**( 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 Laplace transform of $\cos t \cos 2t \cos 3t$. 05

b) Construct an analytic function whose real part is $e^x \cos y$. 05

c) Find the directional derivative of $\emptyset = x^4 + y^4 + z^4$ at point $A\ (1, -2, 1)$ in the direction of $AB$ where $B$ is $(2, 6, -1)$. 05

d) Expand $f(x) = lx - x^2,\ 0 < x < l$ in a half-range sine-series. 05

Q.2 a) Find the angle between the normals to the surface $xy = z^2$ at the points $(1, 4, 2), (-3, -3, 3)$. 06

b) Find the Fourier series for 06

$$f(x) = \begin{cases} -c & -a < x < 0 \\ c, & 0 < x < a \end{cases}$$

c) Find the inverse Laplace transform of 08

(i) $\dfrac{4s + 12}{s^2 + 8s + 12}$

(ii) $\log\left(\dfrac{s^2 + a^2}{\sqrt{s + b}}\right)$

Q. 3 a) State true or false with proper justification "There does not exists an analytic function whose real part is $x^3 - 3x^2y - y^3$. 06

b) 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

c) Expand $f(x) = 4 - x^2$ in the interval (0, 2). 08

Q. 4 a) Use Gauss's Divergence theorem to evaluate $\iint_S \bar{N} \cdot \bar{F}\ dS$ where $\bar{F} = 4x\ i + 3y\ j - 2z\ k$ and $S$ is the surface bounded by $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$. 06

**TURN OVER**

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

c) Solve using Laplace transform $\frac{dy}{dt} + 3y = 2 + e^{-t}$ with $y(0) = 1$. 08

Q. 5 a) Find Laplace transform of $(1 + 2t - 3t^2 + 4t^3)H(t-2)$ where 06

$$H(t-2) = \begin{cases} 0, & t < 2 \\ 1, & t \geq 2 \end{cases}$$

b) Prove that $2J_0''(x) = J_2(x) - J_0(x)$. 06

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

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

Q. 6 a) Using Green's theorem evaluate 06

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

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

b) Express the function 06

$$f(x) = \begin{cases} 1 & for\ |x| < 1 \\ 0 & for\ |x| > 1 \end{cases}$$

as a Fourier Integral.

c) Under the transformation $w = (1+i)z + (2-i)$, find the region in the $w$ −plane into which the rectangular region bounded by $x = 0, y = 0, x = 1, y = 2$ in the $z$ −plane is mapped. 08

_____xxx_____xxx_____

**Q.P.Code: 21759**

**(3 Hours) [Total Marks: 80]**

**Instructions** – i) Questions 1is Compulsory
ii) Out of remaining questions attempt any three questions
Iii) Assume suitable additional data if required.bridge
iv)Figures in the bracket to the right hand side indicate full marks.

| | | | |
|---|---|---|---|
| Q.1 | a) | Compare analog instrument with digital instrument. | **(05)** |
| | b) | Explain selection criteria for transducers. | **(05)** |
| | c) | Which is fastest ADC and why? | **(05)** |
| | d) | Describe the various types of sweeps used in CRO. | **(05)** |
| Q.2 | a) | Explain working of LVDT and define its application in displacement measurement. | **(10)** |
| Q.2 | b) | Draw neat block diagram of Dual Beam oscilloscope. Give the comparison between Dual Trace and Dual Beam Oscilloscope. | **(10)** |
| Q.3 | a) | Draw and explain Hay bridge and its application for measurement of inductances. | **(10)** |
| Q.3 | b) | Explain principle of operation and working of dual slope DVM. | **(10)** |
| Q.4 | a) | Define power and energy and explain working of a single phase energy meter. | **(10)** |
| Q.4 | b) | Draw and explain capacitive transducer for level measurement | **(10)** |
| Q.5 | a) | Draw the block diagram of generalised measurement system and explain its component | **(10)** |
| Q.5 | b) | Draw andexplain Wheatstone bridge and drive expression for measurement of resistance. | **(10)** |
| Q.6 | a) | Explain dual slope ADC with neat block diagram and comment on its speed | **(10)** |
| Q.6 | b) | Define Q factor and explain working of a Q meter for Q factor measurement. | **(10)** |

**Q.P. Code : 24054**

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

Please check whether you have got the right question paper.

N.B: 1. Questions No. 1. is compulsory and solve THREE questions from remaining questions.
2. Assume suitable data if necessary.

Q.1. Solve any Four. 20

a) Justify multiple carriers are generated during Avalanche breakdown in zener diode.
b) Why BJT does not work properly at high frequencies.
c) How current flows in E-MOSFET without presence of channel inside.
d) Justify APD is superior to Photodiode.
e) State applications of Power Devices.

Q.2. a) Draw construction of IMPATT diode and explain its working with necessary waveforms. 10
b) What is the use of small signal ac model of BJT, draw and explain hybrid –II model. 10

Q.3. a) Derive equation of Electric field and maximum electric field when PN junction under zero bias 10
b) Draw construction VI characteristics and small signal model of JFET. 10

Q.4 a) Explain working of MOSFET considering different values of VGS voltages. 10
b) What is solar cell explain its structure and model and working. 10

Q.5 a) Draw structure of IGBT, explain VI characteristics and working. 10
b) What is MESFET draw its structure VI characteristics and explain its operation. 10

Q.6 a) With the help of Energy Band diagram explain different metal semiconductor ohmic contacts. 10
b) Explain VI characteristics of TRIAC and state its use in power Electronic circuit. 05
c) What is HBT compare energy band diagram of BJT with HBT 05

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# Q.P. Code: 25013

*(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 $\sin\sqrt{t}$ 5

B) Prove that u = $-r^3\sin 3\Theta$ is harmonic function also find harmonic conjugate function of u 5

C) Find a fourier series to represent f(x) = $\left(\frac{\pi-x}{2}\right)^2$ in (0 , 2π) hence deduce that 5

$\frac{\pi^2}{6} = \frac{1}{1}+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+\ldots\ldots$

D) Find the acute angle between the surface $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at (2,-1,2) 5

Q2

A) Prove that $J_{(-3/2)}(x) = -\sqrt{\frac{2}{\pi x}}\,.\left(\frac{\cos x}{x}+\sin x\right)$ 6

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

C) Obtain the fourier series for f(x) =$|x|$ in (-π , π) 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) $2\tanh^{-1}(s)$ (ii) $e^{-4s}.\frac{s}{(s+4)^3}$ 6

B) Find the image of the rectangular region bounded by x=0 , x=3 , y=0 ,y=2 under the bilinear transformation w = z +(1+i) 6

C) Prove that y = $\sqrt{x}\,J_n(x)$ is a solution of the equation , 8

$x^2\frac{d^2y}{dx^2}+\left(x^2-n^2+\frac{1}{4}\right)y=0$

Q4

A) Find Complex form of Fourier Series of coshax in (-a , a) 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 inverse Laplace transform of $\frac{1}{(s^2+4s+13)^2}$ using convolution theorem 6

c) Prove that $\bar{F}$=($y^2\cos x + z^3$)i+(2ysinx-4)j+($3xz^2$+2)k is a conservative field .Find (i)Scalar Potential for $\bar{F}$ (ii) The work done in moving an object in this field from (0 ,1,-1) to($\frac{\pi}{2}$ , -1 ,2). 8

Q6

A) Find the Laplace Transform of $e^{-4t}\int_0^t usin3udu$ 6

B) Use stoke's theorem to evaluate $\int_C \bar{F} \cdot \overline{dr}$ where $\bar{F}$ =(2x-y)i-yz$^2$j –y$^2$zk and S is the surface of hemisphere x$^2$ +y$^2$+z$^2$ =a$^2$ lying above the XY- plane 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

**Q.P. Code :33463**

**[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 from remaining five questions.

Q.1
a) Explain the term noise margin and its value for TTL and CMOS family. **05**
b) Differentiate between synchronous and asynchronous counter. **05**
c) Draw truth table and logic diagram of Full Adder. **05**
d) Explain shift registers and its applications **05**

Q.2
a) Use K-map to reduce the following function and then implement it by NOR gates only. **10**

$$F(ABCD) = \sum m\ (4,6,12,14) + \sum d\ (1,3,9,11)$$

b) Implement the following function using 8:1 MUX and logic gates. **10**

$$P(A,B,C,D) = \sum m\ (1,2,5,8,10,12,15) + \sum d\ (0,6)$$

Q.3
a) Design a mealy sequence detector to detect 1010 using D flip-flops and logic gates. **10**

b) Design a MOD 5 asynchronous counter and explain the glitch problem. **10**

Q.4
a) Design a circuit with optimum utilization of PLA to implement the following functions. **10**

$$F1 = \sum m\ (2,12,13)$$
$$F2 = \sum m\ (7,8,9,10,11,12,13,14,15)$$
$$F3 = \sum m\ (1,2,8,12,13)$$

b) Design 4 bit Johnson counter using J-K flip-flop. Explain its working using waveform. **10**

Q.5 a) Eliminate redundant states and draw the reduced state diagram. **10**

| PS | NS | | O/P | |
|---|---|---|---|---|
| | X=0 | X=1 | X = 0 | X = 1 |
| 1 | 2 | 3 | 0 | 0 |
| 2 | 2 | 4 | 0 | 0 |
| 3 | 2 | 3 | 0 | 0 |
| 4 | 5 | 3 | 0 | 0 |
| 5 | 2 | 6 | 0 | 1 |
| 6 | 5 | 3 | 0 | 0 |

b) Discuss XC 4000 FPGA architecture with neat block diagram. **10**

Q.6 Write short notes on **20**

a) VHDL
b) Stuck at '0' and stuck at '1' fault
c) Master slave JK flip flop
d) BCD Adder

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

Please check whether you have got the right question paper.

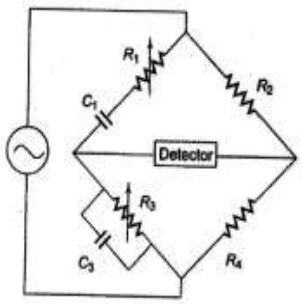
N.B: (i) Question No. 1 is compulsory & attempt any three out of the remaining five questions.
(ii) Assume suitable data if required but justify it logically wherever applicable. Figures to the right indicate full marks & every sub-question from Q.2 to Q.6 have equal weightage And have 10 marks each.

Q.1 **Attempt any four** **20**

(a) Define the following static characteristics of instruments.
(i) Sensitivity
(ii) Precision
(iii) Dead zone
(iv) Drift.
(v) Accuracy
(b) Draw a neat circuit diagram of LCR - Q meter & explain its operating principle.
(c) Compare dual slope and dual beam CRO.
(d) Describe operating principle of harmonic distortion analyzer with a neat block diagram.
(e) With a neat diagram, explain the principle of digital time measurement.
(f) Compare sensor and transducer.

Q.2 (a) Voltmeter having a sensitivity of 1000 ohm/volts read 100V on its 150 V scale when connected across an unknown resistor in series with a millimeter, when millimeter reads 5m A **20**
(i) Calculate apparent resistance of unknown resistor.
(ii) Calculate actual resistance of unknown resistor.
(iii) Calculate error due to loading effect of voltmeter.

(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?




Q.3 (a) Draw the block diagram of dual trace CRO and explain its operation. **20**
(b) Explain how Lissajous patterns / figures are used for measurement of an unknown frequency & phase shift using a cathode ray oscilloscope (CRO).

Q.4 (a) Draw the circuit diagram and explain the operation of bridge used to measure capacitance. **20**
(b) Explain various features of digital storage oscilloscope.

Q.5 (a) Draw the neat diagram and explain the operation of successive approximation type DVM. **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) Draw the diagram and explain the operation of Rotameter. **20**

(b) Explain the operation of Pirani gauge for pressure measurement?

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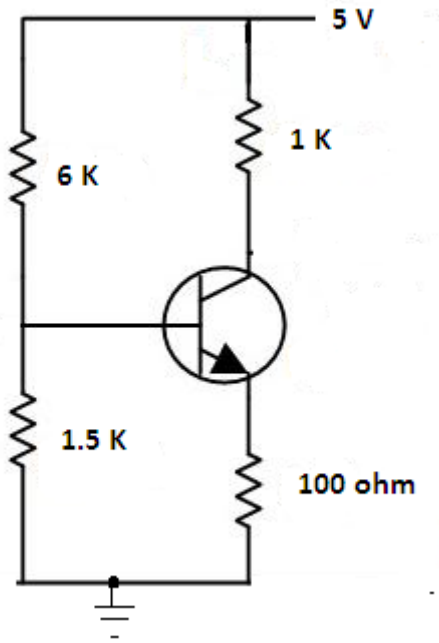
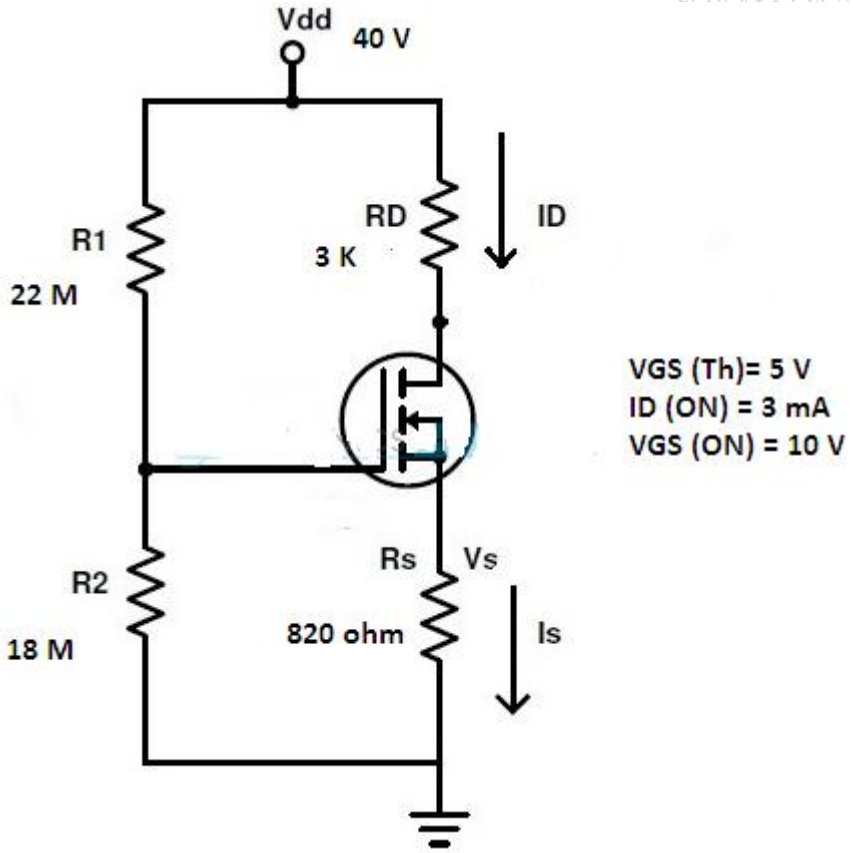
**(3 Hours)** **Maximum Marks 80**

**N.B: (1) Question No.1 is compulsory.**
**(2) Solve any three out of remaining question.**
**(3) Assume suitable data if necessary.**

| | | |
|---|---|---|
| Que-1 | Solve **any Four** | Marks |
| a | What happens when pn junction diode is made forward bias, explain considering any suitable application. | 5 |
| b | Explain how CC configuration of BJT gives voltage gain less than 1 | 5 |
| c | Explain with the help of construction that MOSFET gives more Input resistance than JFET | 5 |
| d | What is varactor Diode, also state its applications. | 5 |
| e | Compare C, L and LC filters. | 5 |
| Que-2a | Draw Energy band diagram of pn junction diode under i) Zero Bias ii) Forward bias and iii) Reverse Bias | 10 |
| Que-2b | For the given circuit find Steady State DC Parameters Icq and Vceq<br>Given **β = 100** and **VBE = 0.7 V,** also state in which region the circuit is working. | 10 |



Que-3a For the given MOSFET amplifier , Determine IDq, VGSq and VDS. 10




Que-3b Explain working principle, characteristics and applications of Photodiode. 10

Que-4a What is the need of Filters, Explain L filter circuit? 10

Que-4b For the voltage divider biased BJT amplifier without bypass capacitor circuit derive equation of Input resistance, Voltage gain, current gain and output resistance. 10

Que-5a Design Single Stage CE amplifier for the given specifications 15
Av ≥ 100, S =10, Vo = 3 V, fL =20 HZ, use transistor BC 147 B
Use coupling and bypass capacitor as C1 = C2 = 10 µF and CE = 100 µF.

Que-5b What is Clamping circuit, explain with neat Input and output waveforms for negative Clamping circuit. 05

Que-6a For the voltage divider biased E MOSFET circuit derive equation of Input Resistance, Voltage gain and output resistance. 10

Que-6b Derive equation of Input resistance, Current gain and Voltage gain for CC amplifier. 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. | $\theta_{fa}$ °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 | 50 Ω | — | — | — |
| ECN 149 | 15 Ω | — | — | — |
| ECN 055 | 12 Ω | — | — | — |
| 2N 3055 | 6 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. | $I_{DSS}$ | $g_{os}$ (typical) | $-V_p$ Volts | $r_d$ | Derate above 25°C | $\theta_{ja}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

(3 Hours) [Total Marks: 80]

N.B: (1) Question No.**1** is **compulsory.**

(2)Attempt any **three** questions from **remaining** questions.

(3)Assume suitable **data** if **required.**

(4)**Attempt every question in a group and not randomly.**

1. (a) Check for Hurwitz polynomial (20)

$Q(S) = S^5 + S^3 + S^1$

$Q(S) = S^4 + 6S^3 + 8S^2 + 10$

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

(c) What are conditions for rational function F(S) with real coefficient to be p.r.f?

(d) Explain Y-parameter in terms of Z-parameter.

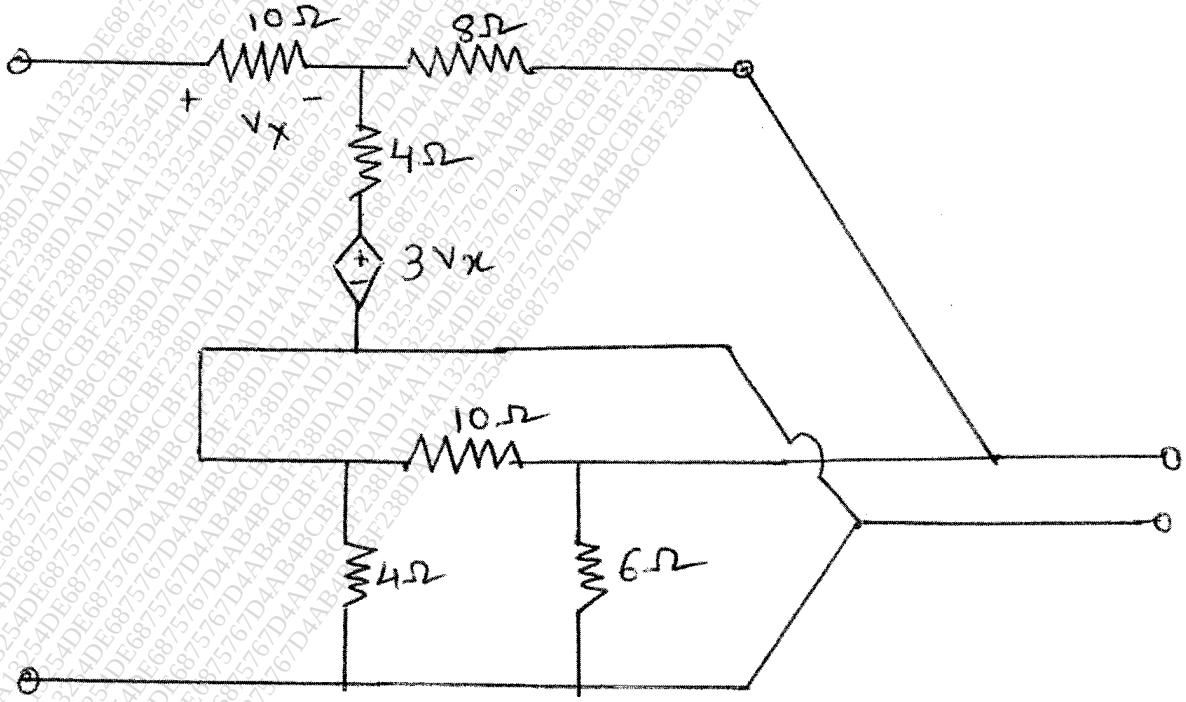
2. (a) Realise the following function in Foster-I and Foster-II forms. (20)

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

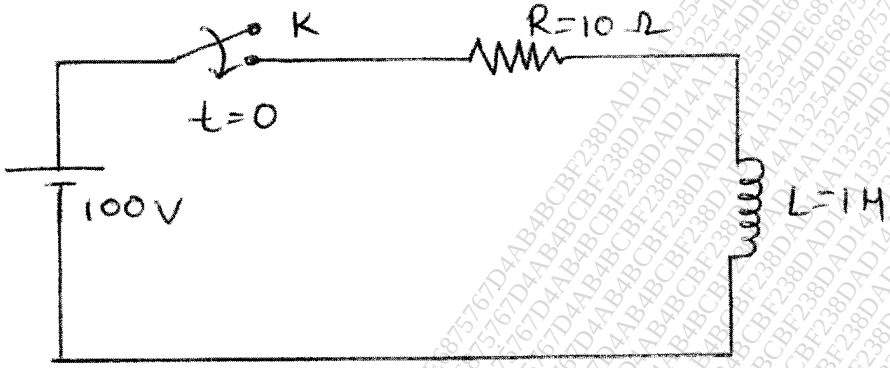
(b) Realise the following function in Cauer –I and Cauer-II forms.

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

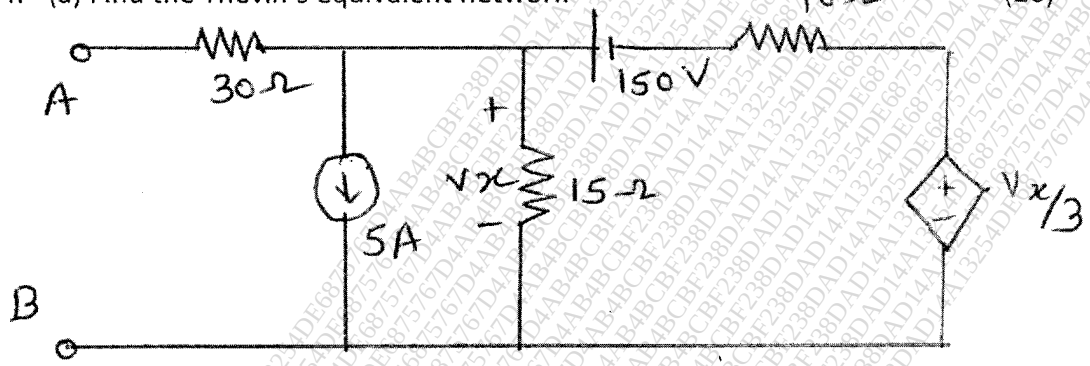
3. (a) Obtain hybrid parameter of the inter connected network. (20)



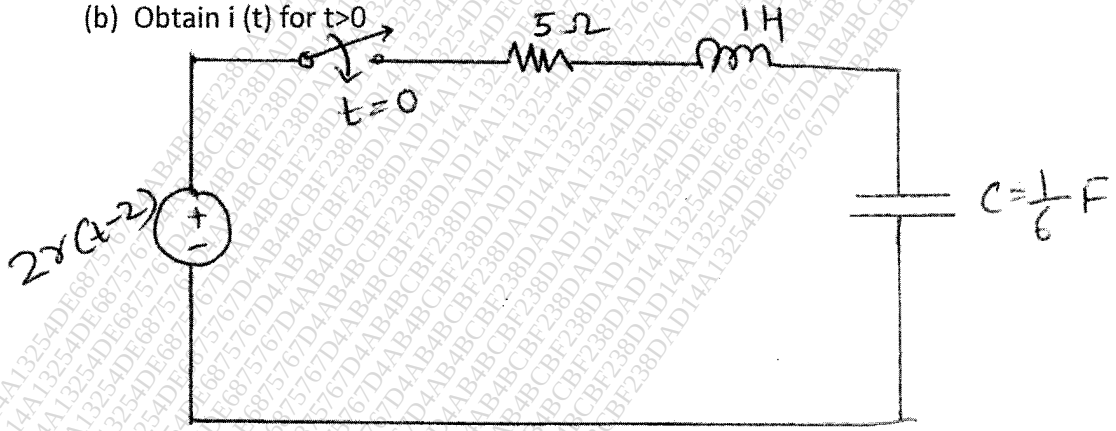
(b) The switch is closed at t=0, find values of I, $\frac{dI}{dt}$, $\frac{d^2I}{dt^2}$ at t=0+.Assume all initial current of inductor to be zero for circuit



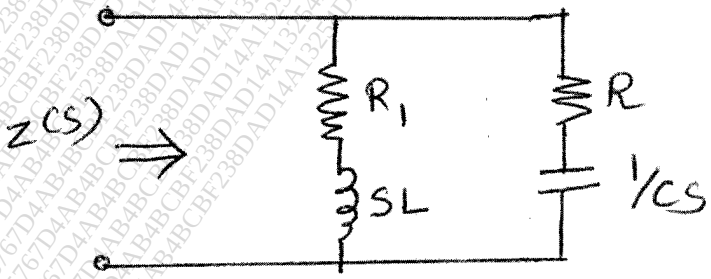

4. (a) Find the Thevin's equivalent network (20)



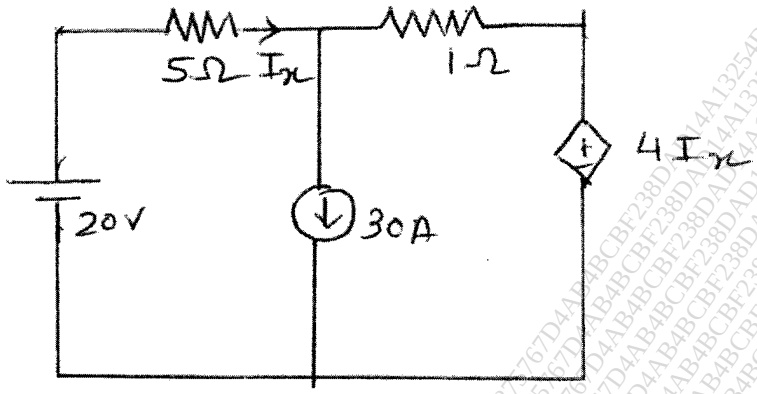

(b) Obtain i (t) for t>0




5. (a) The poles and zeros of the network shown below are as follows:
Poles at -1+j$\sqrt{5}$, -1-j$\sqrt{5}$, zeros at -1,-3 and the scale factor is K. If Z(0) = 1.Find the values of R,$R_1$,L and C.



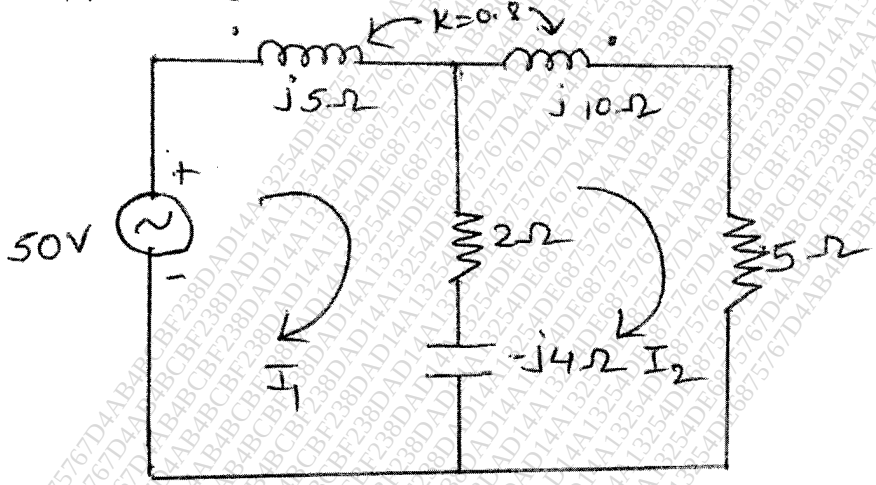
(b) Find the current Ix using superposition theorem.




6. (a) Check whether the following functions are prf or not:- (20)

$$F(S) = \frac{2S^4 + 7S^3 + 11S^2 + 12S + 4}{S^4 + 5S^3 + 9S^2 + 11S + 6}$$

(b)Find Voltage across 5Ω resistor using mesh Analysis.



**Q. P. Code: 40096**

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

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

**Q1. Attempt any four** **20 M**

a) **Explain selection procedure of transducers.**
b) **Draw mega-ohm Bridge and list applications.**
c) **Define accuracy , precision, linearity, sensitivity and resolution.**
d) **Explain measuring principle of ' Q ' meter and list applications.**
e) **Explain level measurement using differential pressure technique.**

**Q2. Attempt the following** **20 M**

a) **Explain in detail different types of errors in measurement system.**
b) **Write short note on - dead weight tester.**

**Q3. Attempt the following** **20 M**

a) **Explain strain gauge transducer. Derive its gauge factor.**
b) **Draw a neat labeled McLeod Gauge system diagram.**

**Q4. Attempt the following** **20 M**

a) **Explain LVDT with neat labeled diagram.**
b) **Explain significance of Lissajous figures in detecting frequency and phase.**

**Q5. Attempt the following** **20 M**

a) **Explain single channel and multichannel data acquisition system with neat labeled separate block diagrams.**
f) **Draw block diagram of CRO. Also draw block diagram of DSO. No explanation needed.List applications of DSO.**

**Q6. Write Short note on following (any four)** **20 M**

a) **Temperature measurement techniques**
b) **Strain Gauges**
c) **Turbine flow meter**
d) **Pirani guage**
e) **Wien bridge and kelvin bridge**

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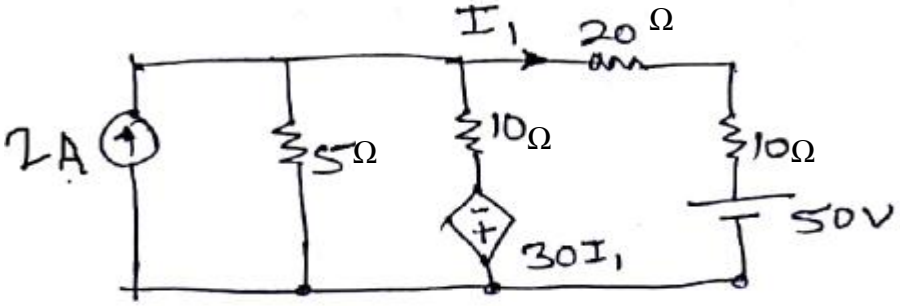
QP CODE:

**REVISED COURSE**

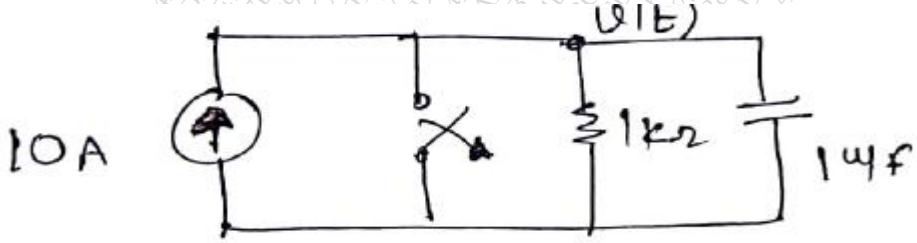
**(3 Hours)** **Total Marks: 80**

**N. B.** 1**)** Question No. 1 is compulsory.
2) Attempt any three questions out of the remaining five questions.
3) Figures to the right indicate full marks.
4) Assume suitable data wherever required but justify the same.

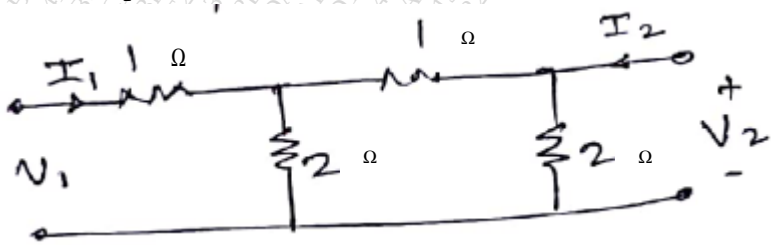
Q.1 (A) Find the voltage across 5 Ω resistor using Nodal Analysis. [5M]



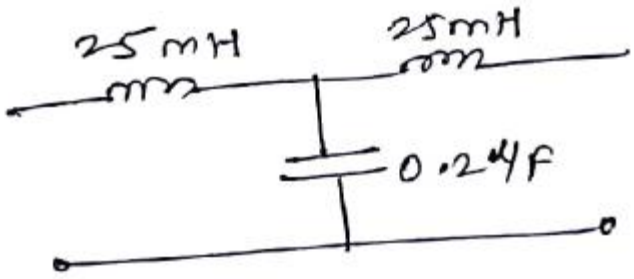

Q.1 (B) Find V, dV/dt and $d^2V/dt^2$ at $t=0^+$. [5M]




Q.1 (C) Determine ABCD parameter for the network shown. [5M]



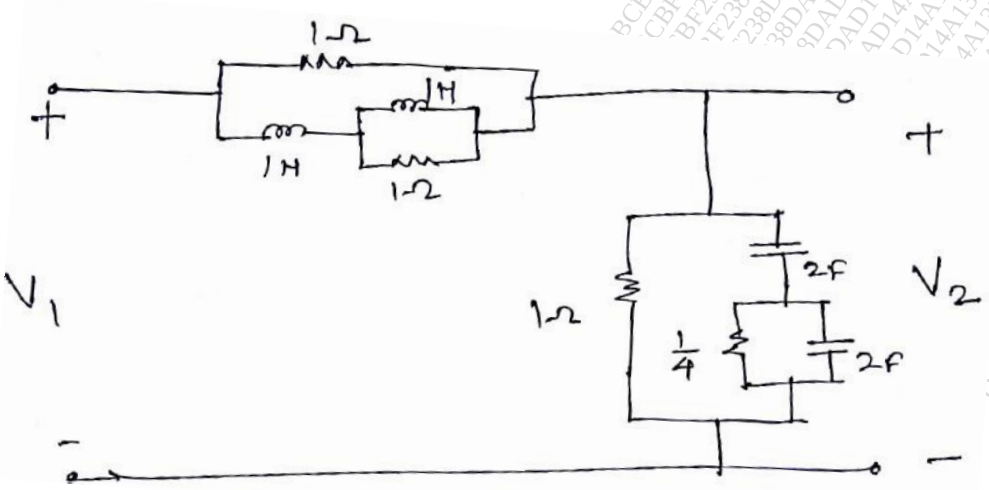

Q.1 (D) Find k, $f_c$ & passband for the network shown. [5M]



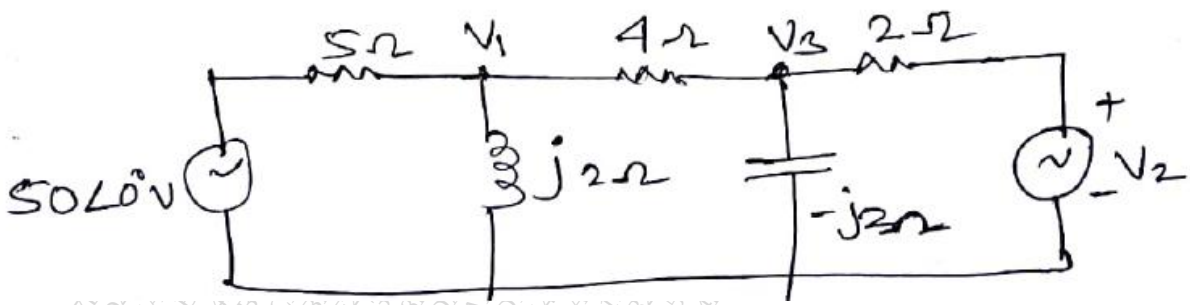

[P.T.O.

Q.2 (A) State maximum power transfer theorem. Draw power diagram for variation of $R_L$. [10M]
Determine the maximum value of $R_L$ power transfer.

Q.2 (B) For the network shown in fig. Prove that the input impedance of port 1 is 1Ω [10M]
and also Find the Voltage Transfer function.




Q.3 (A) In the network of figure, find the voltage $V_2$ which results in zero current through 4Ω [10M]




Q.3 (B) Check whether $P(s) = 2s^6+s^5+13s^4+6s^3+56s^2+25s+25$ is Hurwitz. [5M]

Q.3 (C) Plot the pole and zero of the given network function. Also obtain time domain response of it. [5M]

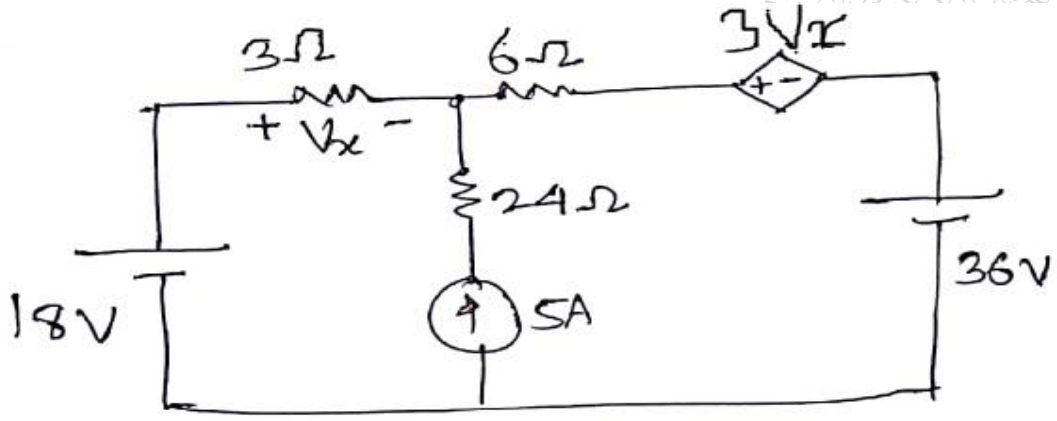
$$F(s) = \frac{2S}{(S+1)(S+2)}$$

Q.4 (A) Derive condition for reciprocity in terms of z-parameters and symmetry in terms of h-parameters. [10M]

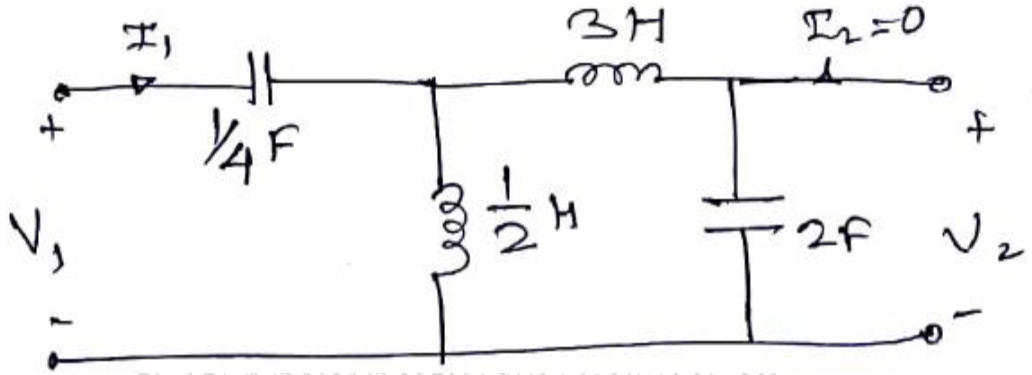
Q.4 (B) Design constant k-low pass filter using π- section having cut-off frequency of 4 kHz and nominal impedance of 500 Ω for the designed circuit find the characteristics impedance. Attenuation constant and phase constant at 2 KHz and 6 KHz. [10M]

[P. T. O

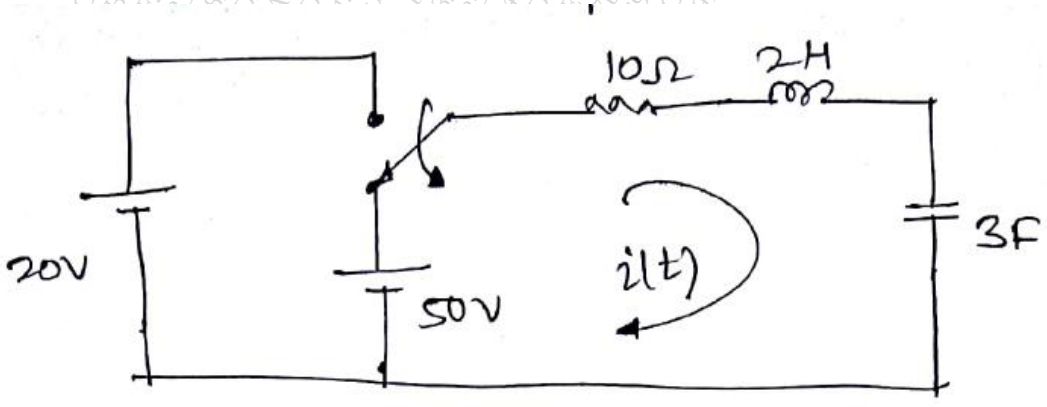
Q.5 (A) Find the voltage $V_x$ in fig. by using Superposition theorem. [10M]




Q.5 (B) Find the network function $\frac{V1}{I1}$ , $\frac{V2}{V1}$ & $\frac{V2}{I1}$ for the network in fig [10M]




Q.6 (A) Determine the expression for the current i(t). [10M]




Q.6 (B) Obtain the foster-I and Causer-I forms of the RL impedance function. [10M]

$$Z(s) = \frac{s(s+4)(s+8)}{(s+1)(s+6)}$$

**(3 Hours)** **[Total Marks : 80 ]**

N.B. : (1) Question No. 1 is **Compulsory**.

(2) Attempt any **three** questions out of **remaining five**.

(3) Each question carries 20 marks and sub-question carry equal marks.

(4) Assume suitable data if required.

**1.** (a) Convert the following numbers as mentioned against them: (5)

(I) $(101011)_2$ convert to decimal number.

(II) Convert $(129.625)_{10}$ Hexadecimal form.

(III) Write $(-20)_{10}$ in Two's complement form.

(b) Write differences between synchronous and asynchronous counters. (5)

(c) Explain use of latch as a switch debouncer (5)

(d) Explain current and voltage parameters of logic families. (5)

**2.** (a) Simplify using Quine McCluskey method and draw the logic diagram using basic gates for the following function; (10)
$Y = F(A, B, C, D) = \Sigma m ( 5, 11,13, 14, 15) + \Sigma d (4, 6, 7)$.

(b) Draw four bit Ring counter and explain its operation. (10)

**3.** (a) Implement the following function using only one 4:1 multiplexer and gates; (10)

$Y=F(A,B,C,D) = \Sigma m (2, 3, 5, 7,10, 11, 12, 13)$

(b) Design 3 bit look ahead carry generator circuit. (10)

**4.** (a) Draw circuit diagram of 2 input TTL NAND gate and explain its operation. (10)

(b) Implement full adder using decoder having active low outputs and gates with fan in 2. (10)

**5.** (a) Design lockout free mod 10 up synchronous counter using JKMS flip flops. (10)

(b) Explain parity circuits. (10)

**6.** (a) Convert the flip flop (I) JKMS to D flip flop (II) SR to T flip flop. (10)

(b) Design 8 bit comparator using 4 bit comparator IC 7485 and explain its operation. (10)

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