S.E Extc (Core) (CBGS).
Ckts & Tx. lines.

2/12/14

QP Code :14684

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

N.B. : (1) Attempt Ql and any 3 from the 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.
(3) Assume suitable data, if missing, with justification.

---

1. (a) Prove that $F(s) = (s + \alpha)$, where a is a non-zero positive integer, is Hurwitz. Hence show that the polynomial $P(s) = (s + 6)^2 (s + 4)^6$ is also Hurwitz. **5**
   (b) State and prove Initial Value Theorem. **5**
   (c) Determine the ABCD parameters of the network shown in Fig. 1(c) considering the network as a cascade of two sub-networks. **5**

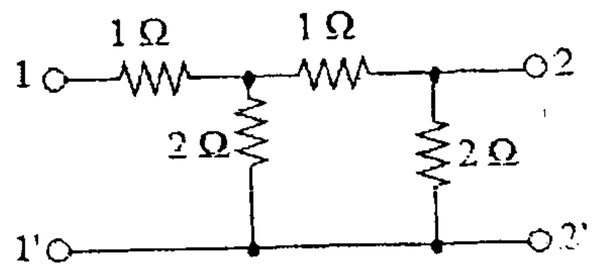


Fig. 1(c)

   (d) Find Foster I and II, and Cauer I and II circuits for the driving point admittance $Y(s) = \frac{s^2 + 1}{s}$ Comment on your result. **5**

2. (a) Find the value of the variable resistance R in the circuit shown in Fig. 2(a) such that the power delivered to the load resistance $R_L = 2$ ohm is maximum. **10**

   Evaluate the maximum value of the power.

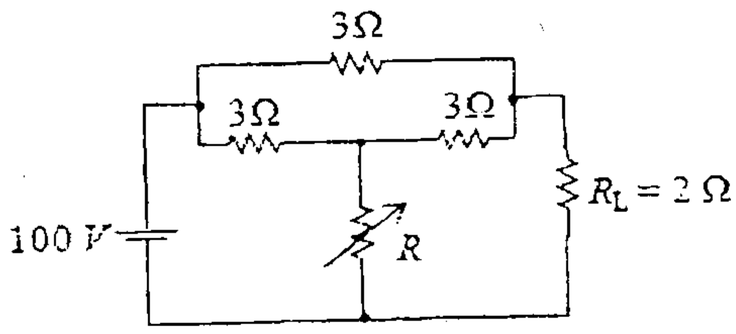


Fig 2(a)

(b) Two identical 2-port networks are connected in cascade. If the y-parameters of each network are $y_{11} = -y_{12} = -y_{21} = y_{22} = 10$ mho determine the y-parameters of the composite network. 5

(c) In the circuit shown in Fig. 2(c) find V_x. 5

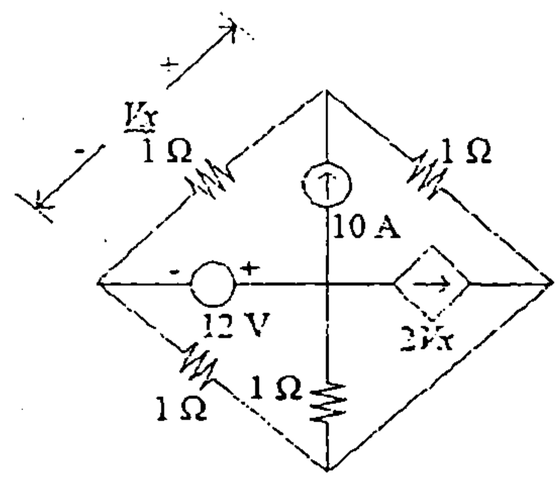


Fig 2(c)

3. (a) Test if $Z(s) = \dfrac{(s+1)(s+9)}{s(s+4)}$ represents a driving point impedance of an RL, RC or LC circuit. 10

Sketch $Z(\sigma)$ or $Z(\omega)$ curves whichever is applicable.

Find Foster II canonic circuit for the function.

(b) State and prove Final Value Theorem 5

(c) The parameters of a transmission line are: 0.25 μ mho/km, 6 Ω /km, 2.2. mH/km, 005 μF/km. Find the characteristic impedance Z_0 and propagation constant γ at 1 kHz. 5

4. (a) Derive an expression for current I in the circuit shown in Fig 4(a) under the condition $\omega^2 LC = 0.5$ where ω is the radian frequency of the ac voltage V. Hence show that $|I|$ is independent of the impedance Z_R. 10

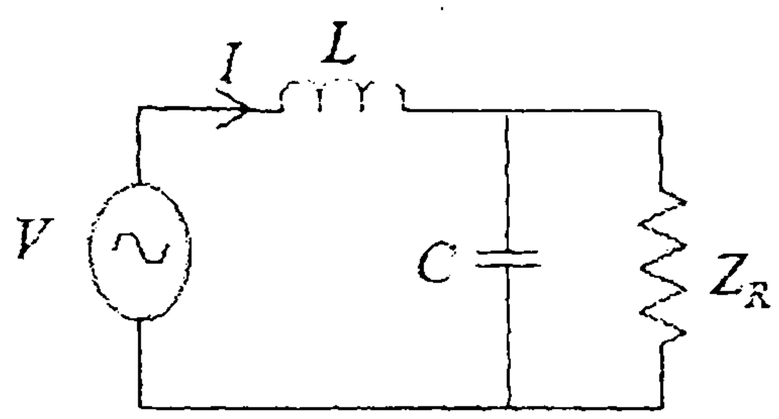


Fig 4 (a)

(b) Test if $F(s) = \dfrac{s^3 + 10s^2 + 27s + 18}{(s+1)(s+3)(s+5)}$ is a Positive Real Function. Realize the function as driving point impedance in Foster I form. 5

TURN OVER

(c) Determine V_2 for the network shown in Fig. 4(c) when $L = CR^2$ and V_1 is a pulse of height 10 V and width 1 s. **5**

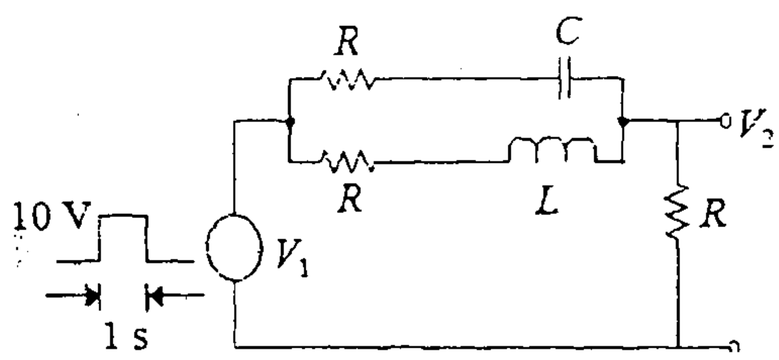


Fig 4 (c)

5. (a) A unit step voltage is applied to a circuit consisting of only passive elements (each has numerical value 1). The current supplied by the source is exponentially decreasing as shown in Fig. 5(a). Find the circuit with the minimum number of elements possible. **10**

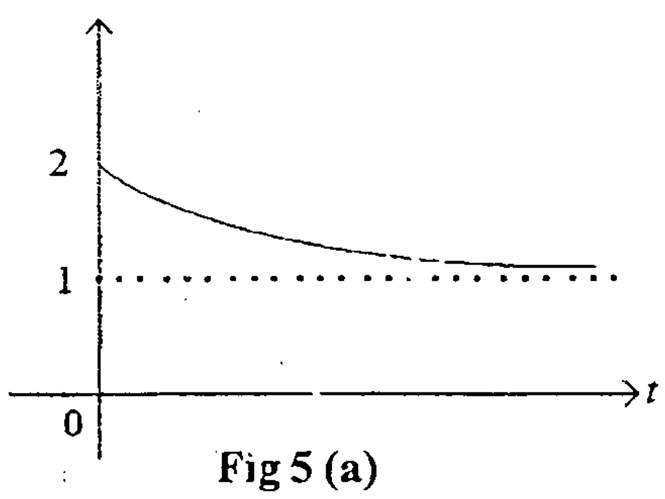


Fig 5 (a)

(b) Define and give the significance of the following . **5**

(i) Characteristic impedance

(ii) Propagation constant

(iii) Reflection coefficient

(c) State the conditions for a reciproca 2-port network in terms of *y*-parameters and then convert it in terms of ABCD parameters. **5**

6. (a) Write a brief note on Smith chart under the following heads. **10**

(i) VSWR circles

(ii) Characteristics

(iii) Applications

A lossless 75 Ω transmission line is terminated by an impedance of $150 + j150$ Ω. Using Smith chart determine the following.

(i) VSWR

(ii) reflection coefficient

(b) Find Thevenin resistance of the circuit shown in Fig. 6(b) across the terminals AB. 5

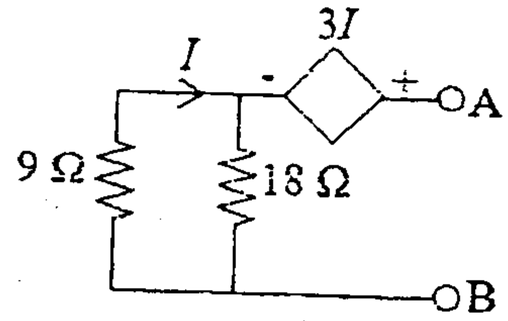


Fig. 6(b)

(c) Determine the Laplace transform of $v_1(t)$ shown in Fig. 6(c)(i). Hence find the Laplace transform of $v_2(t)$ shown in Fig. 6(c) (ii). 5

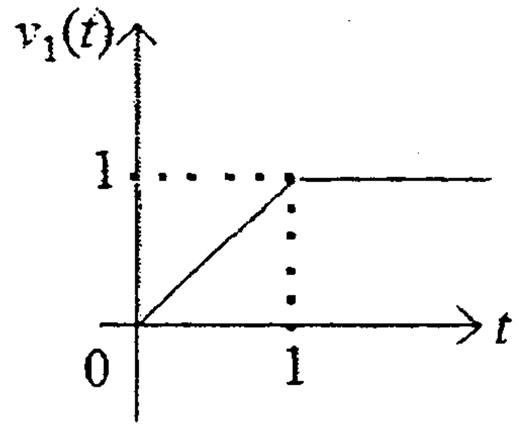


Fig. 6(c) (i)

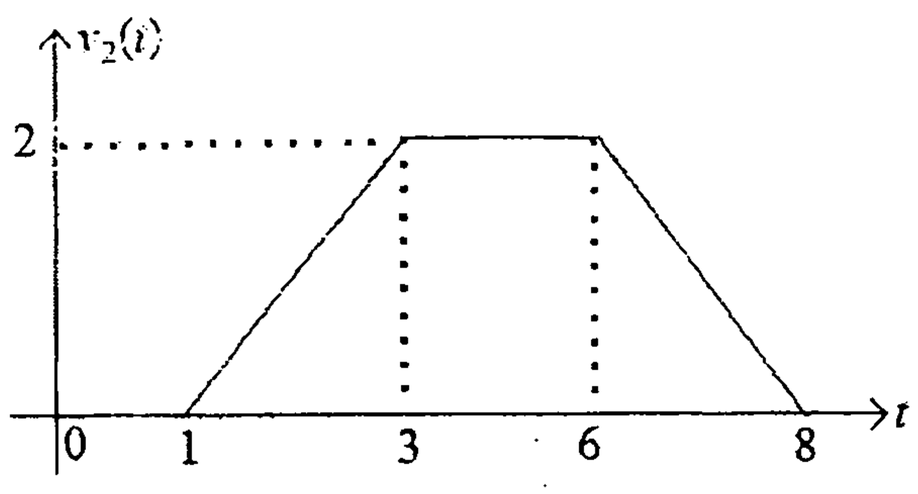


Fig. 6(c) (ii)

S.E. EXTC Sem 3 (CBGS). 8/12/14.
EI & Measurements.

QP Code :14653

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

N.B. :(1) Attempt **four** questions, question no. **1** is **compulsory**.
(2) Assume suitable **data** where ever **required**.
(3) Answers to the questions should be grouped **together**.
(4) **Figure** to the **right** of question indicates **full** marks.

1. Attempt any **five** : – **20**
   (a) Why wave analyzer is known as frequency selective voltmeter?
   (b) Define accuracy, precision and sensitivity with suitable example.
   (c) General specifications of Digital Multi-meter.
   (d) List various sensors for pressure and temperature along with their ranges.
   (e) List name of bridges for RLC measurement with proper classification.
   (f) Significance of three and half digit display.

2. (a) Explain working of strain gauge and draw the expression for gauge factor. **10**
   (b) Draw neat block diagram of CRO and explain its functioning, comment on role of sweep in CRO. **10**

3. (a) Draw and explain Weighted resistor network type DAC for 3 bits input taking suitable example. **10**
   (b) Explain Kevin's double bridge and its application in very low resistance measurement. **10**

4. (a) Explain dual slop integration type ADC with the help of block diagram and comment on its speed. **10**
   (b) Explain LVDT and define its application in displacement measurement. **10**

5. (a) Explain Hetrodyne type wave analyser and its applications. **10**
   (b) Discuss DSO with the help of block diagram along with various modes of operation. Also explain its applications. **10**

6. (a) Draw and discuss Maxwell Bridge and its application for measurement of inductance. **10**
   (b) Define Q factor and explain working of a Q meter for Q factor measurement. **10**

GN-Con.:10243-14.

SE EXTC III CBGS Nov-Dec 2014 Digital Electronics

QP Code :14614

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

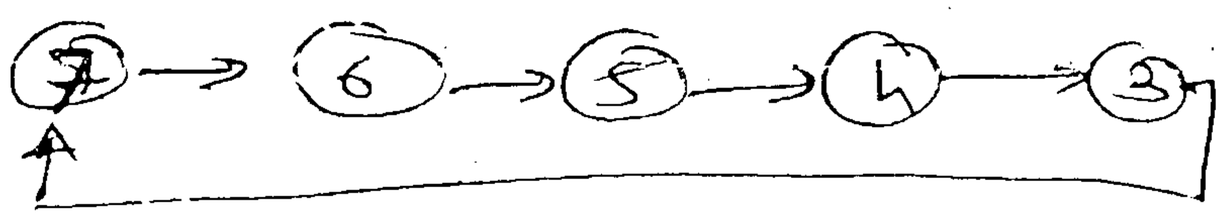
N.B. : (1) Question no **1 is compulsory.**
(2) Out of remaining questions, attempt any **three** questions.
(3) **Assume** suitable additional data if required.
(4) Fig. in brackets on **right** hand side indicates **full** marks.

1. (a) Compare Moore and Mealy machines models. **5**
(b) Design a 4:1 multiplexer using only NAND gates. **5**
(c) Write a VHDL code for full adder. **5**
(d) Convert SR F/F to D F/F. **5**

2. (a) Implement the following Boolean function with 8:1 multiplexer. **10**
$F(A,B,C,D) = \pi\, m(0,3,5,6,8,9,10,12,14)$
(b) State truth table of 3 bit Gray to Binary conversion then design it using 3:8 decoder and additional gates. **10**

3. (a) Use the quine-Mc-Cluskey method of minimization and find the expression for the function. **10**
$F(A,B,C,D) = \sum m\,(0,1,2,3,5,7,8,9,11,14)$
(b) Define the following in terms of Logic families **10**
(i) Propagation delay
(ii) Fanout
(iii) Power Dissipation
(iv) Figures of Merit
(v) Noise margin

4. (a) Design ripple counter using JK flip flop for the state. **10**



(b) (i) Give the advantage and disadvantage of CMOS family. **10**
(ii) Implement a full-subtractor using two-Half-Subtractors.

5. (a) Design an even parity generator with 3 data bits. **10**
(b) Explain any one shift register in detail. **10**

6. (a) Draw and explain the block diagram of architecture of XC9500 CPLD family. **10**
(b) Explain Johnson counter or twisted ring counter. **10**

GN-Con.:9129-14.

S.E. EXTC – Sem 3 (CBGS). 20/11/14.

AE–I

(Analog Electronics-I).

QP Code : 14553

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

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

1. Attempt any **five** :— **20**

(a) The PNP transistor shown in Fig la has β=50. Find the value of Rc to obtain Vc = +5V. What happens if transistor is replaced with another transistor having β=100.

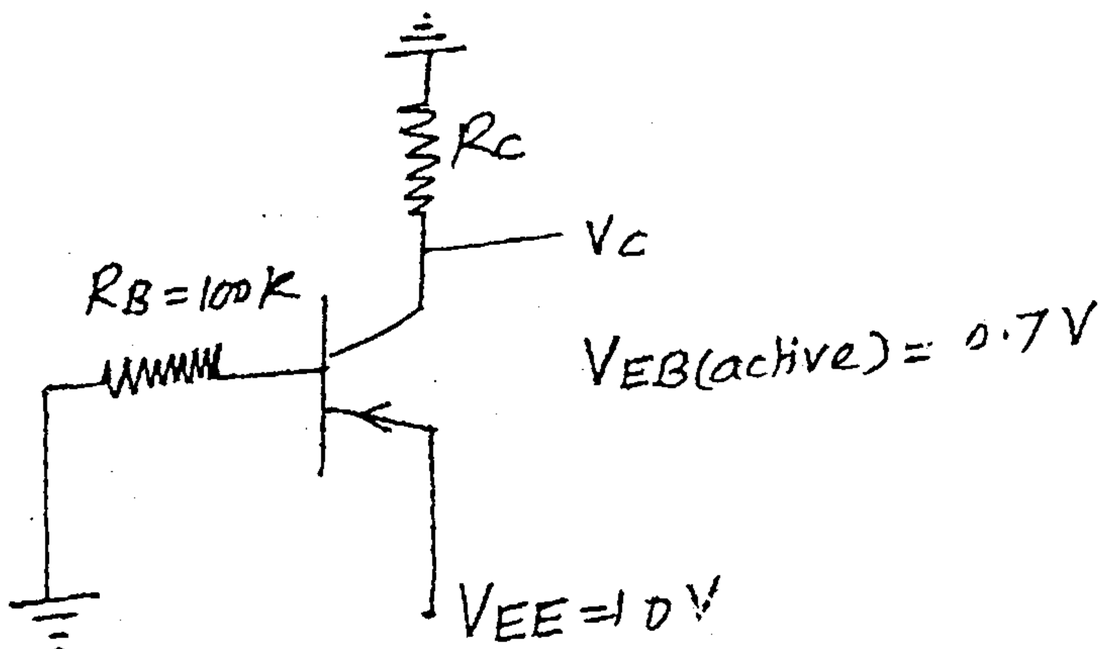


Fig 1a.

(b) Draw small signal model of JFET and explain significance of each parameter.
(c) Why common collector amplifier is used as buffer. Why buffers are required.
(d) Write down current equation of diode and explain significance of each parameters.
(e) For the circuit shown in Fig le. Find I_{DS} and V_{DS} if V_{RS}=1.5 V.

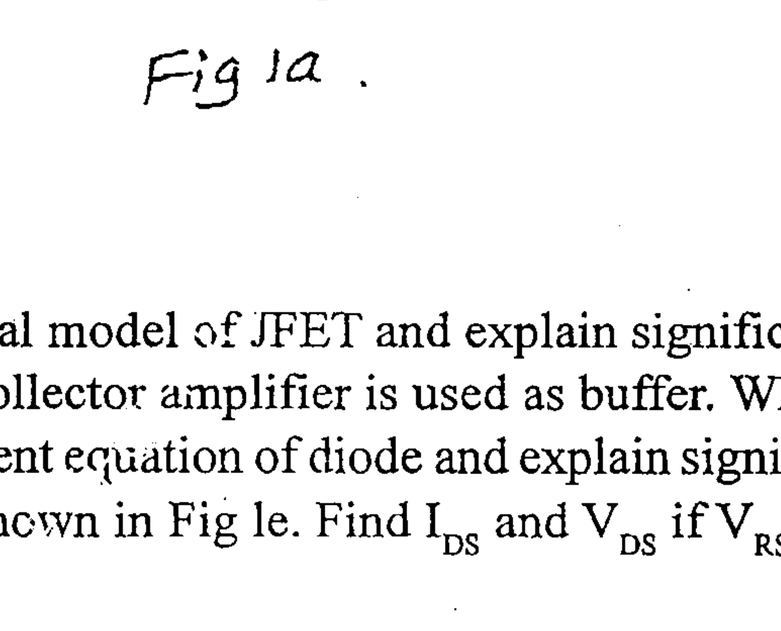


Fig 1e.

(f) Compare Collpit's and Clapp's oscillator.

2. (a) Explain working of n-channel EMOSFET with the help output characteristics, showing clearly effect of channel length modulation. Given equation of drain current in linear and saturation current along with conditions. **10**

(b) Design JFET circuit with voltage divider biasing as shown in Fig 2b with JFET parameters I_{DSS}=12mA, V_P= -3.5V and λ=0. Let R_1+R_2=100K, I_{DSQ} = 5mA and V_{DSQ}=5V. **10**

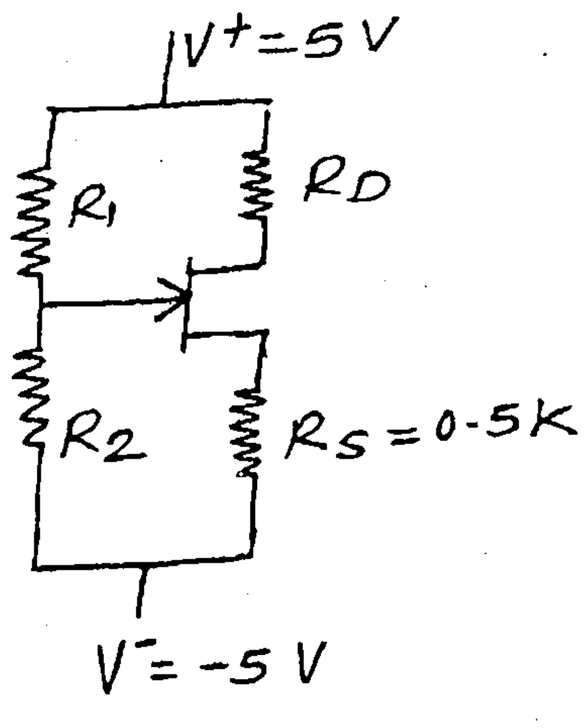


Fig 2b

3. (a) Draw circuit diagram of common emitter amplifier with voltage divider bias with bypassed emitter resistance and derive expression for voltage gain, current gain, input resistance, output resistance using hybrid-π model which includes early effect. **10**

(b) In n-channel E-MOSFET **10**

(i) Substrate doping $N_A=10^{16}$ cm^{-3}

(ii) Polysilicon Gae doping $N_D=10^{20}$ cm^{-3}

(iii) Gate oxide thickness tox =0.5 μm

(iv) Oxide positive charge interface density=$4x10^{10}$cm^{-2}

(v) Charge of electron= $1.6x10^{-19}$col

(vi) Permittivity of free space $\epsilon_0=8.85x10^{-14}$ F/cm.

(vii) Dielectric constant of Si=11.9

(viii) Dielectric constant of $Si0_2$ =3.9

Find zero bias threshold voltage (V_{TO})

4. (a) Explain the working of wien-Bridge Oscillator. Derive the expression for frequency of Oscillation and the value of gain required for sustained oscillation. 10

(b) For the circuit shown in Fig 4b, assume β=100. 10

(i) Find thevenin's equivalent voltage V_{TH} and resistance R_{TH} for base circuit.

(ii) Determine I_{CQ} and V_{CEQ}

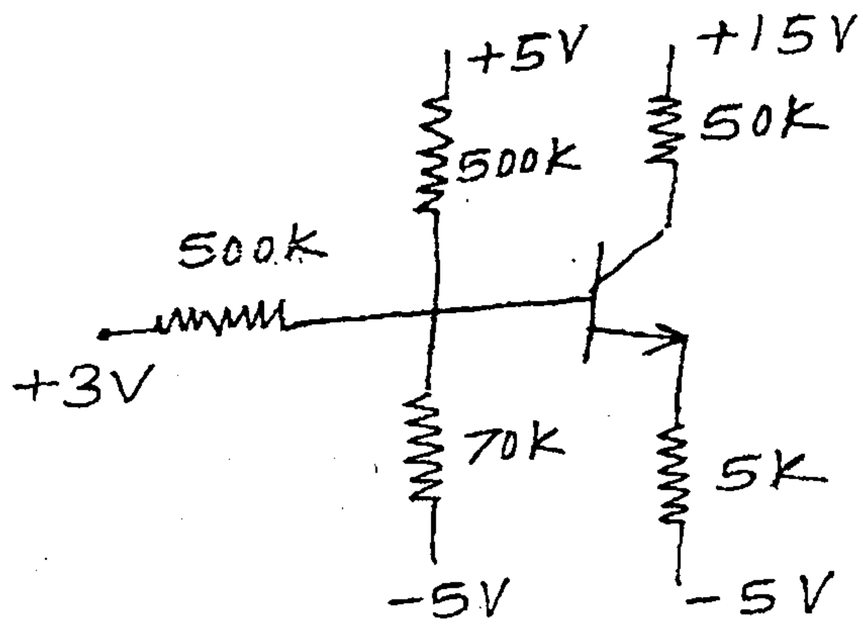


Fig 4b.

5. (a) Draw a required diode clamper circuit to generate the output v_o to from the input v_I as shown in Fig 5a if 10

(i) $V\gamma = 0V$

(ii) $V\gamma = 0.7V$. Where $V\gamma$ is cutin voltage of diode.

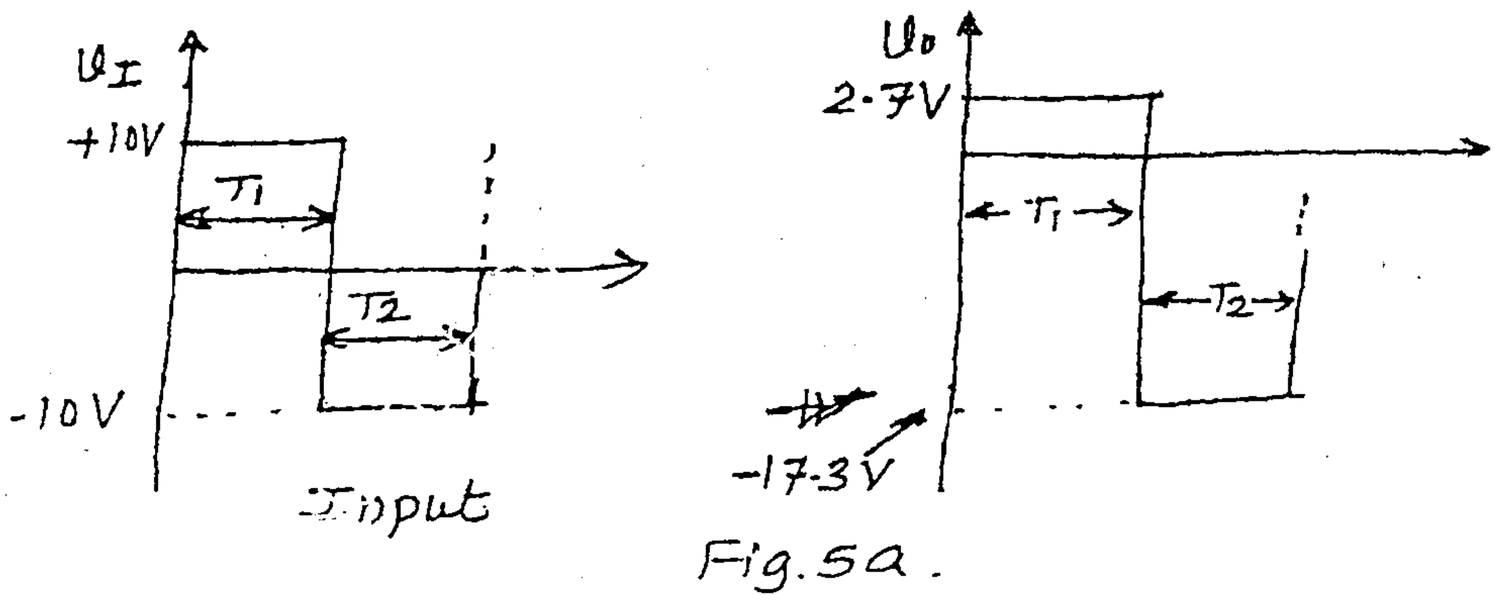


Fig.5a.

(b) What are different biasing techniques used to bias D-MOSFET and E-MOSFET. Explain with the help of appropriate circuit diagrams. **10**

6. Write short notes on any **four** :— **20**
   (i) Hybrid-π model of BJT
   (ii) Twin-T oscillator
   (iii) AC and DC load line.
   (iv) Construction and operation of photodiode.
   (v) MOS capacitor.

S.E. Sem III (CBGS) 26/11/14.
ETRx and EXTC.
App. Maths – III

QP Code : 14571

(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 right indicate full marks.

1. (a) Prove that $f(z)=x^2-y^2+2ixy$ is analytic and find $f'(z)$ 5
(b) Find the Fourier series expansion for $f(x)=|x|,\ in\ (-\pi,\pi)$ 5
(c) Using laplace transform solve the following differential equation with given condition $\frac{d^2y}{dt^2}+y=t,\ given\ that\ y(0)=1\ \&\ y'(0)=0$ 5
(d) If $\overline{A}=\nabla(xy+yz+zx)$, *find* $\nabla\cdot\overline{A}$ *and* $\nabla\times\overline{A}$ 5

2. (a) If $L[J_0(t)]=\frac{1}{\sqrt{s^2+1}}$, prove that $\int_0^\infty e^{-6t}t\,J_0(4t)\,dt=3/500$ 6
(b) Find the directional derivative of $\phi=x^4+y^4+z^4$ *at* $A(1,-2,1)$ in the direction of AB where B *is* $(2,6,-1)$. Also find the maximum directional derivative of ϕ at $(1,-2,1)$. 6
(c) Find the Fourier series expansion for $f(x)=4-x^2$, *in* $(0,2)$
Hence deduce that $\frac{\pi^2}{6}=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}\cdots\cdots$ 8

3. (a) Prove that $J_{1/2}(x)=\sqrt{\frac{2}{\pi x}}\sin x$ 6
(b) Using Green's theorem evaluate $\int_C (2x^2-y^2)\,dx+(x^2+y^2)\,dy$ where 'c' is the boundary of the surface enclosed by the lines $x=0,\ y=0,\ x=2,\ y=2$. 6
(c) i) Find Laplace Transform of $e^{-3t}\int_0^t u\sin 3u\,du$
ii) Find the Laplace transform of $\frac{d}{dt}\left(\frac{1-\cos 2t}{t}\right)$ 8

4. (a) Obtain complex form of Fourier series for the functions $f(x)=\sin ax\ \ in\ \ (-\pi,\pi)$, where a is not an integer. 6
(b) Find the analytic function whose imaginary part is $v=\frac{x}{x^2+y^2}+\cosh y\cdot\cos x$ 6
(c) Find inverse Laplace Transform of following
i) $\log\left(\frac{s^2+a^2}{\sqrt{s+b}}\right)$ ii) $\frac{1}{s^3(s-1)}$ 8

5. (a) Obtain half-range cosine series for $f(x)=x(2-x)\ \ in\ \ 0<x<2$ 6
(b) Prove that $\overline{F}=\frac{\overline{r}}{r^3}$ is both irrotational and solenoidal 6
(c) Show that the function $u=\sin x\cosh y+2\cos x\sinh y+x^2-y^2+4xy$ satisfies

[TURN OVER

Laplace's equation and find it corresponding analytic function 8

6. (a) Evaluate by Stoke's theorem $\int_C (x\,y\,dx + x\,y^2\,dy)$ where C is the square in the xy-plane with vertices $(1,0), (0,1), (-1,0), and\ (0,-1)$ 6

(b) Find the bilinear transformation, which maps the points $z = -1, 1, \infty$ onto the points $w = -i, -1, i$. 6

(c) Show that the general solution of $\frac{d^2y}{dx^2} + 4x^2y = 0$ is

$y = \sqrt{x}\left[A\,J_{1/4}(x^2) + B\,J_{-1/4}(x^2)\right]$ where A and B are constants. 8