H·E-I (EXTC)
SE Sem-III CBGS 12/05/2016
May-June-16
EXTC Sub:- AE-I

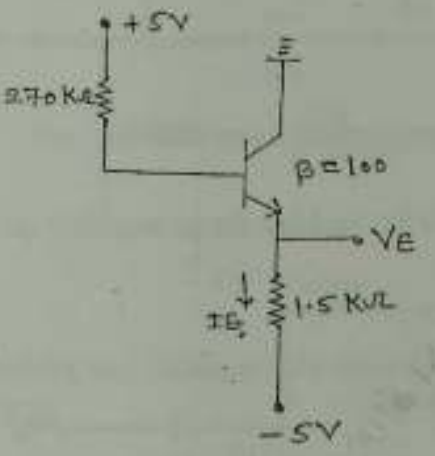
QP Code : 30569

(3 Hours) [Total Marks : 80

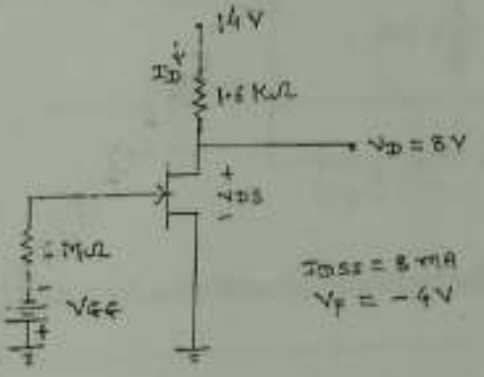
N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume suitable data if required and mention the same in answer sheet.

1. Attempt **any five** questions :- 20

(a) Find V_E and I_E for the circuit given below.



(b) For the circuit given below find I_D, V_{DS}, V_{GS}



(c) Write down current equation of diode and explain significance of each parameters.

(d) Explain the concept of thermal runaway in BJT.

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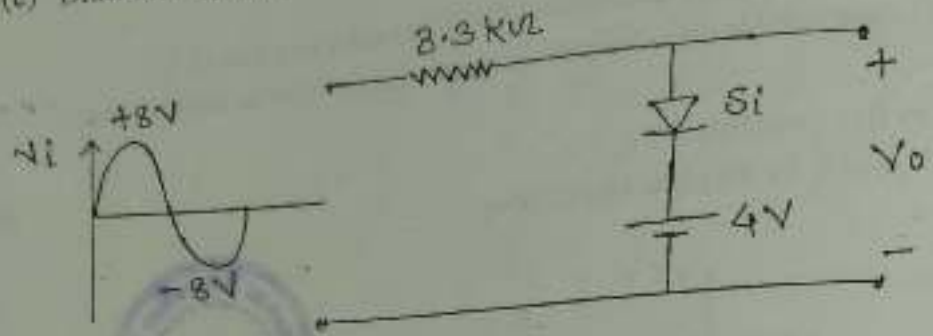
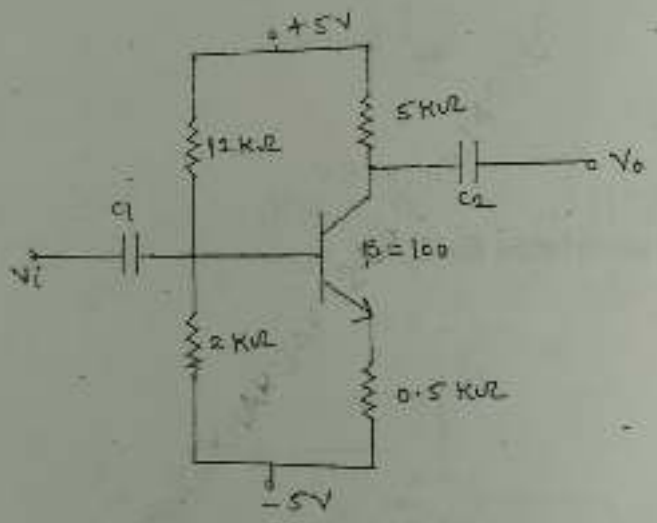
(e) Draw the output Waveform Vo for circuit shown.



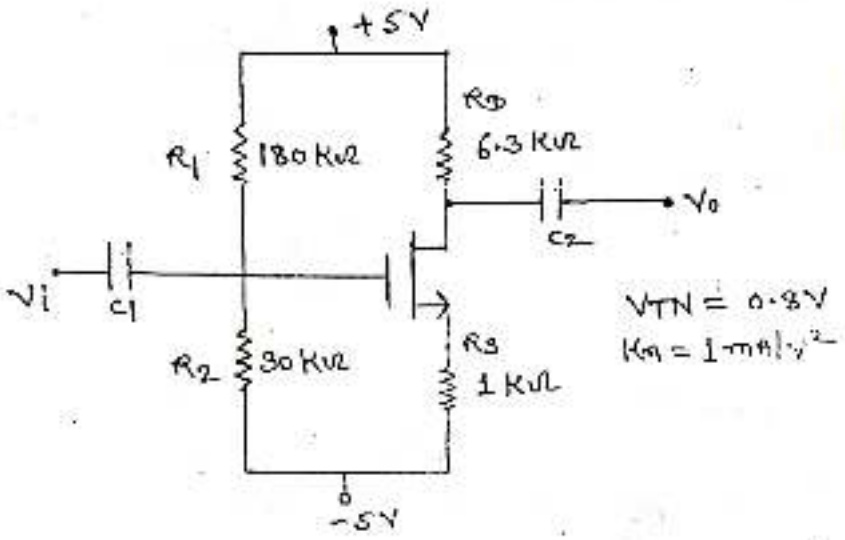
(f) State and explain Barkhausen's criteria for oscillations.

2. (a) Determine Q-Print and draw d.c. load line for the amplifier shown. 10



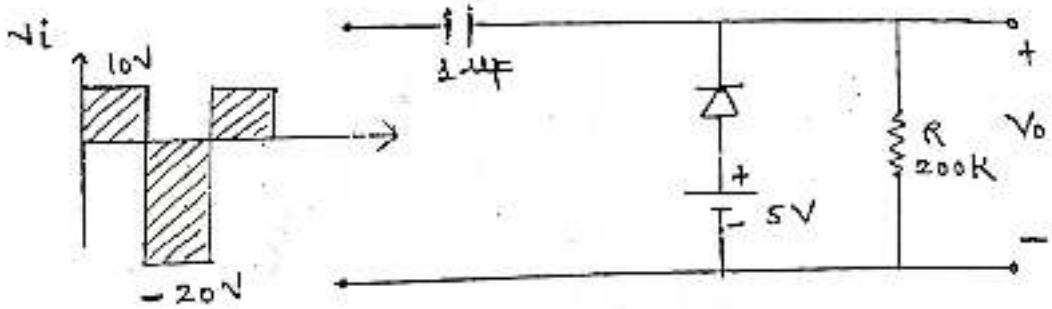
(b) Derive the expression for frequency of oscillation for a BJT RC phase shift oscillator. 10

3. (a) Determine voltage gain, Input resistance and output resistance for the MOSFET amplifier shown. 10



(b) Explain the working and characteristics of n-channel Junction Field Effect Transiators (JFET) 10

4. (a) Draw the output waveform V_0 for ckt shown if (i) Vr = 0V (ii) Vr = 0.7v where Vr is cutin voltage of diode. 10



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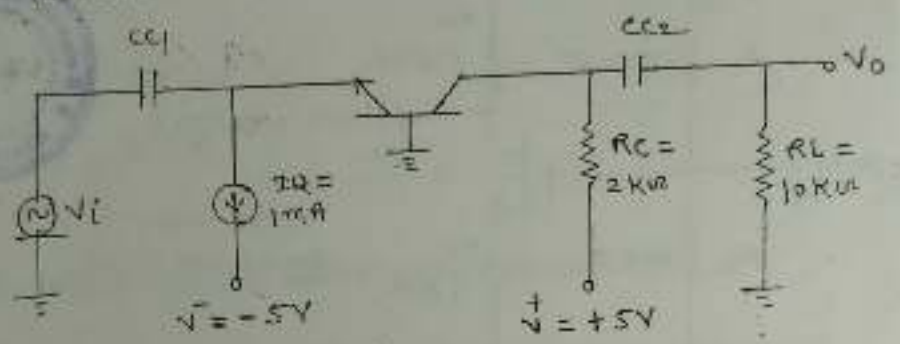
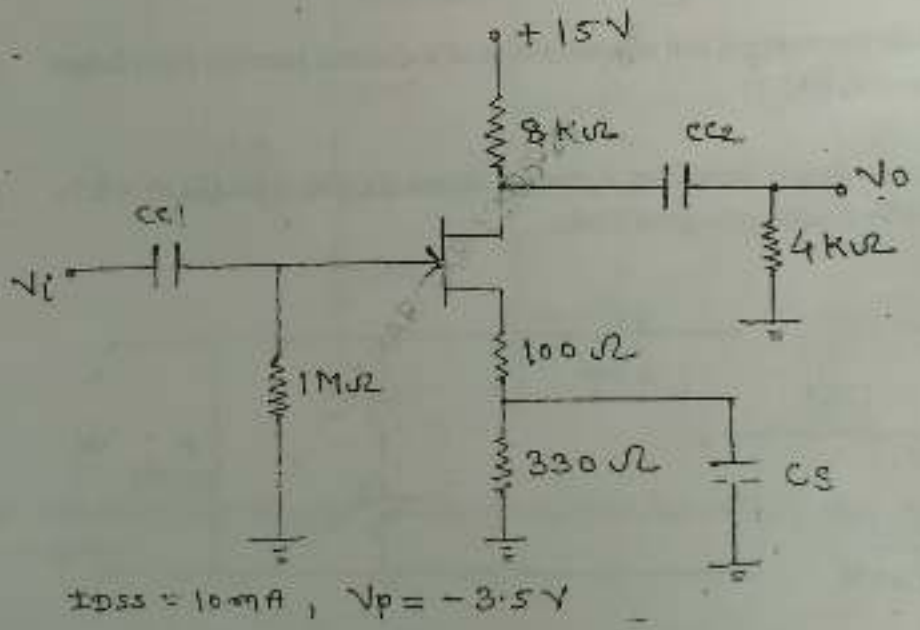
(b) For the common base circuit shown, the transistor has parameters $\beta = 120$ and $V_A = \infty$ 10

(i) Determine the quiescent V_{CEQ}

(ii) Determine the small signal voltage gain and output resistance.



5. (a) For the Amplifier shown determine (i) Q point (ii) Av, Zi, Zo 10



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(b) Derive expressions for voltage gain, input resistance and output resistance for source follower circuit using n-channel MOSFET. 10

6. Write short notes on **any Four** :- 20

(i) Construction and operation of varactor diode
(ii) MOS capacitor
(iii) Transistor as a switch
(iv) Crystal oscillator
(v) Hybrid-π model of BJT

Se Sem III (old) EDCI (EXTC)

18/05/201

Sub:- EDCI

EXTC

QP Code : 28715

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable **data** whenever **necessary** but **justify** the same.

1. (a) Design single stage RC coupled C E amplifier for the followingspecifications: $A_v \geq 110$, $V_o = 3.5V$, $F_L = 20Hz$ .Use $V_{CC} = 15V$. 15
   (b) For the above designed amplifier determine; voltage gain, input impedance, output impedance. 5

2. (a) Design single stage CS amplifier employing JFET type BFW11 for the following specifications; $A_v \geq 12$, $V_o = 4.2V$, $I_{DSO} = 1.2mA$, $V_{CC} = 21V$ and $F_L = 20Hz$. 15
   (b) For the designed amplifier, determine what will be the maximum output voltage that can be obtained without distortion and corresponding input voltage that can be applied in the worst condition. 5

3. (a) Draw small signal hybrid parameter equivalent circuit for CE amplifier and define the same. What are the advantages of h-parameters? 10
   (b) Design voltage divider bias circuit for $I_E = 1.2mA$ $V_{CE} = 2.2V$, $R_E = 1k\Omega$ and $\beta = 60$. $S_{dc} = 8$. Assume $V_{CC} = 9V$. 10

4. (a) For the amplifier shown in figure.1 analyze and determine 10
   (i) D C bias condition
   (ii) Small-signal voltage gain
   (iii) Input and output impedance.

   The circuit parameters are:
   $R_1 = 56k\Omega$, $R_2 = 12.2k\Omega$ $R_E = 0.4k\Omega$, $R_C = 2k\Omega$,$R_L = 10k\Omega R_s = 0.5k$,
   $V_{CC} = 10V$
   and BJT parameters are $\beta = 100$, $V_{BE} = 0.7V$

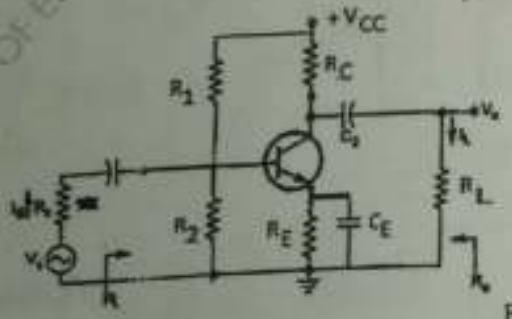

Fig.1

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(b) Draw circuit diagram of JFET small signal CS amplifier with self-bias and derive the expression for, small signal mid-band voltage gain, input impedance and output impedance. 10

5. (a) Explain the biasing techniques for D- MOSFET and E-MOSFET 10
(b) A JFET amplifier with voltage divider biasing circuit shown in figure 2 below has the following parameters: $I_{DSS} = 4mA$, $V_p = -2V$ 10
The circuit parameters: RD = 1kΩ, $R_1 = 12M\Omega$, $I_{DQ} = 3.4mA$ and $V_{DS} = 10.7V$, $V_{DD} = 24V$. Determine the values of R_2 and R_S

6. (a) Design L section LC filter with full wave rectifier to meet following specifications: The DC output voltage $V_{DC} = 220V$, deliver $I_L = 70mA \pm 20mA$ to the resistive load, and required ripple factor is 0.04. Also find bleeder resistance if required. 12
(b) Design a simple Zener voltage regulator to meet the following specifications: Output voltage $V_D = 6.8V$, Load current 8
$I_{L\,max} = 60mA, I_{Lmin} = 0mA$, $I_{Zmax} = 100mA, I_Z min = 5mA$,
Pz = 440m W and Input voltage $V_i = 20V$ to $30V$.

7. Write a short note on following (**any two**) 20
(a) SCR (Construction and Characteristics).
(b) Bias compensation techniques.
(c) E-MOSFET (Construction and Characteristics).

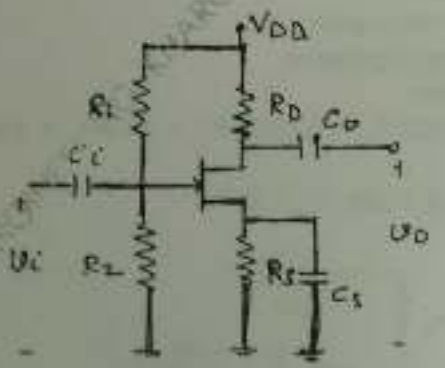

Fig. 2

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Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 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_{EBO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal h_{fe} min.	typ.	max.	V_{BE} max.	θ_{jc} °C/W	Derate above 25°C W/°C
2N3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	—
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N525(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

BFW 11—JFET MUTUAL CHARACTERISTICS

−V_{GS} 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
I_{DS} 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
I_{DS} 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
I_{DS} 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}	−V_p Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μΩ	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	[illegible]	8	[illegible] K	—	°C/mW

UJT type	P_d max. @25°C	I_E max. @25°C	I_p peak pulse current max.	V_{BE} Volts max.	V_{BB} Volts	T_j max	η min.	η max.	R_{BB} KΩ min.	R_{BB} KΩ typ.	Max.	I_p max. μA	I_v min. mA	I_{EO} μA
2N2646	300mW	50mA	2Amp.	30	35	125°C	0·56	0·75	4·7	7·0	9·1	5·0	4·0	−12·0

May-16

SE Sem III (CBGS) AM III EXTC

18/5/2016

EXTC

Sub:- AM-III

QP Code : 30538

(Revised course)

Time :3 hours

Total marks :80

N.B : (1) Question No.1 is compulsory.
(2) Answer any three questions from remaining.
(3) Assume suitable data if necessary.

Evaluate

1. (a) $\int_0^\infty e^{-3t}\left(\frac{\sinh t \sin t}{t}\right)dt$ 15

(b) Obtain the Fourier Series expression for $f(x)=9-x^2$ in (-3,3) 5

(c) Find the value of 'p' such that the function f(z) expressed in polar co-ordinates as $f(z)=r^3\cos p\theta + ir^3\sin 3\theta$ is analytic. 5

(d) If $\bar{F}=(y^2-z^2+3yz-2x)\hat{i}+(3xz+2xy)\hat{j}+(3xy-2xz+2z)\hat{k}$.
Show that $\bar{F}$ is irrotational and solenoidal. 5

2. (a) Solve the differential equation using Laplace Transform 6

$\frac{d^2y}{dt^2}-4\frac{dy}{dt}+8y=1$, given y(0)=0 and y'(0)=1

(b) Prove that 6

$J_4(x)=\left(\frac{48}{x^3}-\frac{8}{x}\right)J_1(x)-\left(\frac{24}{x^2}-1\right)J_0(x)$

(c) i) Find the directional derivative of 18
$\phi=4xz^3-3x^2y^2z$ at (2,-1,2) in the direction of $2\hat{i}+3\hat{j}+6\hat{k}$.

ii) If $\bar{r}=x\hat{i}+y\hat{j}+z\hat{k}$
Prove that $\nabla \log r=\frac{\bar{r}}{r^2}$

3. (a) Show that $\{\cos x, \cos 2x, \cos 3x, \ldots\}$ is a set of orthogonal functions over $(-\pi, \pi)$. Hence construct an orthonormal set. 7

(b) Find an analytic function f(z) =u+iv where. 5

$$w = \frac{x}{2}\log(x^2+y^2) - y\tan^{-1}\left(\frac{y}{x}\right) + \sin x \cosh y$$

(c) Find Laplace transform of 7

i) $\int_0^t ue^{-3u}\cos^2 2u\,du$

ii) $t\sqrt{1+\sin t}$

4. (a) Find the Fourier Series for 6

$f(x) = \frac{3x^2 - 6\pi x + 2\pi^2}{12}$ in $(0, 2\pi)$

Hence deduce that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} \ldots\ldots = \frac{\pi^2}{6}$

(b) Prove that 6

$$\int_0^b xJ_n(ax)\,dx = \frac{b}{a}J_{n+1}(ab)$$

c) Find 8

i) $L^{-1}\left[\log\left(\frac{s^2+1}{s(s+1)}\right)\right]$

ii) $L^{-1}\left[\left(\frac{s+2}{s^2-2s+17}\right)\right]$

5. (a) Obtain the half range cosine series for 6

$$f(x) = x, 0 < x < \frac{\pi}{2}$$
$$= \pi - x, \frac{\pi}{2} < x < \pi$$

(b) Find the Bi- linear Transformation which maps the points 1,i,-1 of z plane onto 1,0,-i of w-plane 5

(c) Verify Green's Theorem for $\int \bar{F} \cdot d\bar{r}$ where 15

$\bar{F} = (x^2 - xy^3)\hat{i} + (x^3 - y^2)\hat{j}$ and C is the curve bounded by $x^2 = y$ and $x = y$

6.(a) Show that the transformation 5

$w = \frac{1-iz}{1+z}$ maps the unit circle $|z| = 1$ into real axis of w plane.

(b) Using Convolution theorem find 5

$$L^{-1}\left[\frac{s}{(s^2+1)(s^2+4)}\right]$$

(c) 15

i) Use Gauss Divergence Theorem to evaluate $\iint_S \bar{F} \cdot \hat{n}\, ds$ where $\bar{F} = x\hat{i} + y\hat{j} + z\hat{k}$ and S is the sphere $x^2 + y^2 + z^2 = 9$ and $\hat{n}$ is the outward normal to S

ii) Use Stoke's Theorem to evaluate $\int \bar{F} \cdot d\bar{r}$ where $\bar{F} = x^2\hat{i} - xy\hat{j}$ and C is the square in the plane z=0 and bounded by x=0,y=0,x=a and y=a.

SE sem-III (CBGS) May-16 May-16

SE EXTC/CBGS/SEM-III/D.E/2415/16

QP Code : 30666

Sub:- DE

EXTC

(3 Hours)

Max Marks: 80

1. Question No. 1 is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures in brackets on the right hand side indicate full marks.

1. (A) Compare Combinational circuits with Sequential circuits. (05)
   (B) Compare Synchronous with Asynchronous counter. (05)
   (C) Compare TTL with CMOS logic families. (05)
   (D) Compare PLA with PAL. (05)

2. (A) Write the VHDL code for 2-bit up-down counter with positive edge triggered clock. (10)
   (B) State and prove the De Morgan's theorem. (05)
   (C) Draw the block diagram of internal architecture of XC4000 family FPGA. (05)

3. (A) Design synchronous counter using T-type flip flops for getting the following sequence: 0 → 2 → 4 → 6 → 0. Take care of lockout condition. (10)
   (B) Convert T-type flip flop into D-type flip flop. (05)
   (C) Write $(AB)_{16}$ into its BCD code and Octal code. (05)

4. (A) Implement the following Boolean equation using single 4:1 MUX and few logic gates: (10)
   $F(P,Q,R,S) = \prod M(0,2,5,6,7,9,12,15)$.
   (B) Compare FPGAs with CPLDs. (05)
   (C) Implement $Y = A + \bar{B}C$ using only NOR gates. (05)

5. (A) Draw a neat circuit of BCD adder using IC 7483 and explain. (10)
   (B) Using Quine McClusky method, minimize the following: (10)
   $F(P,Q,R,S) = \sum m(0,1,3,7,8,9,15) + d(2,10,11)$.

6. (A) Design a Mealy type sequence detector circuit to detect a sequence 1101 using T-type flip flops. (10)
   (B) What is shift register? Explain any one type of shift register. Give its application. (10)

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EIM EXTC Sem III (CBGS)
30/05/16
May-16
EXTC
Sub:- EIM

QP Code : 30714

(3 Hours) [Total Marks : 80

N. B. : (1) Question No.1 is **compulsory**.
(2) Out of remaining question, attempt any **three** questions.
(3) Assume suitable additional data if required.
(4) **Figure** to the **right** of question indicates **full** marks.
(5) Write your answers in ink only.

1. Attempt any **four**: 20
   (a) Explain Alternate mode and Chop mode in a dual trace oscilloscope
   (b) What is cold junction compensation in thermocouples.
   (c) Write a note on piezoelectric transducer.
   (d) Which is fastest ADC and why?
   (e) Define accuracy, precision and sensitivity with suitable example.
   (f) Compare Analog instrument with Digital Instrument.

2. (a) Explain the principle, working and construction of LVDT. What is meant by residual voltage? 10
   (b) Draw neat block dingram of Dual Beam Oscilloscope. Give the comparison between Dual Trace and Dual Beam Oscilloscope. 10

3. (a) What are the various D/A Converting Techniques? Explain any one technique. 10
   (b) What is the basic principle of wave analyser? Explain heterodyne type wave analyser with application. 10

4. (a) Explain Kelvin's double bridge and its application in very low resistance measurement. 10
   (b) Draw and discuss Hay Bridge and its application for measurement of inductance. 10

5. (a) Explain the principle and working of operation of dual slope DVM. 10
   (b) Define Q factor and explain working of a Q meter for Q factor measurement. 10

6. (a) Draw block diagram for generalised measurement system and explain its components. 5
   (b) List various sensors for pressure and temperature along with their ranges. 5
   (c) Brief out classification of errors in measurements 5
   (d) Explain electrodynamometer type watt meter. 5

EI EXTC Sem III (old) 30/5/16

EXTC Sub:- EI May-16

Q.P. Code : **28796**

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) Assume suitable **data** if **necessary**.

1. Attempt any **four** of the following :- 20
   (a) List the specification of DSO.
   (b) Explain bounded strain gauge in details.
   (c) Draw and explain wave analyzer n detail.
   (d) Draw and explain RTD in detail.
   (e) True RMS meter is always specified by crest factor justify.

2. (a) Explain the significance of 3½ and 4½ digit displant. 10
   (b) Explain modulation method used in R-F felimeter. 10

3. (a) Explain the modes of operation of DSO. 10
   (b) Write note on applications of Q-meter. 10

4. (a) Compare the following temperature transducer with respect to their characteristics, measurement range, applications RTD, thermocouple & thermistor. 10
   (b) What is the role of a time base generator ? What are the time base requirement ? 10

5. (a) Explain the principle of operation of dual slope DVM. 10
   (b) Explain the performance characteristics of D/A converter. 10

6. (a) How is the displacement measured ? State different transducers used for displacement measurement. 10
   (b) Explain pulse code modulation technique. 10

7. (a) Explain different types of measurement error with frequency counter. 10
   (b) Explain FFT analyzer in detail. 10

C.TL EXTC SE Sem III CBGS 03/06/16

May-16

Sub:- CTL

QP Code : **30754**

EXTC

(3 Hours) [Total Marks : 80

N.B. : (1) **Attempt** questions **No. 1** and **any 3** from remaining questions. In all 4 questions are to be attempted.
(2) **All** sub-questions of the **same** question should be answered at **one** place only in their serial orders, and not scattered.
(3) **Assume** suitable **data** with **justification** if missing.

1. (a) Determine Y - parameters for the network shown in fig 1 (a) 5

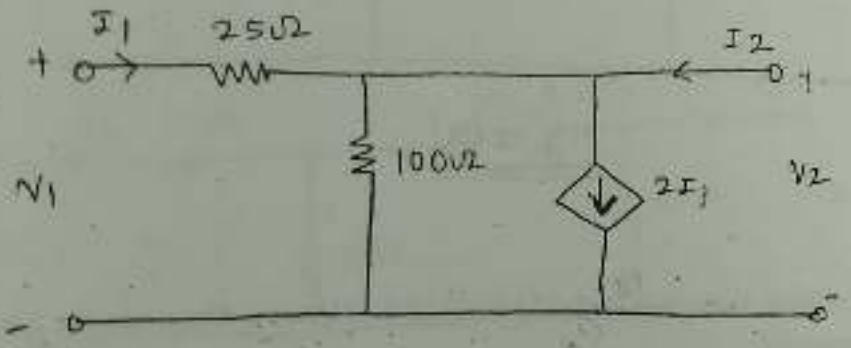

Fig 1 (a)

(b) Test if $F(s) = S^4+S^3+5S^2+3S+4$ is a Hurwitz polynomial 5

(c) Two coils connected in series have self inductance 80 mH & 20 mH respectively 5
The total inductance of the circuit is found to 140 mH. Determine the
(i) mutual inductance between two coils and
(ii) The coefficient of coupling

(d) Synthesize the following function into a network. 5

$$z(s) = \frac{s^2+2s+2}{s^2+s+1}$$ using cauer -1 form.

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2. (a) Find the Thevenin's equivalent across the terminals XY for the circuit shown in fig 2 (a) 10

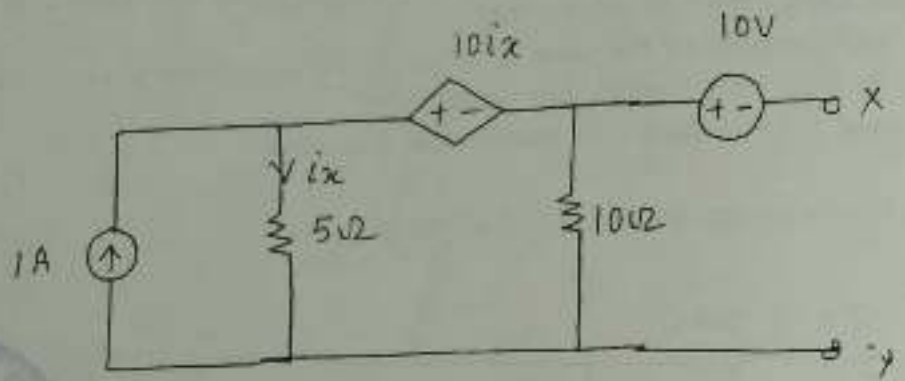


Fig 2(a)

(b) Determine the node voltage at node (1) & (2) of the Network Shown in fig 2(b) by using nodal analysis. 5

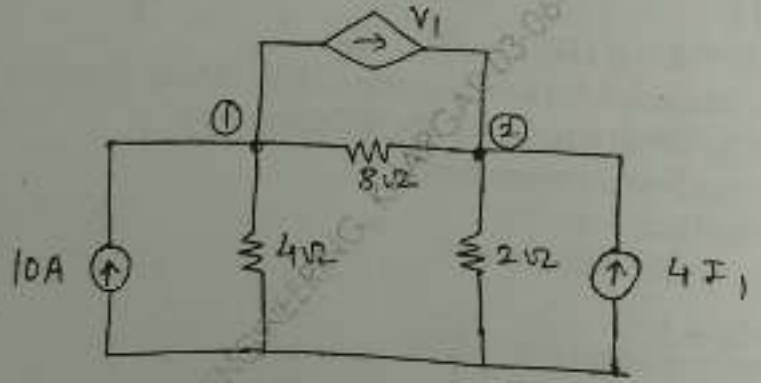


Fig 2(b)

(c) Test Whether

$$F(s)=\frac{s(s+3)(s+5)}{(s+1)(s+4)}$$ is a positive real function. 5

3 (a) Synthesize the driving point function using Foster -I and Foster -II form. 10

$$z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+4)}$$

(b) State and prove Initial value theorem. 5

(c) A Transmission line has distributed parameters R=6 Ohms / km, L = 2.2 mH/km C=0.005 μF /km & G = 0.005 μ mho/km 5
Determine characteristics impedance and propagation constant at 1KHz frequency.

4 (a) Find ABCD parameters for the two port Network shown in fig 4 (a). 10

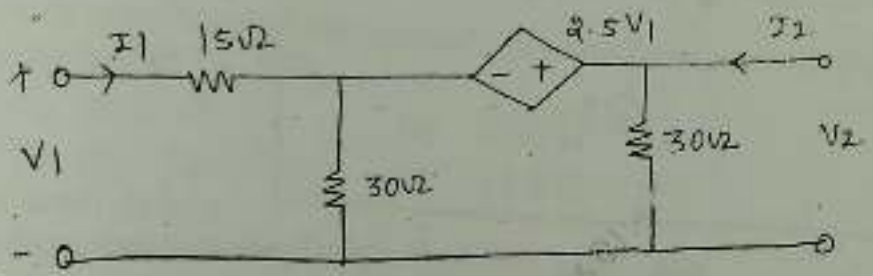


Fig 4 (a)

(b) Find the Network functions $\frac{V_1}{I_1}, \frac{V_2}{I_1}, \frac{V_2}{V_1}$ for the network shown in fig 4 (b) 5

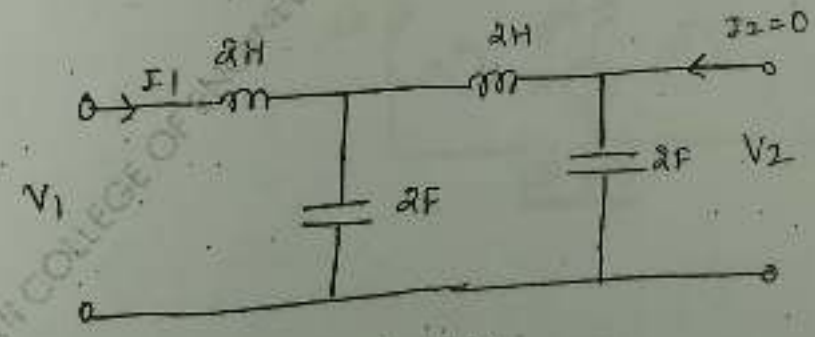


Fig 4(b)

[TURN OVER]

(c) A Transmission line has a characteristics impedance of $50+j\,100\,\Omega$ and is terminated in a load impedance of $73-j\,42.5\,\Omega$ Calculate 5

(a) The reflection coefficient.

(b) The standing wave ratio

5. (a) The Network shown in fig 5 (a), switch K is closed at t = 0, Assume all initial conditions as zero. Find i, $\frac{di}{dt}$ & $\frac{d^2i}{dt^2}$ at $t = 0^+$ 10

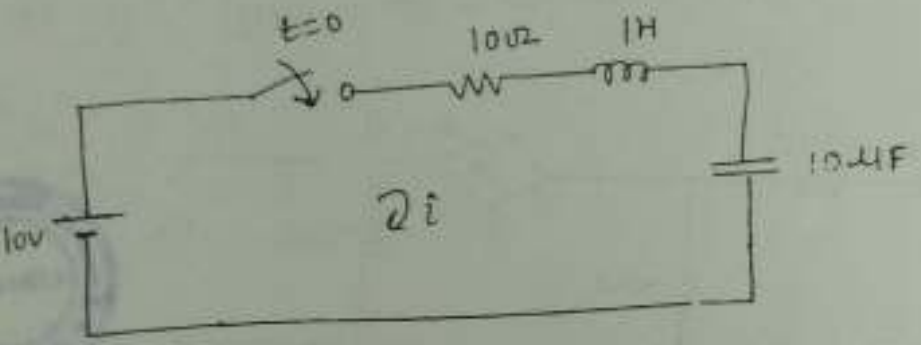


Fig 5(a)

(b) Write the KVL equations in standard form for the N/W shown in fig 5(b) 5

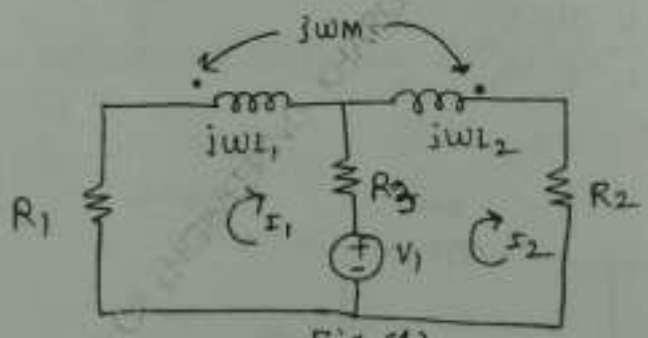


Fig 5(b)

5

(c) Find poles and zero of the Impedance Z(s) for the Network Shown in fig 5 (c) 5

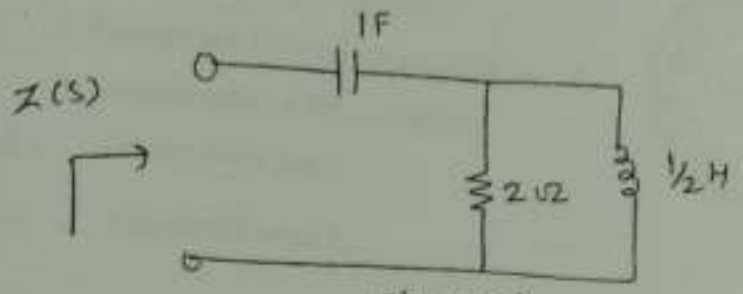


Fig 5(c)

6. (a) Why is the Impedance matching required? Draw the following normalized quantities on the smith chart. 10

(i) (3+i3) Ω (ii) (1.0) Ω

(iii) (2-j1) Ω (i) j 1.0 Ω

(b) Write short note on : 5

Time domain analysis using Laplace Transform.

(c) Define the following terms 5

(i) Phase Velocity

(ii) Characteristic impedance

(iii) Reflection coefficients

SE Sem III, EXTC (old) EN

May-June-16

29/06/2016

Sub:- EN

EXTC

QP Code : 28859

(OLD COURSE)

(3 Hours) [Total Marks: 100]

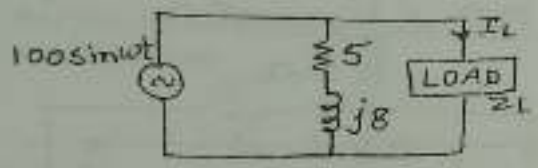
NB: 1. Question no. 1 is compulsory.

2. Attempt any four out of remaining six.

3. Assume suitable data if required.

Q.1 Attempt any four- (20)

(a) Calculate current I_L

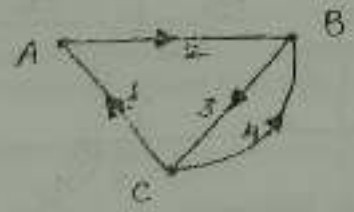


(b) The Z parameters of two port networks are $Z_{11}=5\Omega$, $Z_{22}=7\Omega$, $Z_{12}=Z_{21}=3\Omega$, calculate ABCD parameters.

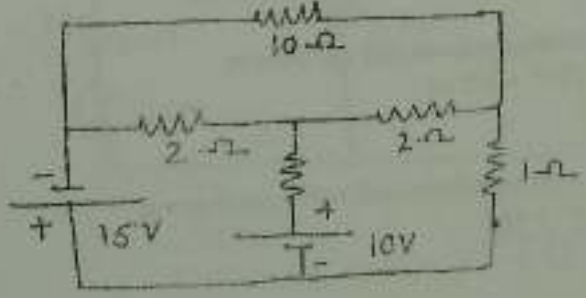
(c) Determine current through 10Ω resistance.

(d) Draw pole-zero plot for the function $F(s) = \frac{5(s+4)}{(s^2+6s+9)(s^2+64)}$

(e) How many trees are possible for the given graph

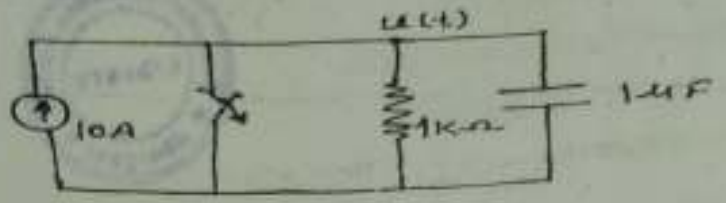


Q.2(a) Find current through 1Ω resistor (10)

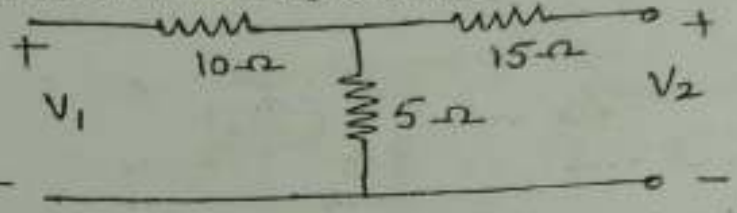


PTO

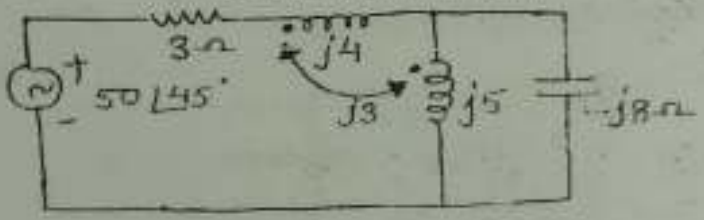
Q.2(b) In the given network switch is open at t=0, determine $v(t)$, $\frac{dv(t)}{dt}$, $\frac{d^2v(t)}{dt}$ at $t=0^+$. (10)



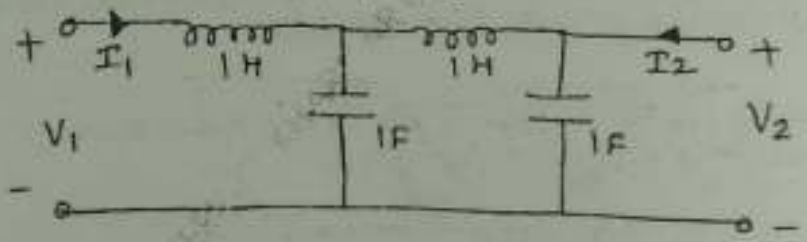
Q.3(a) Find the Y parameters of the given network. (10)



(b) Find the current through 3Ω using mesh analysis. (10)



Q.4(a) Find the network function $\frac{V_1}{I_1}$, $\frac{V_2}{I_1}$ and $\frac{V_1}{V_2}$ for the given network. (10)



(b) Check the positive realness of the following function and give reason (05)

$$Y(S) = \frac{S^3 + 5S}{S^4 + 2S^2 + 1}$$

(c) Test whether the following polynomials are Hurwitz (05)

$S^5 + 8S^4 + 24S^3 + 28S^2 + 23S + 1$

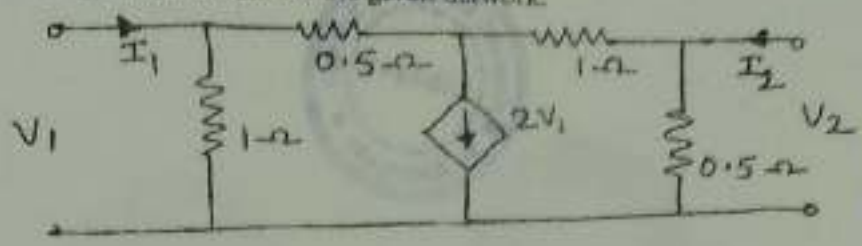
$S^3 + 2S^2 + S$

Q.5(a) Realize the driving point impedance in Foster I and Foster II (10)

$$Z(S) = \frac{3(S^2+1)(S^2+49)}{(S^2+9)}$$

P.T.O.

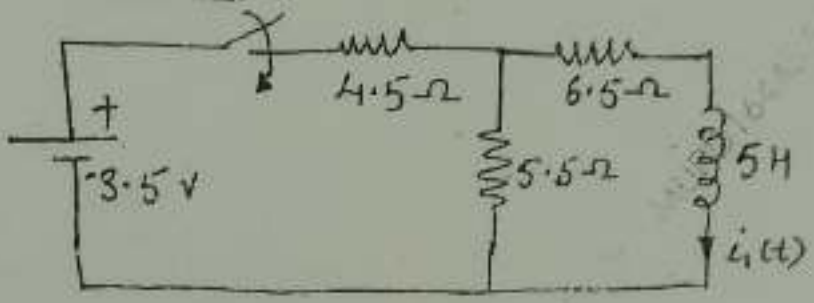
(b) Determine Z parameters for the given network. (10)



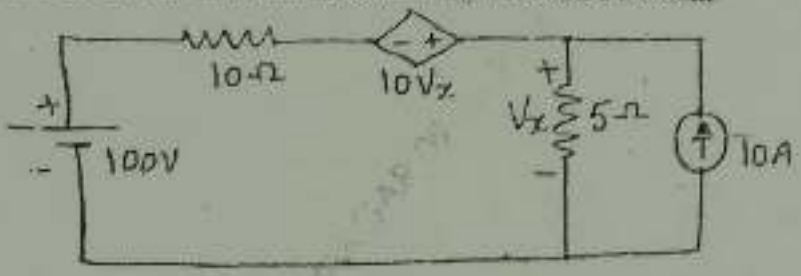
Q.6(a) Draw the Bode plot for the given Transfer Function. (10)

$$G(S)H(S) = \frac{10(S+1)}{S(1+0.02S)(1+0.2S)}$$

(b) For the given network calculate $i_1(t)$ when switch S closed at t=0. Consider zero initial conditions. (10)



Q.7(a) Find the current in 10 ohm resistor using Thevenin's theorem. (10)



(b) For the given network write Tie-set matrix and obtain the network equilibrium equation in matrix form using KVL. (10)