Oscilloscope (DSO) also write applications of DSO.
b) Draw and Explain Lissajous Figures in Detection of Frequency and Phase

Q 4.Attempt the following questions **[20]**

a) Compare RTD, Thermisters, Thermocouples- with their construction , Ranges, and Applications
b) Draw and Explain any one application of Linear Variable Differential Transformer

Q 5.Attempt the following questions **[20]**

a) Draw and Explain Capacitance type method for level measurement .write advantages and disadvantages it.
b) Draw and Explain Rotameter for flow measurement. write advantages and disadvantages of it

Q 6.Write a short note on **[20]**

a) Elastic Pressure Transducers
b) Data acquisition system (DAS)- Single channel
c) Errors in Measurement
d) Auto Ranging and Auto Zero Adjustments in Digital Instruments.