BE/Sem III/CBCS/ETRX/AM-III/ND-17

Q.P. Code: 25014

(3 Hours) *Total Marks :80*

Note: 1) Question No.1 is compulsory
2) Attempt any Three from the remaining

Q1

A) Find Laplace transform of $e^{-4t}\int_0^t usin3udu$ 5

B) Find the orthogonal trajectories of the curves $e^{-x}cosy + xy = \alpha$, where α is a real constant in XY plane. 5

C) Find a Fourier series to represent $f(x) = x^2$ in $(0, 2\pi)$ hence deduce that 5
$\frac{\pi^2}{12} = \frac{1}{1} - \frac{1}{4} + \frac{1}{9} - \frac{1}{16} + \ldots\ldots$

D) Prove that $\vec{F} = (x^2 + xy^2)\,\hat{\imath} + (y^2 + x^2y)\hat{\jmath}$ is irrotational and find its scalar potential 5

Q2

A) If $u = -r^3\sin3\Theta$, find analytic function whose real part is u. 6

B) Find the Bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$ 6

C) Obtain the Fourier series for $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ 8

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1} + \frac{1}{9} + \frac{1}{25} + \ldots\ldots$

Q3

A) Find inverse Laplace transform of (i) $\tan^{-1}\left(\frac{2}{s}\right)$ (ii) $e^{-4s}\cdot\frac{s}{(s+4)^3}$ 6

B) Find Complex form of Fourier Series of coshax + sinhax in (-a , a) 6

C) Verify Greens Theorem for $\int_C (xy + y^2)dx + x^2dy$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$ 8

Q4

A) Prove that $\int x^4 J_1(x)dx = x^4J_2(x) - 2x^3J_3(x)$ 6

B) Use Gauss's Divergence theorem to evaluate $\iint_S \bar{N}.\bar{F}ds$ where $\bar{F}$=4xi +3yj -2zk and S is the surface bounded by x=0 ,y=0 ,z= 0 and 2x +2y +z=4 6

C) Solve using Laplace transform($D^2 + 2D + 1)y = 3te^{-t}$,given $y(0)=4$ and $y'(0)=2$ 8

Q5

A Find half range cosine series for $f(x) = \begin{cases} x, & 0 < x < \left(\frac{\pi}{2}\right) \\ \pi - x, & \left(\frac{\pi}{2}\right) < x < \pi \end{cases}$ 6

B) Find the image of real axis in z –plane onto w-plane under the bilinear transformation $w = \frac{1}{z+i}$ 6

c) Prove that $y = \sqrt{x}\,.J_n(x)$ is a solution of the equation , 8
$x^2\frac{d^2y}{dx^2} + \left(x^2 - n^2 + \frac{1}{4}\right)y = 0$

Q6

A) Find the constant a,b,c if the normal to the surface $ax^2 + yz + bxz^3 = c$ at P(1,2,1) is parallel to the surface $y^2 + xz = 61$ at (10,1,6) 6

B) Find inverse Laplace transform using convolution theorem $\frac{s}{(s^2+9)^2}$ 6

C) Express the function $f(x) = \begin{cases} 1 & , \ |x| < 1 \\ 0 & , \ |x| > 1 \end{cases}$ as Fourier integral .Hence evaluate $\int_0^\infty \frac{sinw.sinwx}{w}\, dw$ 8

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SE/Sem III/CBCS/ETRX/DCD/07-12-2017

Q. P. Code: 27584

Time: 3 Hours **Marks: 80**

N.B.: 1. Question No. 1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Figures to the right indicate full marks.
4. Assume suitable data if required and mention it in answer sheet.

Q1. Solve following **(20 Marks)**

a) Explain the following decimals in gray code form
1. $(42)_{10}$ 2. $(17)_{10}$

b) Explain characteristics of logic families

c) State and Prove Demorgan Theorem

d) Convert JK flip flop to T flip flop.

Q2. a) What is shift register? Explain any one type of shift register. Give its applications. **(10 Marks)**

b) Implement the following Boolean function using 8:1 multiplexer.
$F(A,B,C,D)=\sum M(0,1,4,5,6,8,10,12,13)$ **(10 Marks)**

Q3. a) Explain the Johnson's Counter. Design for initial state 0110. From initial state explain and draw all possible states. **(10 Marks)**

b) Minimize the following expression using Quine McClusky technique.
$F(A,B,C,D)=\sum M(0,1,2,3,5,7,9,11)$ **(10 Marks)**

Q4. a) Design a 2 bit comparator and implement using logic gates **(10 Marks)**

b) Using Boolean Algebra and De-Morgan's theorem prove that
$\overline{Y}\,\overline{Z}+\overline{W}\,\overline{X}\,\overline{Z}+\overline{W}XY\overline{Z}+WY\overline{Z}=Z$
Simplify the expression $[A\overline{B}(C+BD)+\overline{A}\,\overline{B}]C$ as much as possible **(10 Marks)**

Q5. a) Explain the working of 3 bit asynchronous counter with proper timing diagram **(10 Marks)**

b) Design BCD Adder using the integrated circuit 4 bit binary adders. **(10 Marks)**

Q6. Write short notes on following **(20 Marks)**
a) Hazards
b) Hamming Code
c) Encoder and Decoder
d) Compare TTL and CMOS logic families

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SE/Sem III/CBCS/ETRX/EDC-I/29-11-2017

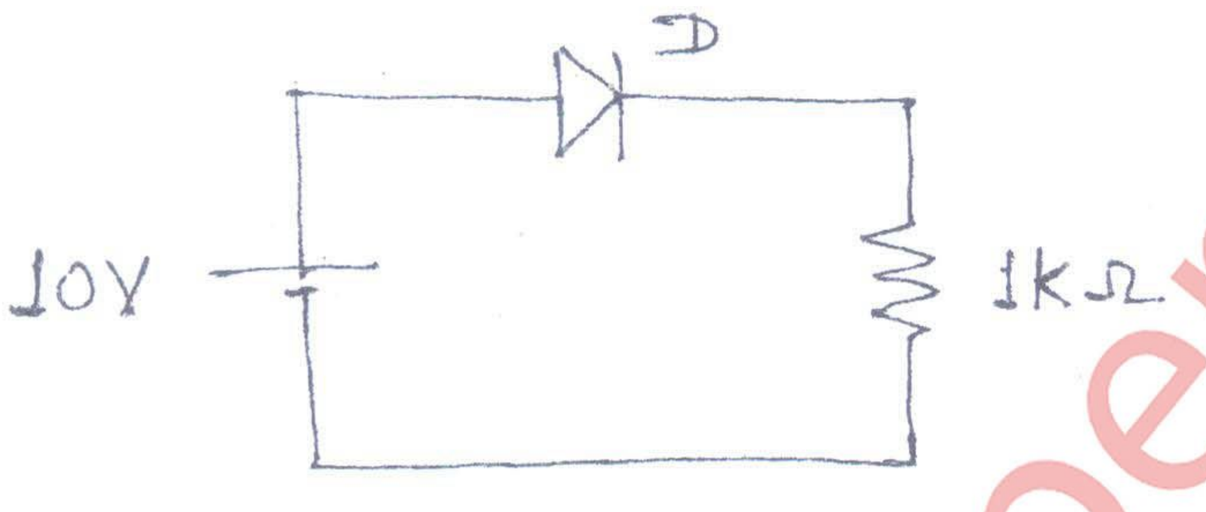
QP CODE: 24600

(3 Hrs) Maximum Marks -80

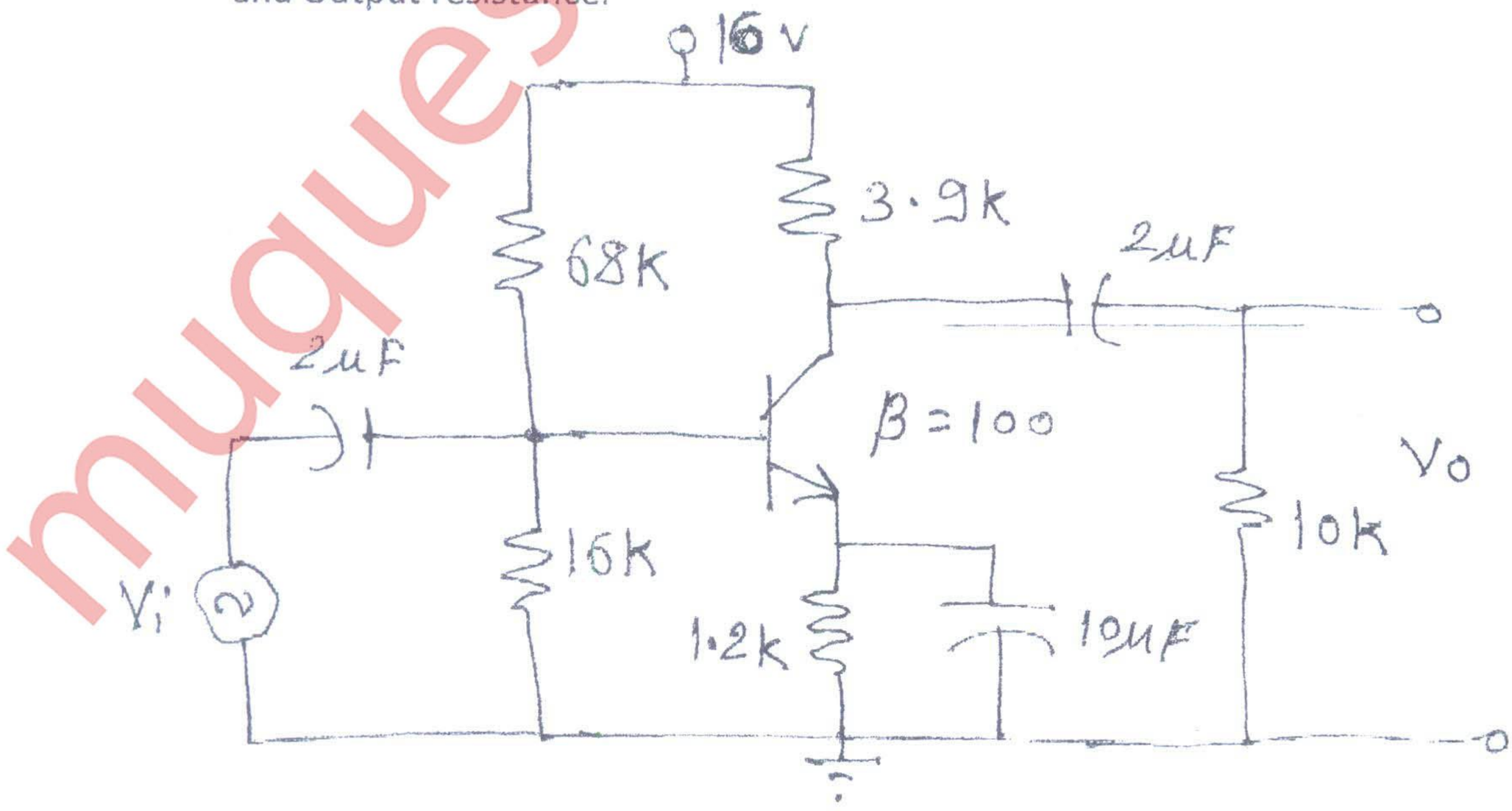
NB:

1 Question No.1 is compulsory and solve any THREE questions from remaining questions.
2 Assume suitable data if necessary
3 Draw clean and neat diagrams

Que-1	Solve any Four	Marks
a	What is DC load line of a diode, draw DC load line for the given circuit.	5



b	Draw output characteristics of BJT in CE configuration and state the importance of Active region.	5
c	Justify how current flows in E Mosfet even in absence of channel inside.	5
d	How solar cell generates electricity, explain with the help of its structure.	5
e	What is the Voltage Regulator explain simple zener shunt voltage Regulator	5
Que-2a	Define the followings related with diode a)Cut in voltage b) Forward characteristics c) Reverse characteristics d) Diffusion capacitance and e) Temperature effects	10
Que-2b	For the given BJT circuit find Voltage Gain , Current Gain, Input Resistance and Output resistance.	10



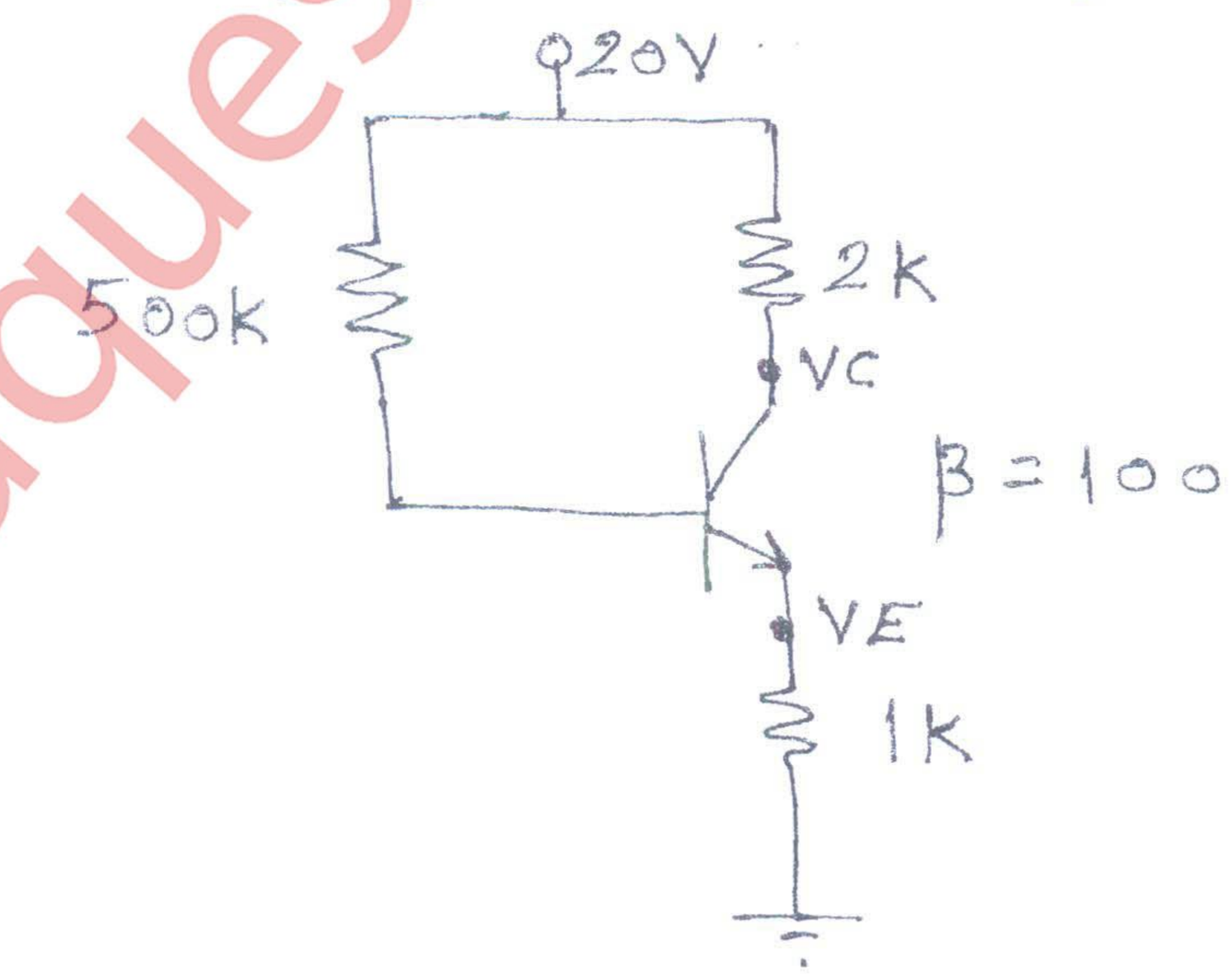
[TURN OVER

Que-3a For the given E Mosfet circuit Determine Idq and VDSq 10

Que-3b Explain working and VI characteristics of Tunnel Diode 10

Que-4a What is the use of Filter in Power supply, Draw circuit diagram of C-Filter and explain its operation. 10

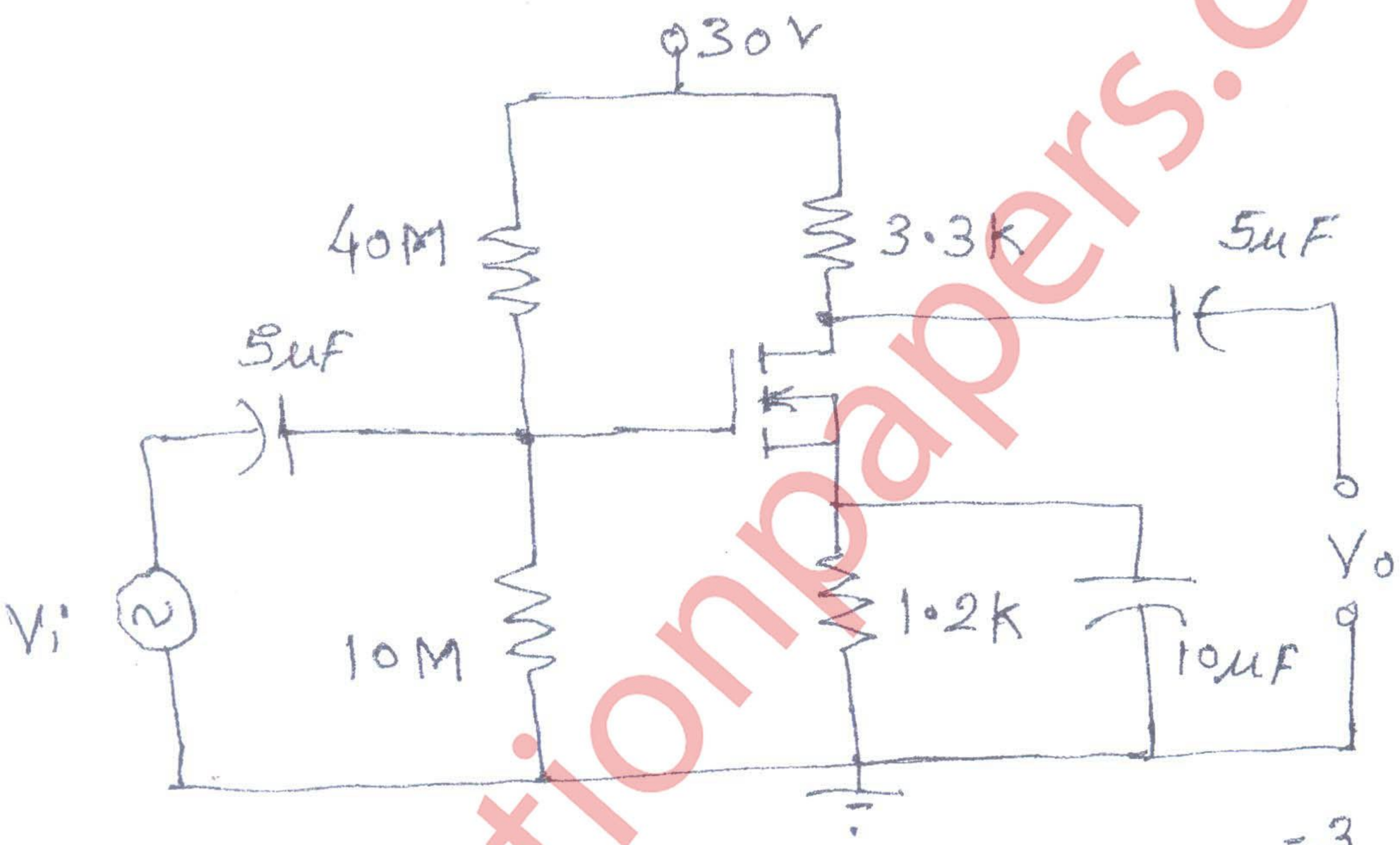
Que-4b Determine ICq, VCEq, VC and VE for the BJT based given circuit 10



Que-5a Design single stage CE amplifier for the following specifications 15
Av ≥ 100, vo = 2.5 V, fL = 20 Hz, Stability factor S=10, use transistor BC 147 A

Que-5b Draw Energy band diagram of diode under zero bias and under Forward bias. 05

Que-6a For the given MOSFET amplifier circuit, find Av, Ri and Ro 10



Given : $V_{GS(Th)} = 3V$, $K = 0.4 \times 10^{-3}$

$r_d = 40K\Omega$

Que-6b Compare CB, CE and CC amplifiers 10

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DBEC DATA SHEET

Transistor type	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	$V_{CE}^{(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{BEO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN 055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN 149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

Transistor type	hie	hoe	hre	θja
BC 147A	2·7 K Ω	18μ ℧	1·5 × 10^{-4}	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	3·2 × 10^{-4}	—
BC 147B	4·5 K Ω	30μ ℧	2 × 10^{-4}	0·4°C/mw
ECN 100	500 Ω	—	——	——
ECN 149	250 Ω	—	——	——
ECN 055	100 Ω	—	——	——
2N 3055	25 Ω	—	——	——

BFW 11—JFET MUTUAL CHARACTERISTICS

–Vgs volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
Ids max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
Ids typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	1·7	0·8	0·2	0·0	0·0	0·0	0·0
Ids min. mA	4·0	3·0	2·2	1·6	1·0	0·5	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0

N-Channel *JFET*

Type	V_{DS} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{mo} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	——	0·59° C/mW

Sem III /CBCS/ETRx/EIM/N-D-17/19-12-17

Q.P. Code: 25815

Time :- 03 Hours **Max. Marks :- 80 Marks**

(i) Question No. 1 is compulsory & attempt any four out of the remaining five questions.
(ii) Assume suitable data if required but justify it logically wherever applicable.
(iii) Figures to the right indicate full marks & every sub-question from Q.2 to Q.6 has equal weightage.
(iv) This paper tests your basic level of understanding the fundamentals; so read each question carefully.

Q.1 ATTEMPT ANY FOUR (04) :- **20**

(a) Define the following dynamic characteristics of instruments & mention for which types of measurements they have to be considered ?

(i) Speed of Response
(ii) Lag
(iii) Fidelity
(iv) Dynamic Error

(b) Draw a neat circuit diagram of LCR – Q meter & explain its operating principle.

(c) Explain the function of delay line in cathode ray oscilloscope (CRO) with neat diagram.

(d) Describe operating principle of heterodyne wave analyzer with a neat block diagram.

(e) With a neat diagram, explain the principle of digital time measurement.

(f) Describe in brief, the classification / types of transducers.

Q.2 (a) The true value of the voltage across a resistor in a circuit is 10 V when it is calculated by mathematical analysis. Measuring the same voltage by six different random individuals (but all with the same digital multimeter) gives the following results as shown :- **20**

Observation No.	Measured Values
1	10.25 V
2	10.05 V
3	9.9 V
4	9.95 V
5	10.15 V
6	9.85 V

(i) Calculate the arithmetic mean (average) for the above observations.
(ii) Calculate the percentage error for the fourth observation.
(iii) Calculate the accuracy for the second observation.
(iv) Determine the precision of the fifth observation.
(v) Calculate the standard deviation (σ) for the above observations.
(vi) Calculate the average deviation (d_{avg}) for the above observations.

For Q.2 (a) students can attempt any five sub-questions between (i) to (vi)

(b) Wien Bridge is one of the AC bridges as shown in the Fig. 1 below. Derive conditions under which the bridge becomes balanced. Which quantity / parameter is it used to measure?

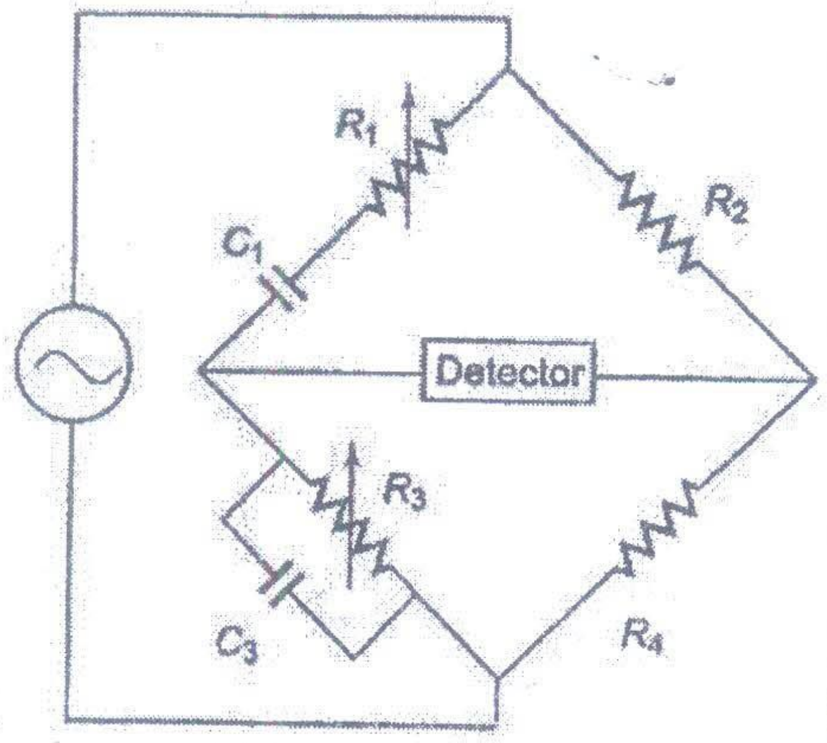


Fig. 1 – The Wien Bridge for Q.2 (b)

Q.3 (a) The block diagram of a general purpose cathode ray oscilloscope (CRO) is as shown in Fig. 2 below. Identify the blocks / elements numbered from 1 to 5 & describe their functionality. What is the use of trigger circuit / trigger generator in CRO ? Explain with neat diagram. **20**

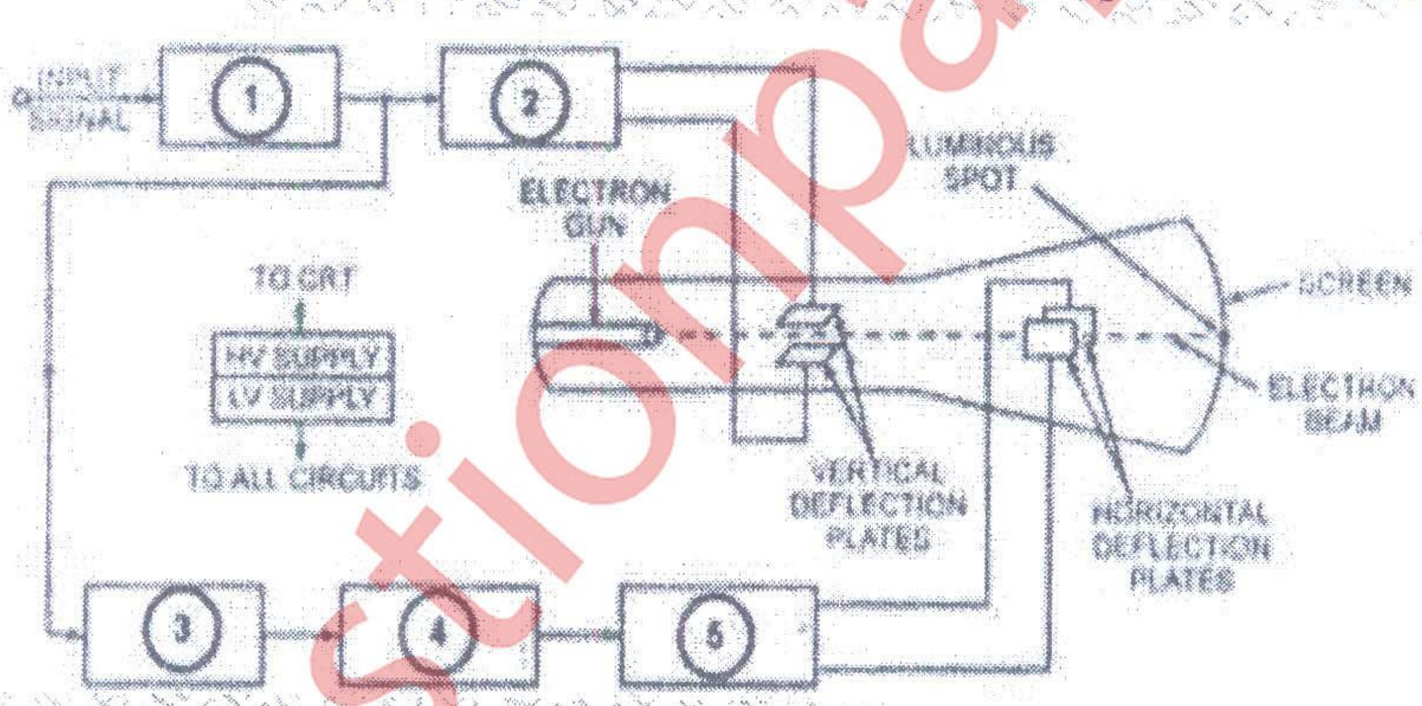


Fig. 2 – Block diagram of general purpose CRO for Q.3 (a)

(b) Explain how Lissajous patterns / figures are used for measurement of an unknown frequency & phase shift using a cathode ray oscilloscope (CRO). Determine the approximate phase shift of the Lissajous figure / pattern as shown in Fig. 3 below observed on CRO screen :-

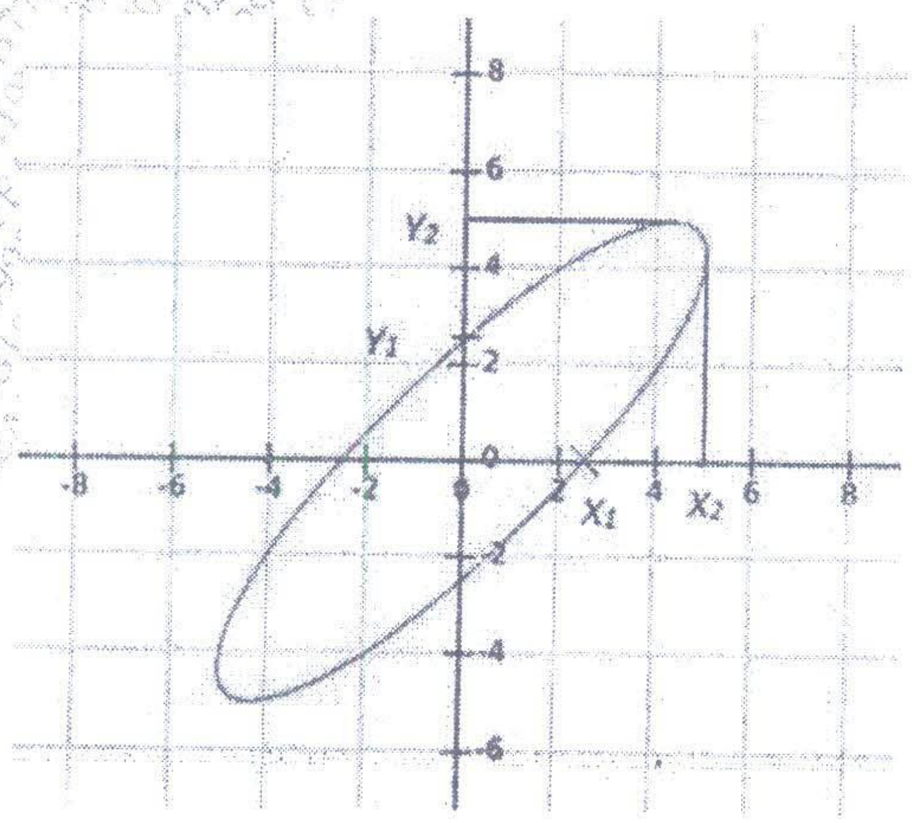


Fig. 3 – Lissajous pattern on CRO for phase measurement for Q.3 (b)

Q.4 (a) From the diagram shown in Fig. 4 below, identify which type of instrument is being used & to measure which kind of electrical signal / input quantity. Describe the operation of that instrument with a neat block diagram. **20**

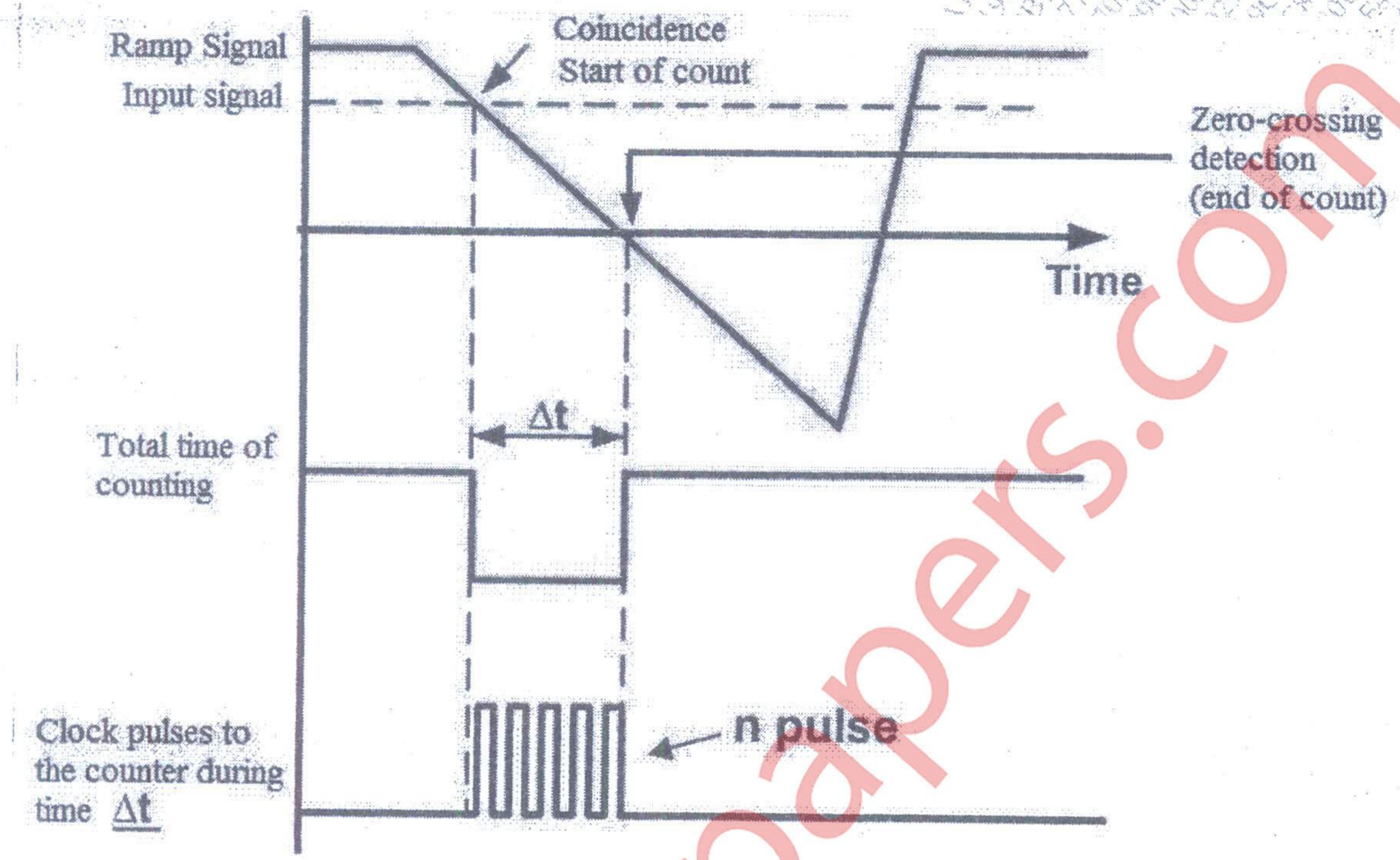


Fig. 4 – Waveform analysis for Q.4 (a)

(b) The diagram below in Fig. 5 shows a graph (spectrum) where a complex waveform having multiple signal components is displayed on a screen, with each individual signals having its own frequency (Hz) & its own amplitude (magnitude is as shown in mV). Which instrument is used to display it ? Describe its operation with a neat block diagram.

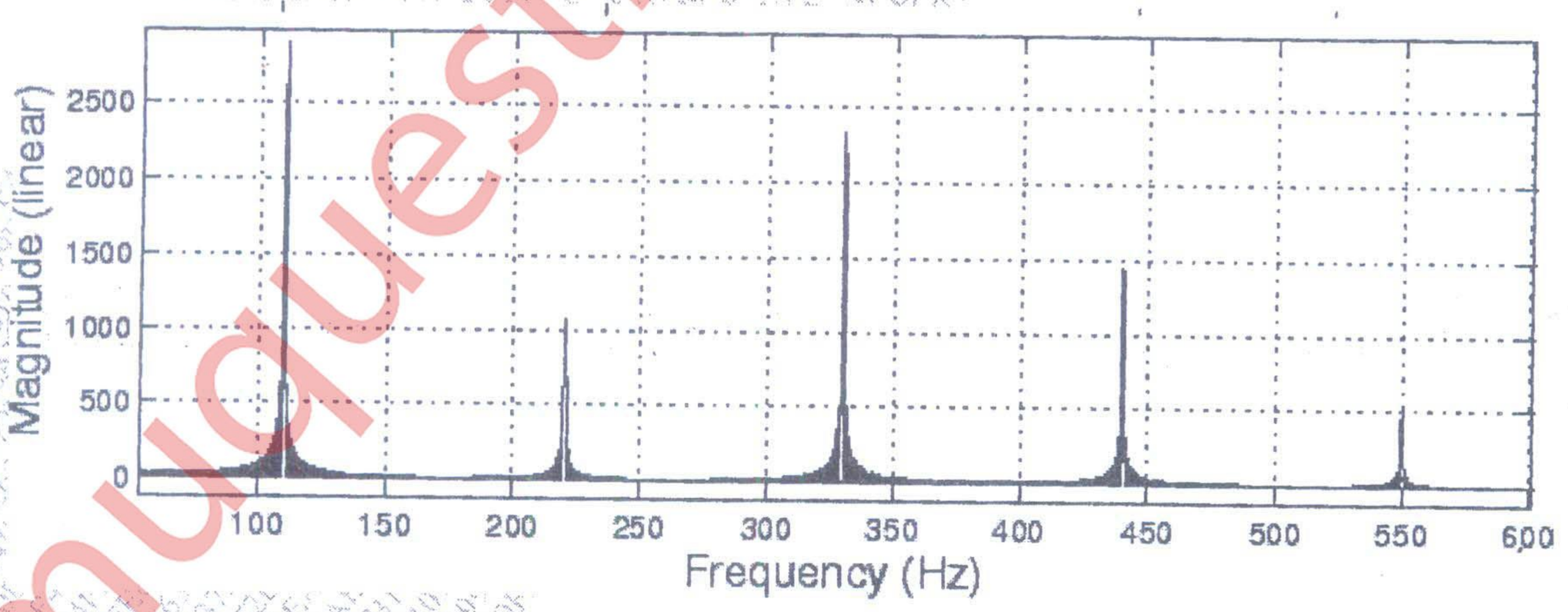


Fig. 5 – Amplitude spectrum of a complex signal waveform for Q.4 (b)

Q.5 (a) You have been asked to measure the displacement of a shaft, which is linearly attached to a piston in a machine wherein the shaft has a rectilinear motion (straight line) going back & forth. Which transducer will you use for above application ? Describe its operation with a neat diagram. **20**

(b) In a food processing unit, a highly acidic solution is stored in a storage tank where its level has to be continuously monitored round the clock. Your supervisor suggests that due to highly acidic nature of the solution, a non-contact transducer should be used for the level measurement. Which transducer will you use for above application ? Describe its operation with a neat diagram.

Q.6 (a) You are asked to measure the flow rate in a network of pipes that carry brine (a salt water solution). At first, it seems an easy task to use electromagnetic flow meters since brine solution being highly conductive, the output signal obtained is proportional to the flow rate. However on close inspection, you find that due to several issues; including the shortage of space & the myriad arrangement of piping the flow transducer can be only installed in a vertical position. The plant supervisor also tells you 'it should be such that' simply by looking at flow rate directly on its scale, he can adjust the valve manually & quickly so as to control it. Which flow transducer will you select for such an application ? Explain with a neat diagram. **20**

(b) A thermostat in a home heating system needs a temperature transducer to work between the temperature ranges of + 15 °C to + 45 °C. Being fully electronic in nature, the thermostat requirements are that the sensor should be as small as possible, be extremely light in weight & portable. Apart from being easily interfaced with electronic devices / circuits in the thermostat, it should have a quick response to the variations in the ambient temperature & should be of cheaper cost. Out of the various temperature transducers, describe which is the best suited for above requirements. Explain its construction, operation & characteristics with a neat diagram.

SE/sem III/CBCS/ETRX/ENAS/13-12-17

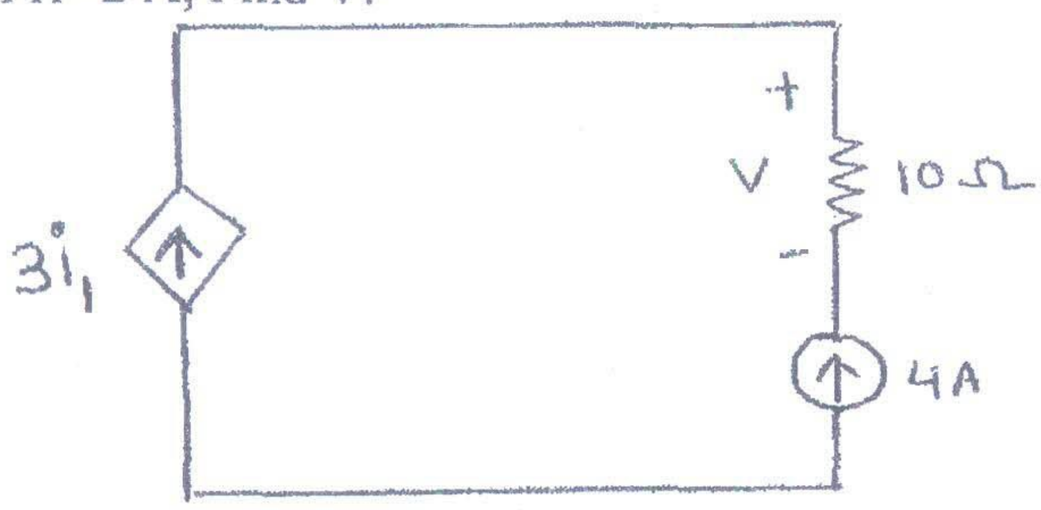
Q.P.Code: 25156

(3 Hours) Total Marks: 80

N.B: (1) Question No.1 is Compulsory.
(2) Attempt any three questions from remaining.
(3) Figures to the right indicate full marks.
(4)Assume Suitable data if required.

1. (a) Obtain Transmission parameters in terms of 'Z' Parameter. (20)

(b) If i1=2 A, Find V.



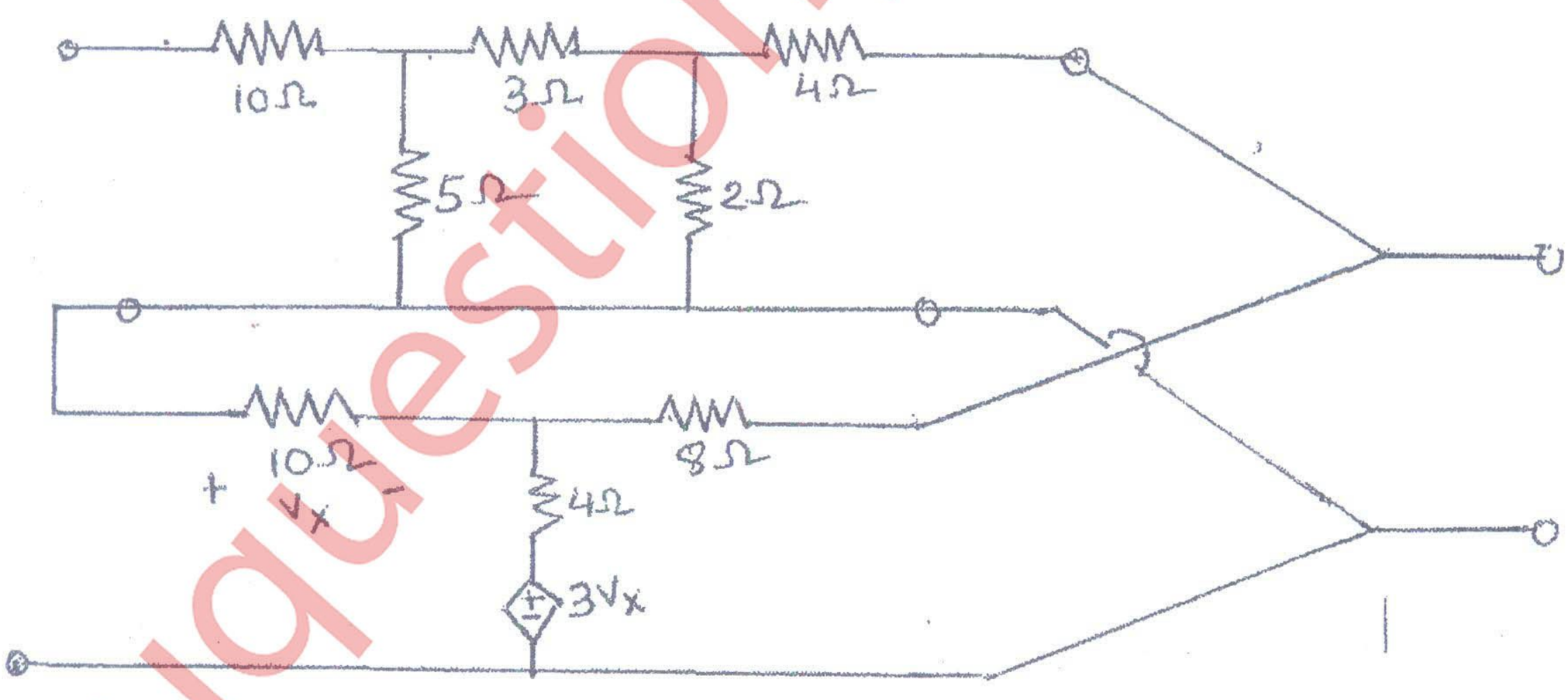
(c) Obtain s-domain (Laplace transform) equivalent circuit diagram of an inductor and capacitor with initial conditions.

(d) Check whether the polynomial is Hurwitz or not by continued fraction method.

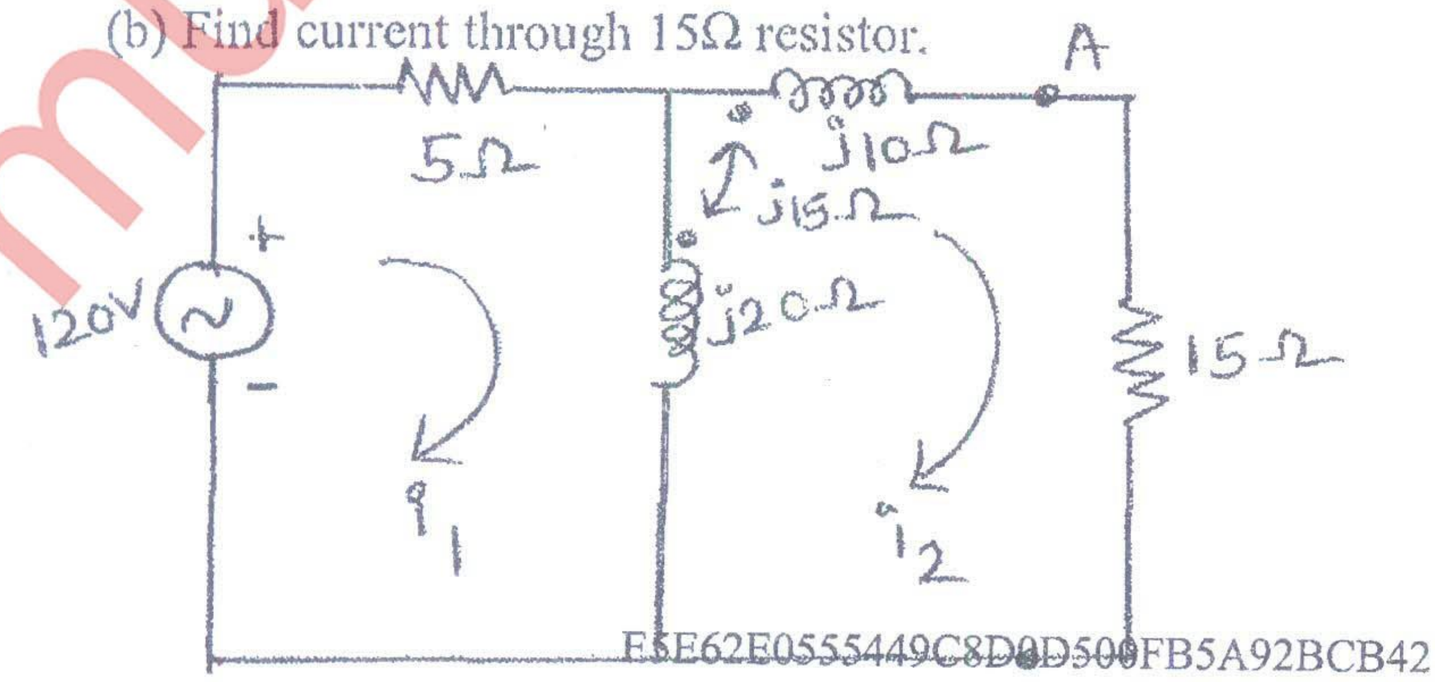
$F(s) = s^4 + S^3 + 4s^2 + 2s + 3$

(e)List the types of damping in a series R-L-C circuit and mention the condition for each damping.

2. (a) Obtain hybrid parameter of the interconnected 2-port network. (8)

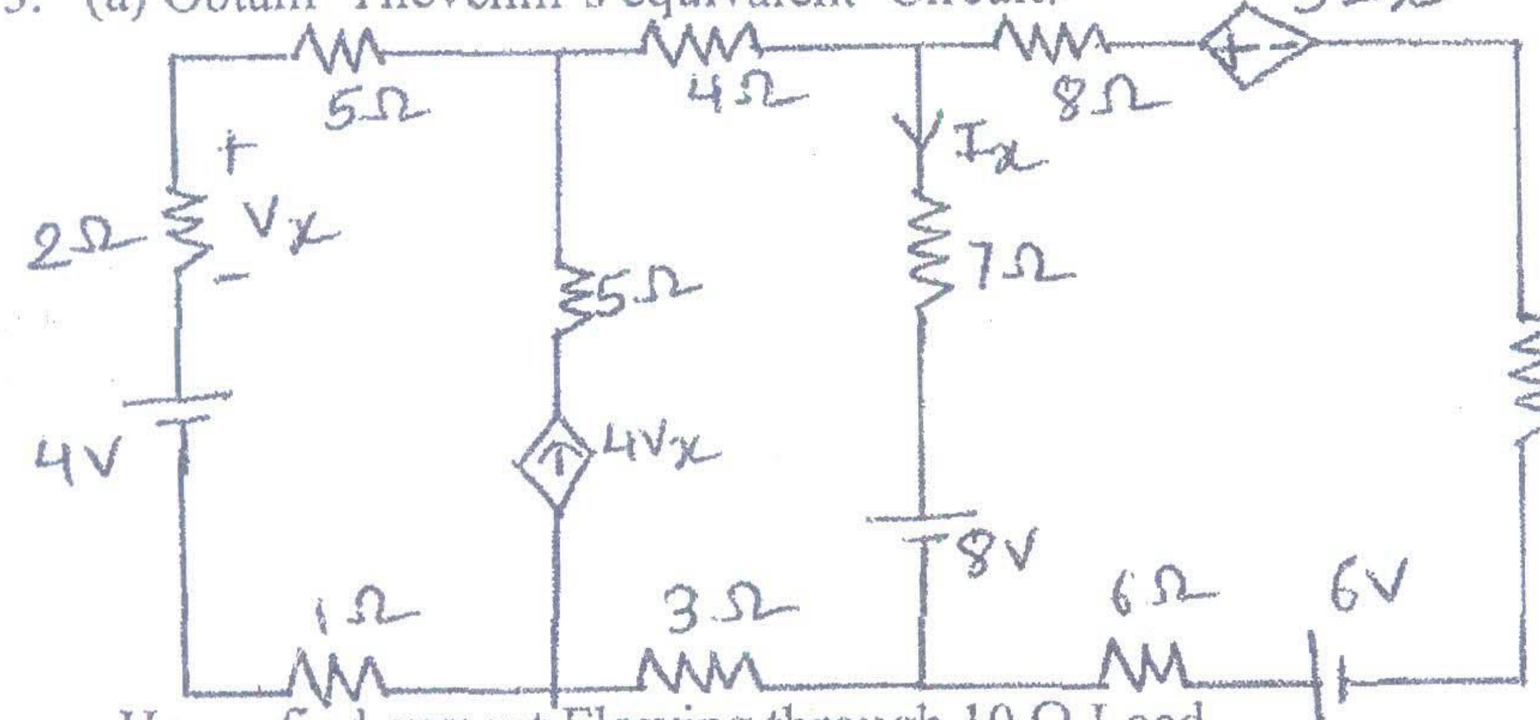


(b) Find current through 15Ω resistor. (6)



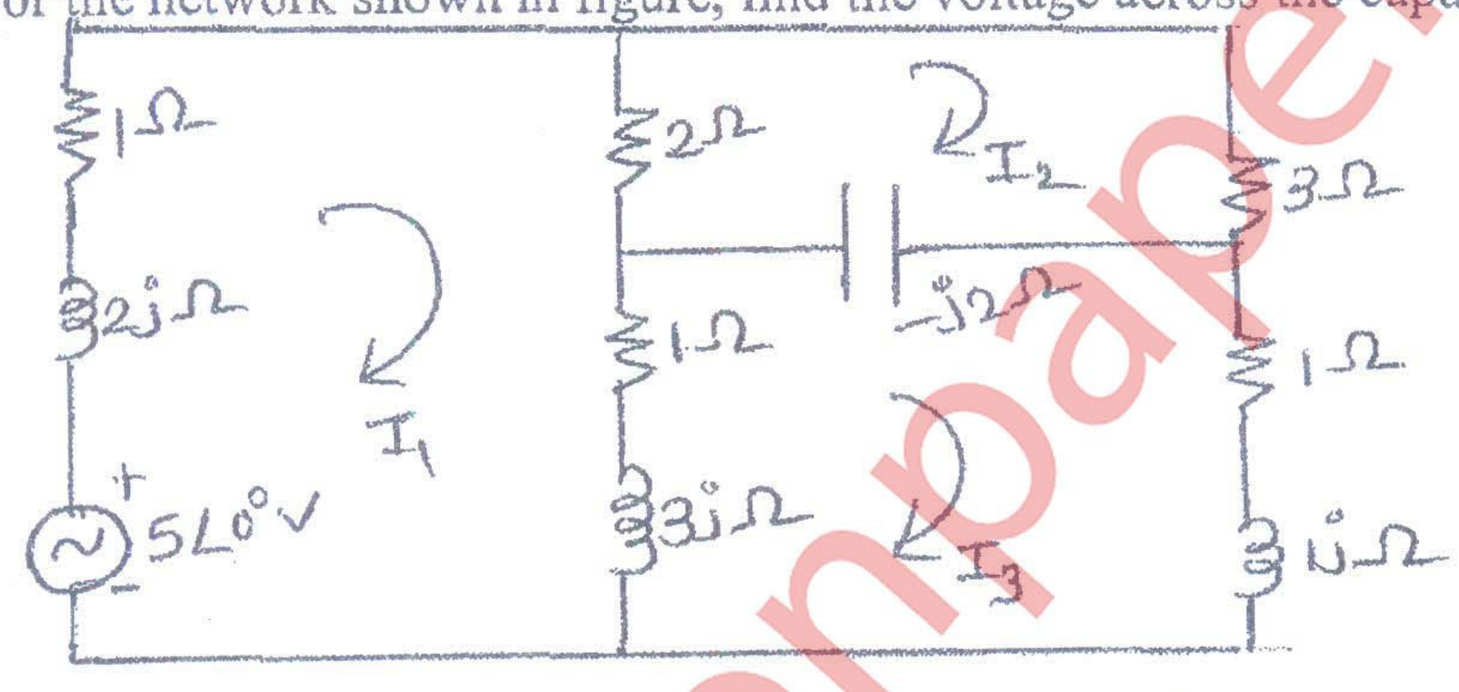
(c)Test whether $F(S) = \frac{2S^4+7S^3+11S^2+12S+4}{S^4+5S^3+9S^2+11S+6}$ is a positive real function. (6)

3. (a) Obtain Thevenin's equivalent Circuit:- (10)

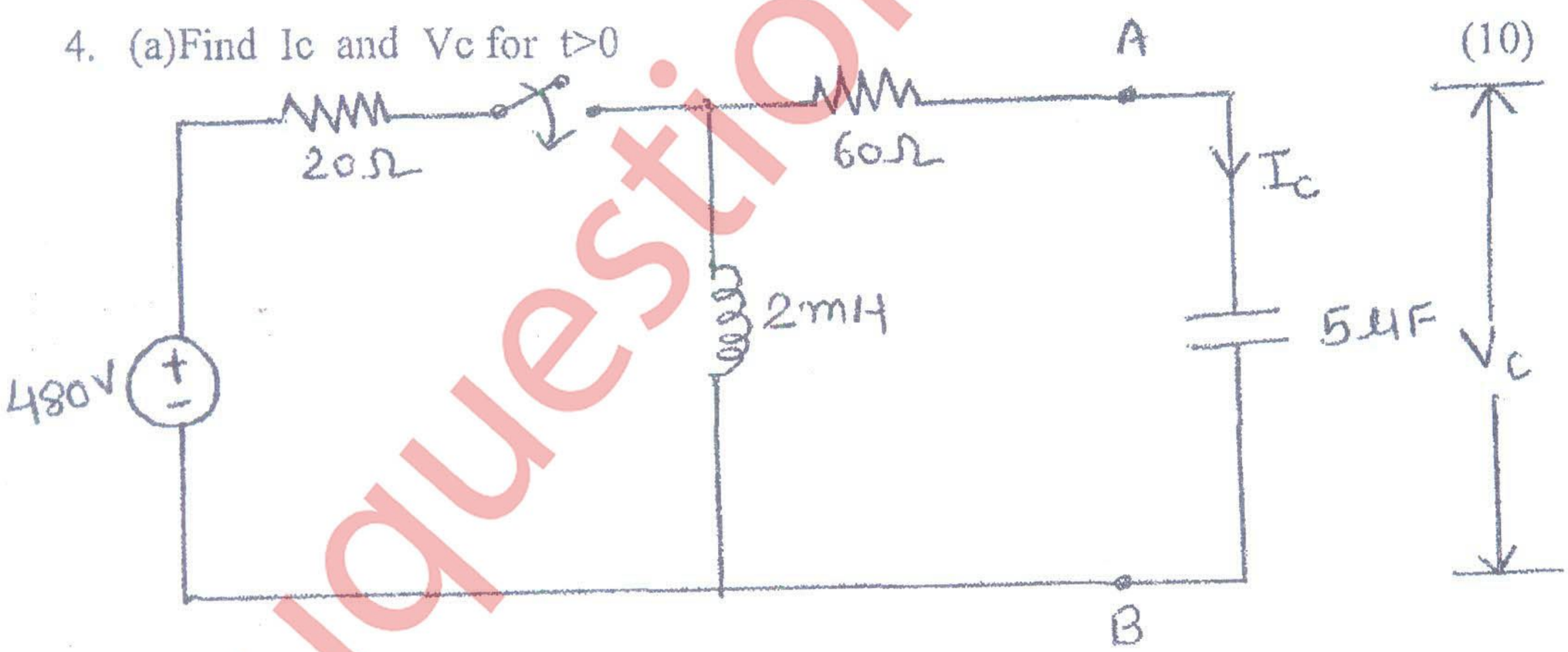


Hence find current Flowing through 10 Ω Load.

(b)For the network shown in figure, find the voltage across the capacitor. (10)



4. (a)Find Ic and Vc for t>0 (10)

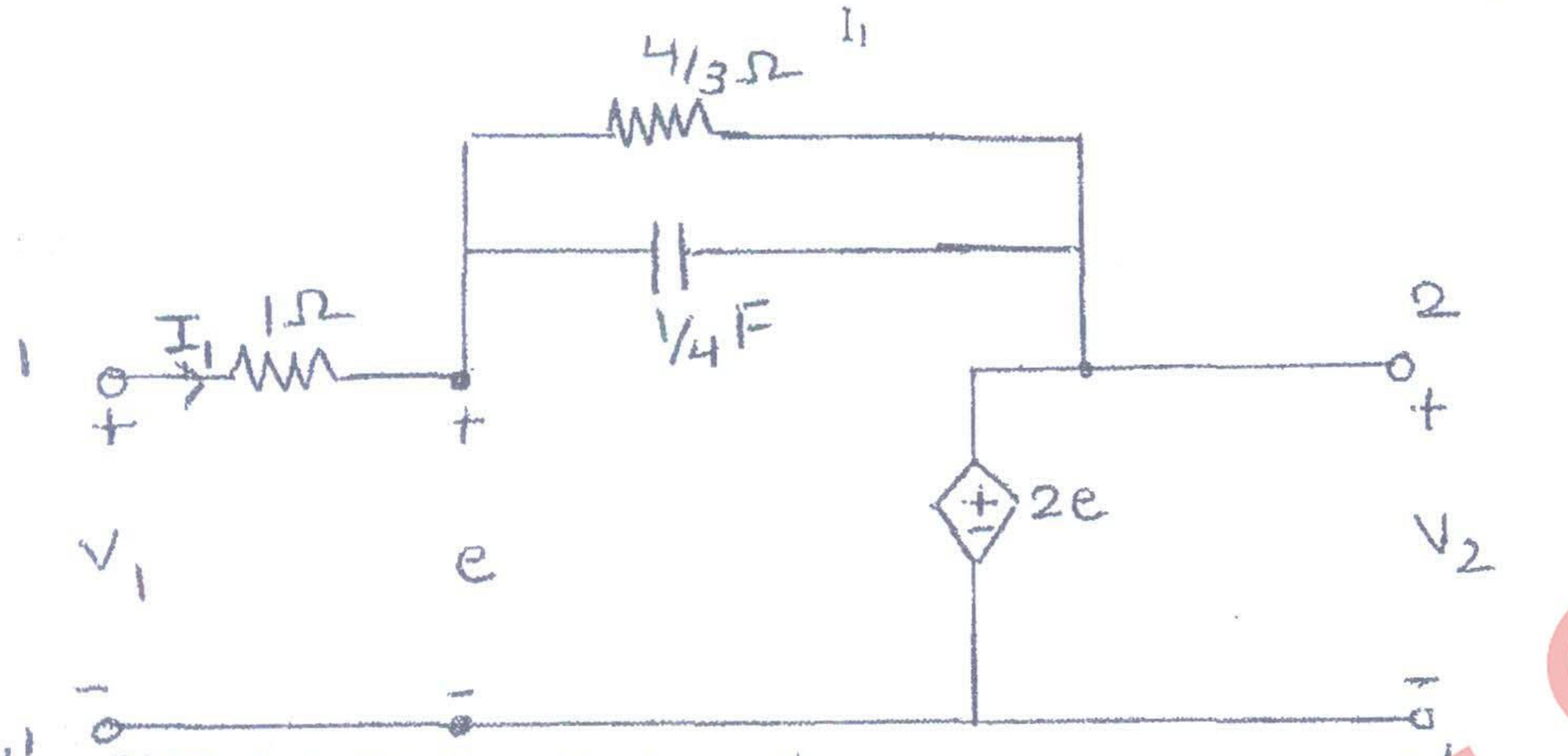


(b) Realise the following function in Foster- I and Foster-II form. (10)

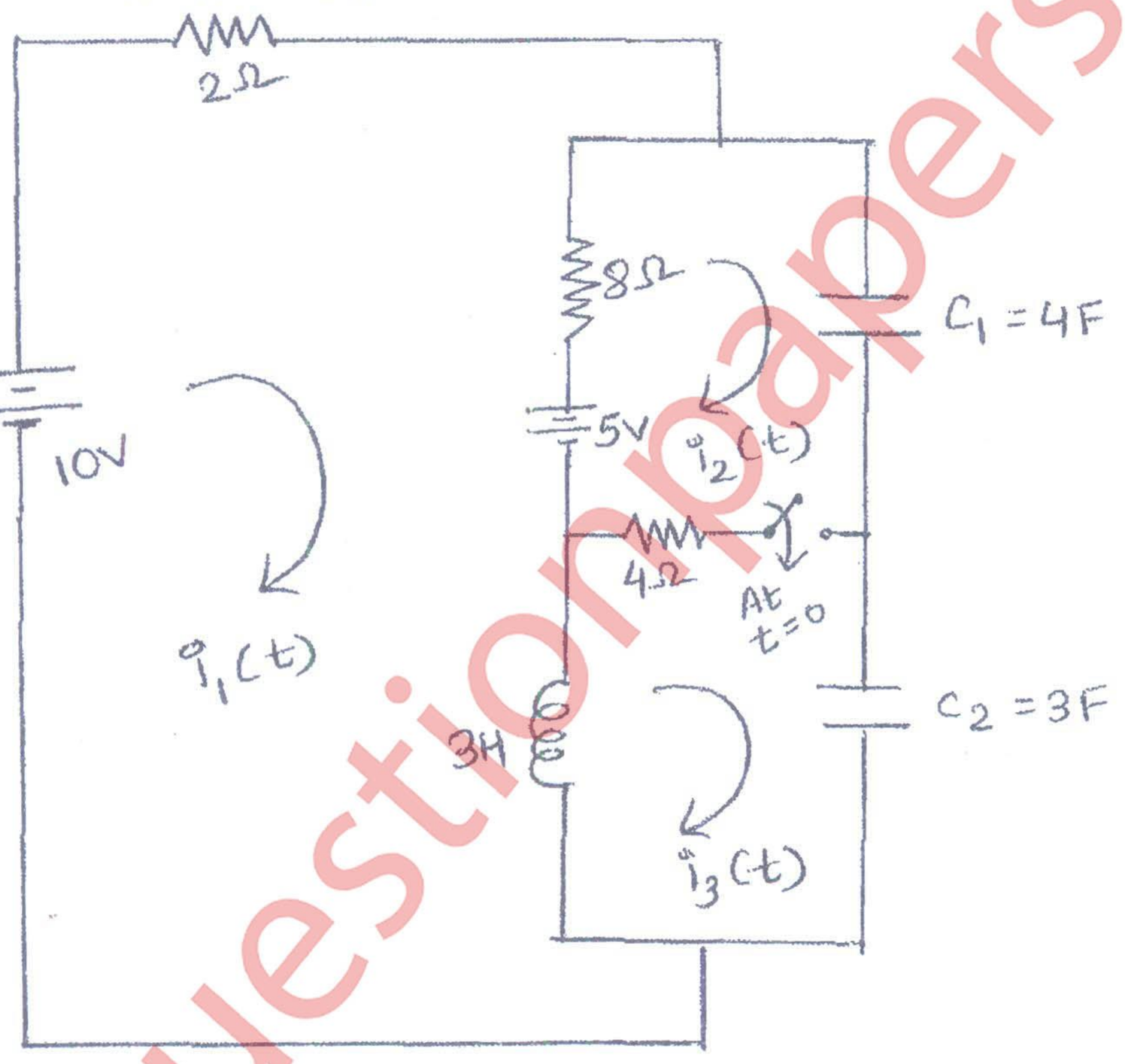
$$Z(s) = \frac{(S+1)(S+3)}{(S+2)(S+4)}$$

Turn Over

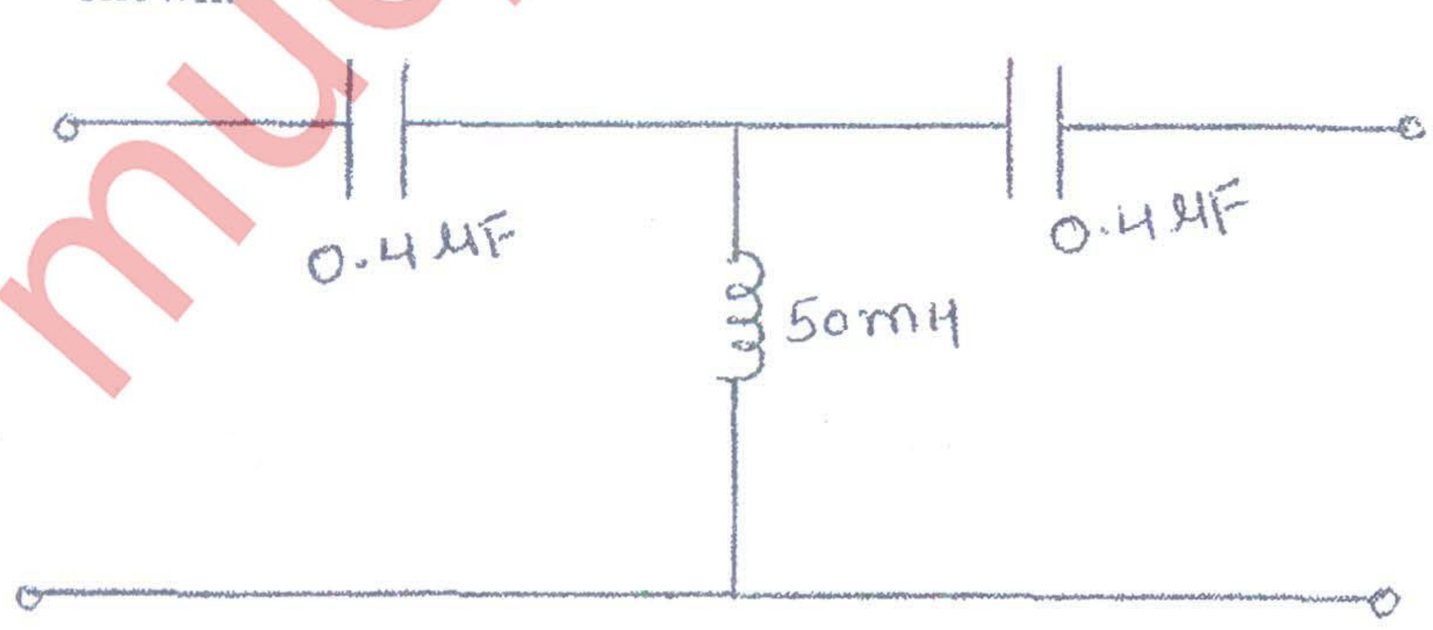
5. (a) Find driving point impedance $\frac{V_1}{I_1}$ for the network shown in figure. (10)



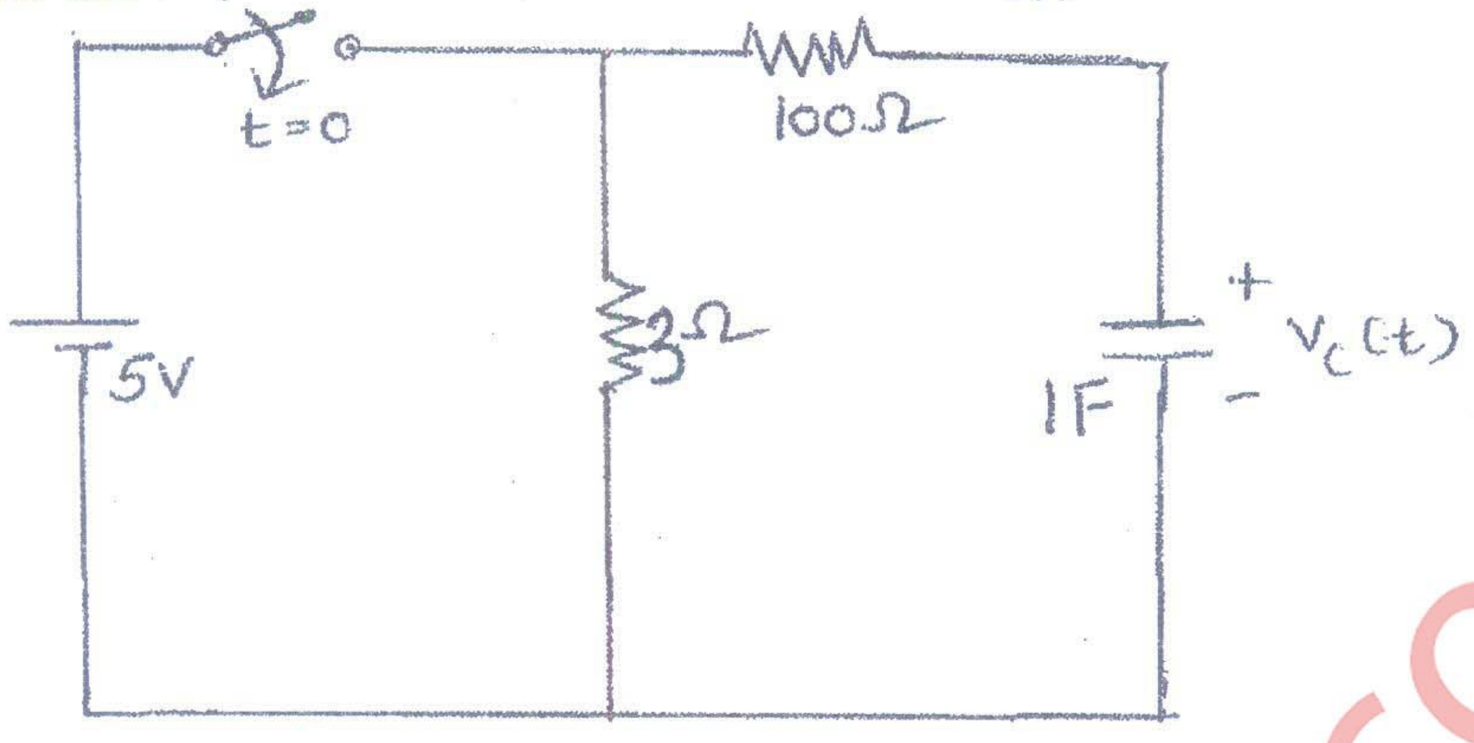
(b) Find $i_1(t), i_2(t)$ and $i_3(t)$ at $t=0^+$



6. (a)Find the characteristic impedance, cut off frequency and pass band for the network shown: (6)



(b)For given circuit , the switch is closed at t=0.Find $V_c(t)$ for t>0



(c) The network shown in Figure reaches a steady state with switch at position 1. At t=0, the switch is changed from the position 1 to the position 2, Find the value of i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t=0^+$