UNIVERSITY OF PUNE

[4362]-170B

S.E. (Electronics/E&Tc)

Electronic Circuit and Applications

(2003 Course)

Total No. of Questions: 12 **[Total No. of Printed Pages: 3]**

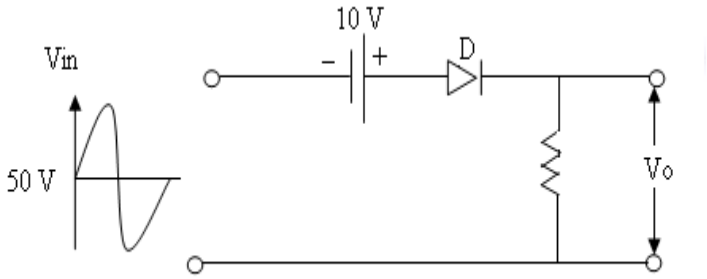
[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

(1) Answer three questions from section-I and three questions from section-II.
(2) Answers to the two sections should be written in separate books.
(3) Neat diagram must be drawn wherever necessary.
(4) Black figures to the right indicate full marks.
(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
(6) Assume suitable data, if necessary.

SECTION-I

Q1. a) Sketch the output for given circuit [6]



b) Draw & explain the CMOS NAND gate [6]
c) Write a short note on clipper & clamper circuit [4]

OR

Q2. a) Draw & explain the Schematic diagram of n-channel enhancement mode MOSFET [6]

b) What is channel length modulation [4]
c) Explain the various circuit models of diode. [6]

Q3. a) Explain the operation of BJT as a relay drive circuit [4]

b) Explain the drive requirement for power MOSFET [6]

c)Determine operating temperature of transistor substrate, the transistor case & heat sink if power BJT carries average current of I_c=1A at average voltage of V_{cE}=10V, Q_{dc}=5°c/w, Q_{sA}=4°c/w, Q_{cs}=1°c/w, T_{air}=25°c [6]

OR

Q4. a) Give the comparision between power MOSFET & power BJT [6]

b) Draw the anti saturation circuit & explain its purpose. [6]

c) Explain second breakdown in power transistor [4]

Q5. a) Compare different types of power amplifier based on following factors [8]

i) Conduction angle ii) Position of point

iii) Efficiency iv) Distortion

b) Give the reason why it is necessary to use heat sink for power transistor [2]

c) A complementary push pull amplifier has capacitive coupled load R_L=8Ω, supply voltage ±12v calculate, [8]

i) Pac max ii) P_d of each transistor

iii) Efficiency

OR

Q6. a) Derive the expression for efficiency of class a power Amplifier with

i) Resistive load ii) Transformer coupled load [8]

b) What is cross over distortion? Explain [2]

c) A sinusoidal signal V_s=1.75 sin (600t) is fed to power amplifier. The resulting output current is,

I_o=15 sin 600t+1.5 sin 1200t+1.2 sin 800t+0.5 sin 2400t

Calculate percentage increase in power due to distortion [8]

SECTION-II

Q7. a) Explain behavioural of transistor at high frequency using T-model [8]

b) Explain single stage tunned amplifier with their advantages & disadvantages. [8]

OR

Q8. a) A FET having g_m=6 mA/V has tuned anode load consisting of 400mH inductance of 5Ω in parallel with capacitor of 3000PF. Find,

i) Resonant frequency ii)Signal BW
ii) Tuned circuit dynamic resistance [8]

b) Draw hybrid Л model for BJT in CE amplifier configuration. Explain significance of each component appearing in this model [8]

Q9. a) Derive the expression for output resistance with feedback & show that due to negative feedback the output resistance reduces for voltage series feedback amplifier [8]

b) Explain miller crystal oscillator, their advantages, disadvantages & application [8]

OR

Q10. a) Write a short note on [8]

i) Current shunt feedback
ii) Voltage series feedback

b) What is the frequency of oscillation of colpift's oscillator using C_1=0.001uf, C_2=0.01uf while L=0.15uH? How much gain does FET need to start the oscillation. [8]

Q11. a) Explain the block diagram of three terminal regulator. Define load regulation & line regulation [8]

b) Draw circuit diagram for transistorised series feedback regulator. Derive expression for output voltage. [8]

c) Write down features of three terminal voltage regulator [2]

OR

Q12. a) Design BJT series regulator circuit to provide output voltage of 12v with maximum load current of 800mA. The variation of input voltage is between 18v & 24v [8]

b) Compare shunt regulator with series regulator [4]

a) Draw the circuit diagram & explain working of fold back current limiting [6]

UNIVERSITY OF PUNE

[4362]-161A

S.E.(Electronics/ E&TC) Examination-2013

SIGNALS & SYSTEM

(2012 Pattern)

[Total No. Of Questions: 6] **[Total No. Of Printed Pages: 2]**

[Time: 2 Hours] **[Max. Marks: 50]**

Instructions:

(1) Attempt Q.1 or Q.2, Q.3 or Q,4., Q,5.or Q.6
(2) Black figures to the right indicate full marks.
(3) Neat diagrams must be drawn wherever necessary.
(4) Assume suitable data, if necessary.

Q. 1. a i) Explain Unit Step function and Ramp Function. What is the relation between them? (3)

ii) Classify the following system (6)

$$\frac{d^3y(t)}{dt^3} + 4\frac{d^2y(t)}{dt^2} + 8\frac{dy(t)}{dt} + y^2(t) = x(t)$$

Q.1. b.) Perform the following convolution graphically $x(t)=e^{-at}$ and $h(t)=u(t)$ (9)

OR

Q.2. a.i) Classify the signals as periodic/aperiodic and find their Fundamental period (4)

a) $x(t)=\cos t + \sin \pi t$ b) $x(t)=e^{-j10t}+e^{j15t}$

ii) Find energy and power of the following signals and state its type (5)

a) $x(t)=e^{-10t}u(t)$ b) $x(t)=tu(t)$

Q. 2.B. i) State and prove the properties of convolution. (5)

ii) Find the step response if the impulse responses are (4)

a) $\delta(n-2) + \delta(n-3)$ b) $(-a)^n u(n)$

Q. 3. a. i) State the dirichlets conditions. (3)

ii) Find the Fourier series coefficients (a_n and b_n) for the continuous time periodic signal (5)

$X(t) = 1.5$ for $0 \leq t \leq 1$

$= -1.5$ for $1 \leq t \leq 2$

With the fundamental frequency $\Omega_0 = \pi$

Q. 3.b) Find the Laplace transform of the following function (8)

1. $f(t) = t^2 e^{-2t} u(t)$
2. $f(t) = \delta(at+b)$
3. $f(t) = t \sin(at)\, u(t)$
4. $f(t) = e^{-5t}[u(t)-u(t-5)]$

OR

Q.4. a) Derive the Fourier Transform of the following signals (8)

a. sgn(t)

b. delta function

c. unit Step function

d. $\sin(\Omega_0 t)$

Q.4.b. i) State initial value and final value theorem with respect to Laplace transform. (4)

ii) Find the Laplace transform of the signal and its ROC (4)

$x(t) = e^{-3t} u(t) + e^{-2t} u(t)$

Q. 5.a.) Derive the Relation between Auto Correlation function and Energy/ (8)

Power spectral density function

b) Explain the following Probability models (8)

a) Gaussian distribution b) Uniform distribution

OR

Q. 6. a. i) Find autocorrelation of the $x(n)=\{1,2,3,4\}$ (4)

ii) Derive the equation for Parseval's theorem (4)

b. i) Define CDF and PDF (3)

ii) State the properties of autocorrelation and cross correlation function (5)

S.E. (E&TC/Electronics)
Examination - 2013
(June 2008 Pattern)
Digital Logic Design

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(1) Answers to the 03 ***section should be written in separate answer books.***
(2) Figures to the right indicate full marks.
(3)Neat diagrams must be drawn whenever necessary.
(4) In section I: Attempt Q1or 2, Q3 or 4, Q5 or 6.
(5) In section II: Attempt Q7 or 8, Q9 or 10, Q11 or 12.

Section I

Q1. (a) Design 4 bit Excess-3 to BCD code converter and implement using logic gates. (10)

(b) Design 4 bit BCD adder using binary adder ICs. (08)

OR

Q2. (a) Minimize the following equation using K-map and realize it using NAND gates only. (10)

$Y=\Sigma\, m(0,1,2,3,5,7,8,9,11,14)$

(b) Design and implement the following function using 8: 1 MUX.

$Y=\Sigma\, m(4,5,8,9,11,12,13,15)$

(08)

Q3. (a) Draw and explain SR flip-flop using NAND gates. (08)

(b) Convert D to T flip-flop and vice versa. (08)

OR

Q4. (a) Design and implement the following counter-states using JK flip-flop and avoid the lockout condition: (08)

0-2-4-6-7-0.

(b) Design MOD 5 asynchronous counter, and also draw the waveforms and mention significance of glitch. (08)

Q5 (a) Write a VHDL code for 4:1 multiplexer using behavioral modeling style (8)

(b) Explain the following statements used in VHDL with suitable examples:

i) Process

ii) Case

iii) if else

iv) with select. (08)

OR

Q6 (a) Write a VHDL code for active high 3:8 decoder, (08)

(b) Write a short note on single and variable in VHDL. (04)

(c) Explain the difference between concurrent statement and sequential statement in VHDL. (04)

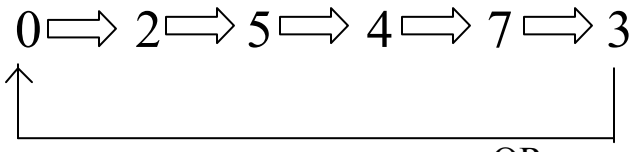
Section II

Q7. (a) Draw ASM chart for a 2 bit up- down counter having mode control input M.

M= 1Up counter.

M= 0 Down center. (08)

(b) Design synchronous counter which will go through the following steps JK FF: (10)



OR

Q8. (a) Design a sequential circuit using Mealy machine for detecting the sequence….1001…. (10)

Use JK Flip-flop.

(b) Explain in short: (08)

i) State table

ii) State Diagram

iii) State Assignment

iv) ASM chart.

Q9. (a) Write a short note on classification of logic families in detail. (08)

(b) State the following characteristics of digital IC's (TTL). (08)

i) Speed of operation.

ii) Fan in fan out

iii) Noise Margin

iv) Voltage parameter

OR

Q10. (a) Draw and explain two input totem pole output TTL NAND gate. (08)

(b) Draw CMOS circuit for NAND gate and NOR gate. (08)

Q11. (a) Design a BCD to excess-3 code converter and implement it using PAL (8)

(b) Draw circuit of one cell of static and dynamic RAM and explain its working (8)

OR

Q12. (a) Design 2K ×8 memory using 1K×8 memory. (08)

(b) Distinguish between volatile and non-volatile memories. (04)

(c) Write a short note on EPROM. (04)

Total No. of Questions : 6 **[Total No. of Printed Pages :2]**

SE (E& TC)

Examination - 2013

ELECTROMAGNETICS

(2008 Pattern)

[Time : 2 Hours] **[Max. Marks : 50]**

(1)Attempt Q1or Q2, Q3 orQ4, Q5 or Q6
(2) Answers all questions in same answer book
(3)Figures to the right indicate full marks.
(4)Use of logarithmic tables, slide rule, electronic pocket calculator and steam tables is allowed
(5) Neat diagrams must be drawn whenever necessary.
(6)Assume suitable data, if necessary.

Q1. (a) Find Electric field intensity (E) at origin if the following charge distributions are present in the free space:

i) Point charge 12 nC at P(2,0,6),

ii) Uniform line charge density 3 nC/m at x=-2, y=3. (8)

iii) Uniform surface charge density 0.2 nC/m² at x=2.

(b) State and prove Gauss law. (8)

OR

Q2 (a) State and prove divergence theorem. (8)

(b) An electric dipole located at the origin in the free space has a moment $p=3a_x- 2a_y+a_z nCm$

i) Find V at (2,3,4)

ii) Find V at $\Upsilon=2.5$, $\theta=30^\circ$, $\phi=40^\circ$ (8)

Q3. (a) Obtain the expression for H at the center of a circular conductor carrying current I using Biot-savart law. (8)

(b) Drive the boundary condition for electric field at an interface between

conductor & free face in terms of both electric field intensity and electric flux density. (8)

OR

Q4. (a) Obtain the H (magnetic field intensity)due to infinite long straight conductor, carrying current I at any point P(r,Q,ϕ). Using ampere's circuit law. (8)

(b) Let the permittivity be 5μH/m in region A where x<0& 20μH/m in the region A where x>0. If there is surface current density K=150 a_y-200a_z A/m at x=0 & if H_A= 300a_x-400a_y+500a_z A/m. Find

i) $|H_{tA}|$ ii)$|H_{NA}|$ iii) $|H_{tB}|$ iv) $|H_{NB}|$ (8)

Q5. (a) State the Maxwell's equation in point form for static electric & steady magnetic fields. Explain how these are modified for time varying fields. (10)

(b) let $\mu=10^{-5}$ H/m $\varepsilon=4\times10^{-9}$ F/m $\sigma=0\rho v=0$ Find K (including units) so that each of the following pairs of field Satisfies Maxwell's equations.

1) $D=6a_x-2ya_y=2za_z$ nC/m^2
   $H=K_x\ a_x=10_y\ a_y-25z\ a_z$ A/m
2) $E=(20y-kt)a_x$ V/m
   $H=(y+2x10^6t)$A/m (8)

OR

Q6. (a) Write short notes on (any one):

i) Finite Difference method.
ii) Method of moments. (8)

(b) In a non magnetic material ($\varepsilon_r\neq,\mu=\mu_0,\sigma=0$)

i) Find E using Maxwell equations.
ii) find pointing vector.
iii) find time average power crossing the surface x=1, 0<y<2, 0<z<3 given $H=30\cos(2\pi*10^8t-6x)\ a_y$ mA/m.

UNIVERSITY OF PUNE

[4362]-161

S. E. (E&TC/ Electronics) Examination May 2013

Signals and Systems (204181)

(2008 Pattern)

[Total No. of Questions:12] **[Total No. Printed Pages: 5]**

[Time : 3 Hours] **[Max. Marks:100]**

Instructions :

*(1) Answer **any three** questions from each section.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator and steam tables is allowed.

(6) Assume suitable data, if necessary.

SECTION-I

Q.1 a) The Trapezoidal signal x(t) is defined by

$$x(t) = \begin{cases} 5 - t & 4 \le t \le 5 \\ 1 & -4 \le t \le 4 \\ t + 5 & -5 \le t \le -4 \\ 0 & \text{otherwise} \end{cases}$$

i. Draw the signal x(t) [2]

ii. Sketch the signal x(t-1) [3]

iii. Sketch the signal x(2t+1) [3]

iv. Determine the total energy of x(t) [5]

v. If $y(t) = \frac{d}{dt}x(t)$, determine the total energy of y(t) [5]

OR

Q.2 a) If x[n] = { 3, 2,1 ,0, 1, 2,3} , y[n] = { -1,-1,-1,-1, 0, 1,1,1,1} Sketch the [8]
↑ ↑

following

i) x[n+2] y[6-n] ii) x[3n-1]

b) For each of the following systems , determine what are the [10]

corresponding system is i) causal ii) memory less

iii) Stable iv) Time Invariant

i) $y[n] = \frac{\sin[x(n)]}{x(n)}$ ii) $y(t) = \int_{-\infty}^{t} x(\lambda) d\lambda$

iii) $\frac{d^2y(t)}{dt^2} + \frac{d(yt)}{dt} = x(t)$ iv) $y(t) = e^{tx(t)}$

Q. 3) Complete the convolution integral by graphical method for [16]

$x(t) = t \quad 0 \leq t \leq 3$

$0 \quad$ 0therwise

$h(t) = A \quad 0 \leq t \leq 2$

$0 \quad$ otherwise

OR

Q.4 a) The convolution of x [n] and h[n] where $x[n] = \left(\frac{1}{2}\right)^n u[n]$ [8]

and $h[n] = \left(\frac{1}{4}\right)^n u[n]$

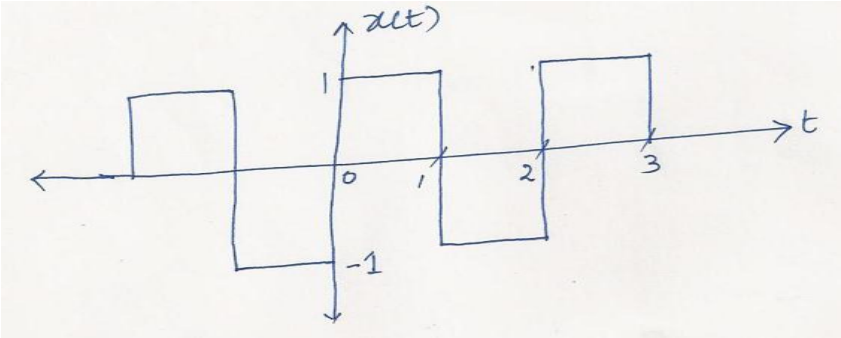
b) Consider a two LIT systems cascaded together. Find the impulse [8]

response of the total system if the impulse response of two systems are

i) $h_1(t) = h_2(t) = \delta(t)$

ii) $h_1(t) = h_2(t) = u(t-2) - u(t-4)$

Q.5) Find the trigonometric Fourier series and plot the magnitude and phase spectrum for the periodic signal x (t) given as [16]



OR

Q.6) Find the Fourier transform of the following : [16]

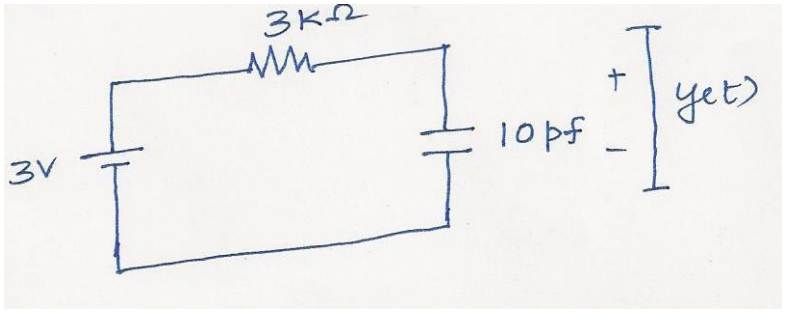
i) $x(t) = 2\,[u(t) - u(t-4)]$

ii) $x(t) = e^{-at}\,u(t)$

iii) $x(t) = \text{sgn}(t)$

SECTION –II

Q.7 a) For the RC circuit shown in Fig. Find y (t) voltage capacitor across capacitor using Laplace transform. Assume all initial conditions to be zero. [8]

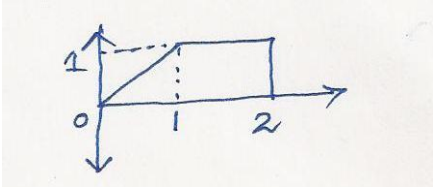


b) Find the Laplace transform of $x(t) = \sin w_0 t\, u(t)$ [8]

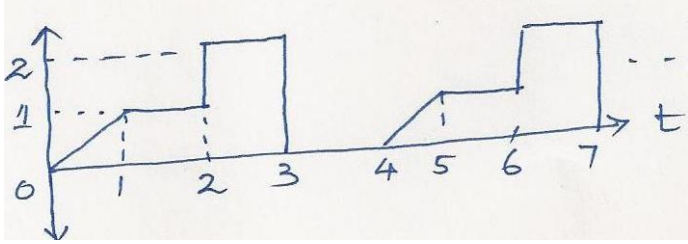
OR

Q.8) Find the Laplace transform of the following signals.

i) [6]



ii) [10]



Q.9 a) Find the cross correlation between the two describe signal given by [8]

$$x_1[n] = \{3, 2, 1, \underset{\uparrow}{0}, 1, 2, 3\}$$

$$x_2[n] = \{1, 2, 3, 0, 3, 2, 1\}$$

b) Find the cross correlation between the signals [10]

$x(t) = u(t) - u(t-1)$; $y(t) = u(t) - u(t-2)$

OR

Q.10 a) Prove that for an energy signal x (t) the Auto correlation function and energy spectral density form Fourier Transform pair. [6]

b) State and explain all the properties of Auto correction function. [6]

c) Find the auto correlation for a discrete signal [6]

x[n] = {1,2,3,4,5}

Q.11 a) CDF of a certain Random variable is given by [8]

$$F_x(x) = \begin{cases} 0 & x \leq 0 \\ kx^2 & 0 < x \leq 10 \\ 100k & x > 10 \end{cases}$$

i) Find the value of K

ii) Determine PDF

iii) Find the values of Probabilities P ($x \leq 5$) ; P (x > 11)

b) Find the mean , standard deviation and variance of uniform [8]

Random variable.

OR

Q.12 a) Explain the following standard Random variables with the [10]

help of sketch of CDF and PDF and also corresponding

mathematical expressions.

i) Uniform Random variable

ii) Gaussian Random variable

iii) Rayleigh Random variable

b) Probability density function of a Random variable x is defined [6]

by

$f_x(x) = 5x^2 \quad 0 \leq x \leq 1$

$0 \quad$ else where

Find E[x] and E [x^2]

UNIVERSITY OF PUNE
[4362]-162
S. E. (Electronics & E&TC) Examination - 2013
SOLID STATE
DEVICES & CIRCUITS
(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :5]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answers to the **two sections** should be written in **separate answer-books**.*
(2) Neat diagrams must be drawn wherever necessary.
(3) Black figures to the right indicate full marks.
(4) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
(5) Assume suitable data, if necessary.

SECTION-I

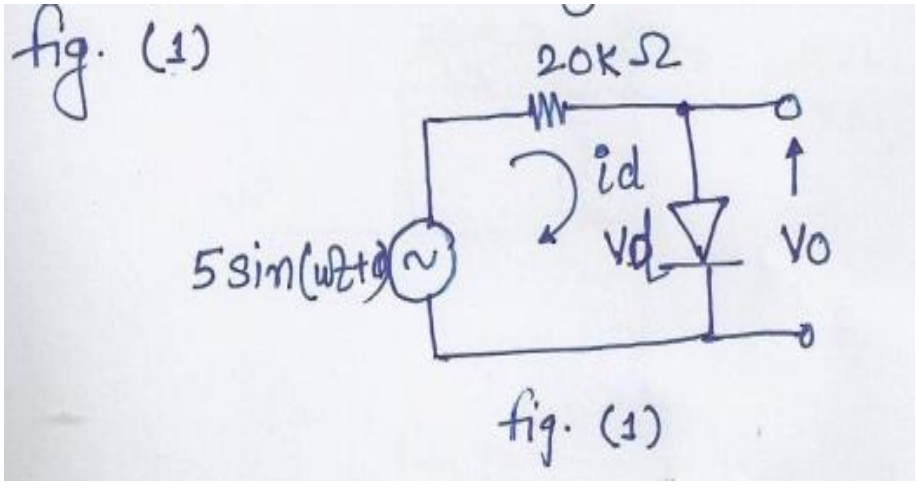
Q1 a) Explain the small signal and large signal model of diodes with suitable V-I characteristics and equivalent ckt. diagrams. [8]

b) What are the various non-ideal effects in MOSFETS? Explain any two in detail. [8]

OR

Q2 a) Explain the switching diode with it's ON-OFF characteristics [8]

b) Find vd and id for the ckt. shown below during forward biased condition of Diode and plot the o/p voltage waveform with respect to i/p signal applied as shown in fig. (1) [4]



Assume Diode as silicon Diode

c) Explain importance of MOSFET as VLSI Device [4]

Q3 a) Explain constant current Biasing with neat circuit diagram. [8]

b) Calculate the D.C. operating condition for the ckt diagram shown in fig.(2) [8]

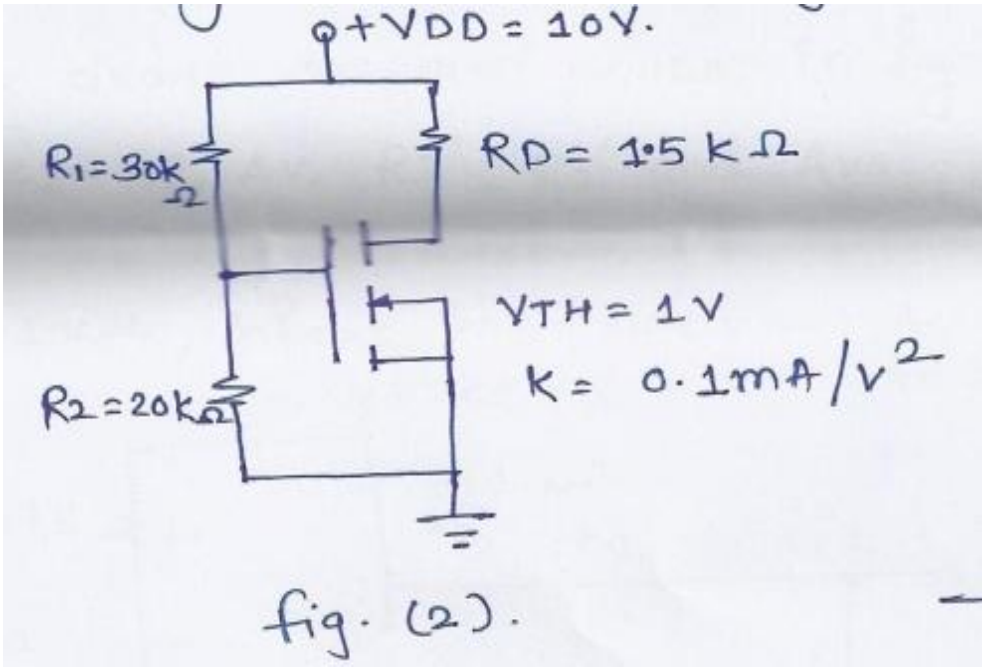


fig. (2).

OR

Q4 a) Explain the concept of scaling and small Geometry effects in MOSFET [8]

b) Determine the operating point for the ckt. Shown in fig. (3) [8]

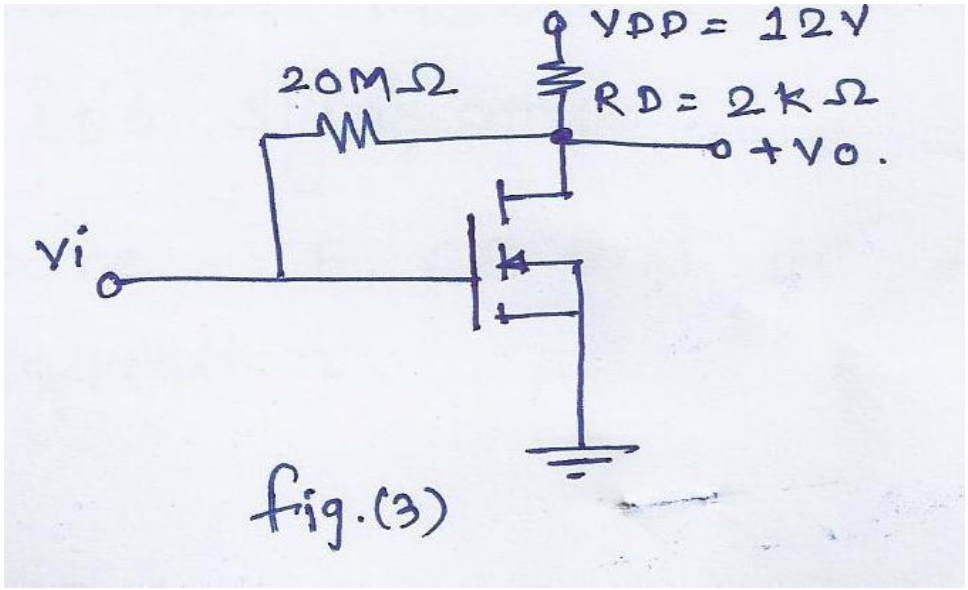


fig.(3)

Q5 a) What is the need of multistage in amplifier? Give the selection of configuration of transistor in multistage amplifier. [4]

b) Write a short note on thermal runaway. [4]

c) For the circuit diagram shown in fig.(4). Calculate: Ai, Av, Ri', Ro′ and Avs. Assume the h-parameters of transistor used as hie=1.1kΩ, hfe=50, hre= hoe=0, Assume all capacitors to be ∞ [10]

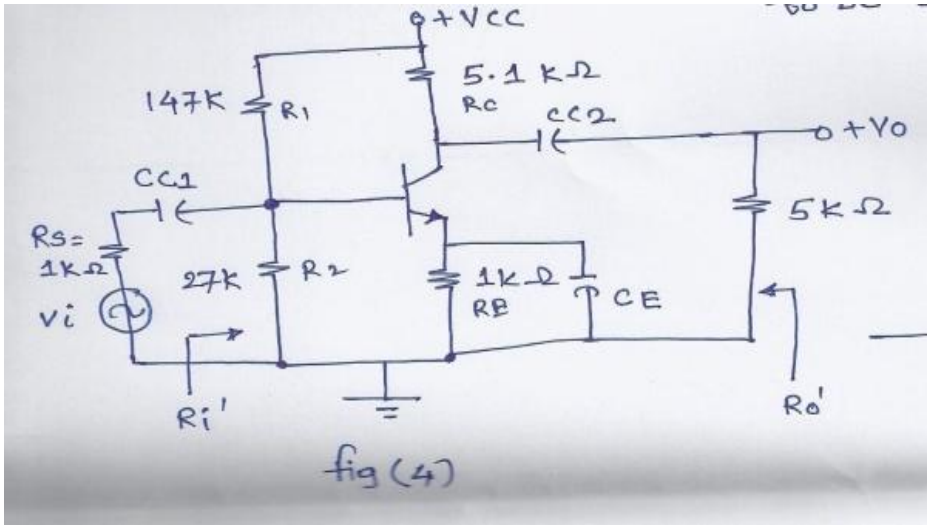


fig (4)

OR

Q6 a) Define the different stability factors and Give it's significance. [6]

b) Compare CE, CB and CC Amplifier configuration. [4]

c) Determine the operating point of the transistor for the circuit diagram shown in fig.(5). Assume the transistor is silicon and β=50. [8]

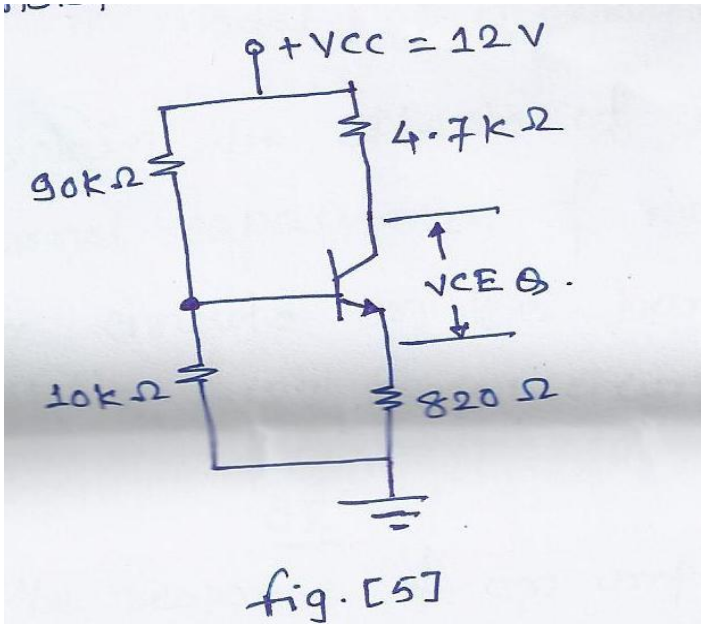


fig. [5]

SECTION-II

Q7 a) Draw and Explain the small signal high frequency hybrid-Π model of transistor [8]

b) Explain the effects of coupling, bypass and internal capacitance of transistors used in Amplifier circuits on the bandwidth of amplifier. With suitable frequency Response curve. [8]

OR

Q8 a) Sketch the response of an amplifier to a low frequency square wave. Define tilt and how the tilt is related to the lower 3db frequency f_L? Sketch the high frequency step response of low pass single pole amplifier. Define rise time. What is the relationship between rise time and high 3db frequency f_H? [8]

b) Define the following Parameters? [8]

1. f_{α}.
2. f_{β}.
3. f_T.
4. .G.B.W.

Q9 a) Explain the significance of +ve and –ve feedback with their applications. [4]

b) Compare the various feedback topologies based on their input and output impedances. [4]

c) For the transistor feedback stage shown in fig.(6) assume hfe=100, hie=1.1k, hre= hoe=0. [8]

1. Identify the topology with justification.
2. Calculate, Rmf, Rif′, Rof′.

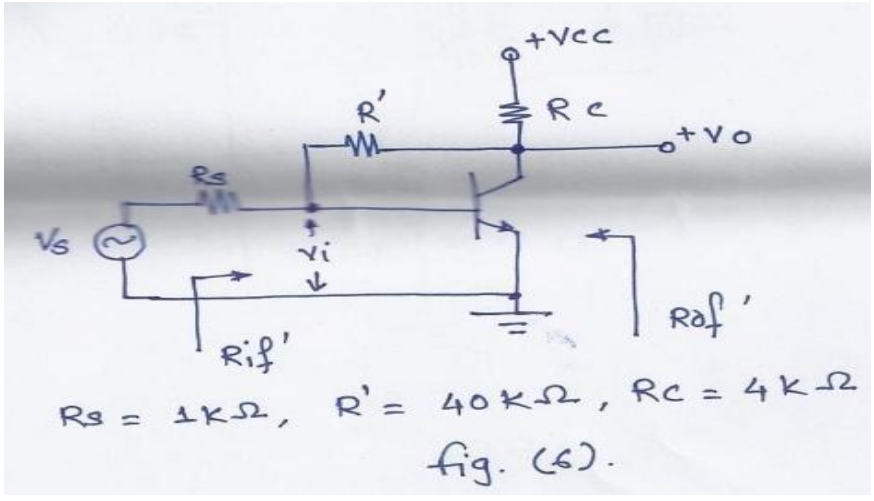


fig. (6).

OR

Q10 a) Explain the Barkhousen's criterion for sustained oscillation. [4]

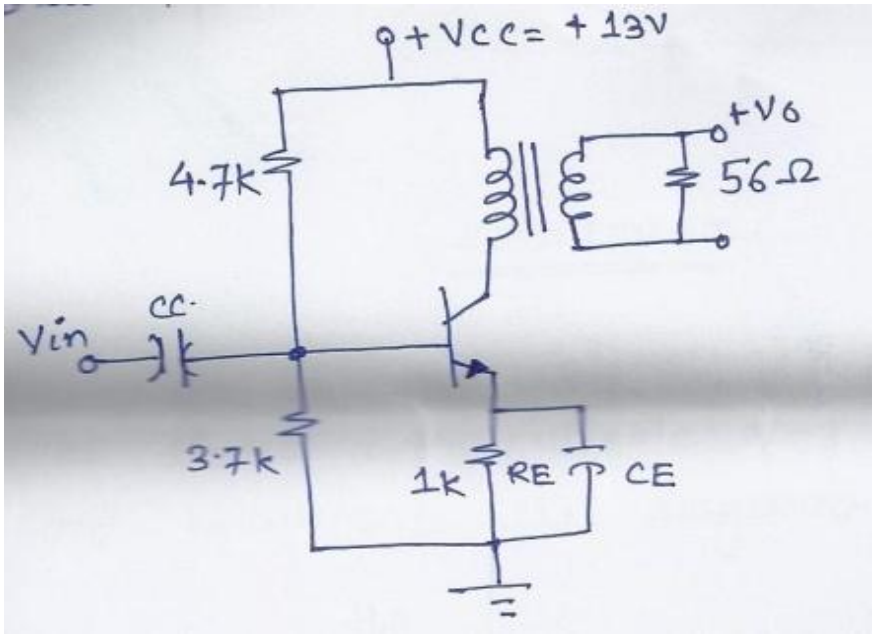
b) Define Gain margin and phase margin [4]

c) Draw and explain the Hartley oscillator. [8]

Q11 a) Write short note on: [8]

1. Harmonic Distortion.
2. Safe operating Area.

b) Calculate the Maximum efficiency of the Class-A Amplifier as shown in fig.(7). Assume that transformer has 80% efficiency. [10]



OR

Q12 a) Explain the class-B push-pull power Amplifier with neat circuit diagram. [8]

b) The collector-Base junction of a certain transistor dissipates 2W. The thermal resistance of case to air is 20°c/w. and junction to case is 8°c/w. The free air temp is 25°c. [6]

1. What is the junction temperature (Tj)?
2. What is the case temperature (Tc)?

c) Compare power BJT and power MOSFET. [4]

UNIVERSITY OF PUNE
[4362-163]
S.E. (E & TC Engineering) Examination-2013
Network Analysis
(2008 pattern)

Time-Three hours **Maximum Marks-100**
[Total No. of Question=12] **[Total no. of printed pages= 4]**

Instructions:

(1)Answer 3 questions from Section-I. Answer question 3 from Section-II,
(2)Answers to the two sections should be written in separate answer books.
(3)Neat diagrams must be drawn whenever necessary.
(4)Figures to the right indicate full marks.
(5)Assume suitable data wherever necessary.

SECTION-I

Q.1

(a)State and explain Maximum Power Transfer theorem when applied to DC circuits. (4)

(b)Find 'V' in the current shown fig.1 using superposition theorem. (6)

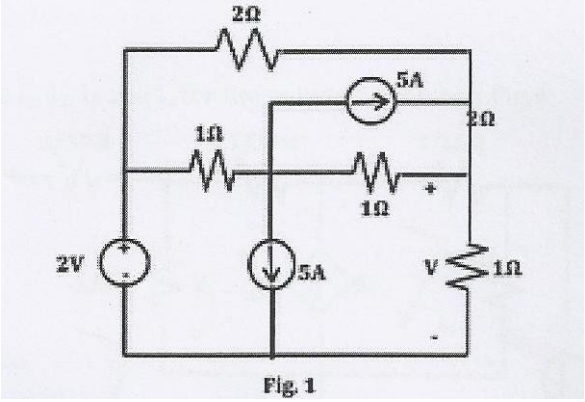


Fig. 1

(c)Using mesh analysis find the magnitude of current dependent source and the current through 2·Ω resistor for the circuit shown in Fig.2 (8)

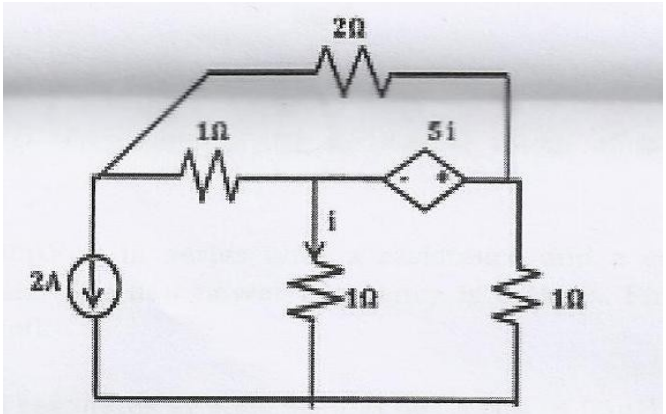


Fig. 2

OR

Q.2

(a)Explain the concept and significance of source shifting. (4)

(b)What should be the value of 'R' such that maximum power transfer can take place from rest of the network to 'R' in Fig.3 .Obtain the amount of this power. (4)

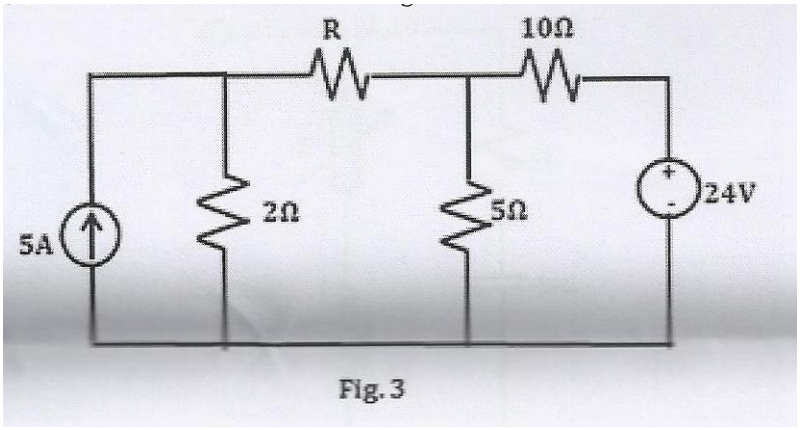


Fig. 3

(c)Find the current I_1 , I_2 and I_3 for the network shown in Fig.4 (8)

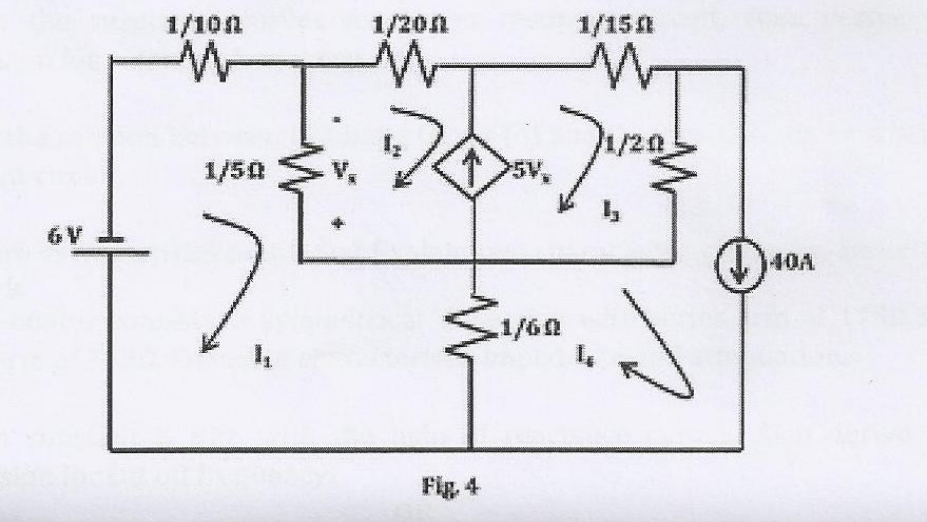


Fig. 4

Q.3

(a)Prove that resonant frequency is the geometric mean of two half power frequencies. (4)

(b)A condenser of 800pF is in series with a resistance and a coil.The circuit resonates at 2.2 Mhz.The half power frequency is 0.7MHz.Find the value of resistance and the coil. (6)

(c)A series RLC circuit resonates at 9.2 Mhz.and has a coil of 55μH and resistance of 25 Ω.If the applied voltage of RLC circuit is 200 V. Compute: (6)

(i)The current at resonance

(ii)The impedance and current at 7.5 MHz.

OR

Q.4

(a)Calculate the value of impedance that will make the circuit shown in Fig.5 resonant. (4)

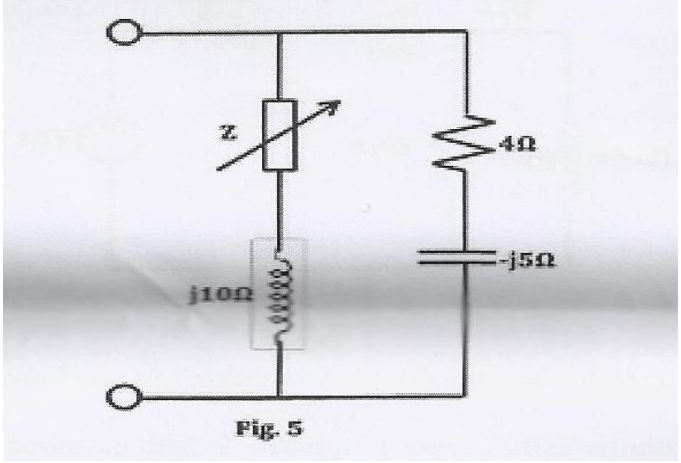


Fig. 5

(b)Explain the reactance curves for series resonant circuit.Also derive the expression for resonant frequency. (6)

(c)Obtain the relation between Detuning factor (∂) and Q_0 at resonance for a series resonant circuit. (6)

Q.5

(a)What are asymmetrical networks?Explain two characteristics of a asymmetrical network. (6)

(b)An attenuator consists of symmetrical T-section with series arm of 175 Ω and shunt arm of 350 Ω. Calculate characteristic impedance and attenuation. (6)

(c)Explain constant K BPF with the help of reactance curves.Also derive the expression for cut off frequency. (4)

OR

Q.6

(a)Obtain the expression for characteristic impedance for symmetrical T network. (4)

(b)Design an m-derived low pass filter (T and π)section having design R_0 =500 Ω cu off frequency $f_c = 1500\,Hz$ and infinite attenuation frequency $f_\alpha = 2000\,Hz$ (6)

(c)Define decibel and neper.Obtain the relation between them. (6)

SECTION-II

Q.7

(a)Explain the following properties of Laplace transform: (8)

(i)Linearity (ii)Time shifting

(iii)Time Scaling (iv)Convolution

(b)For a given circuit in Fig.6 which is in steady state when switch is opened at t=0.Obtain the expression for $I_L(t)$ and $V_L(t)$. (8)

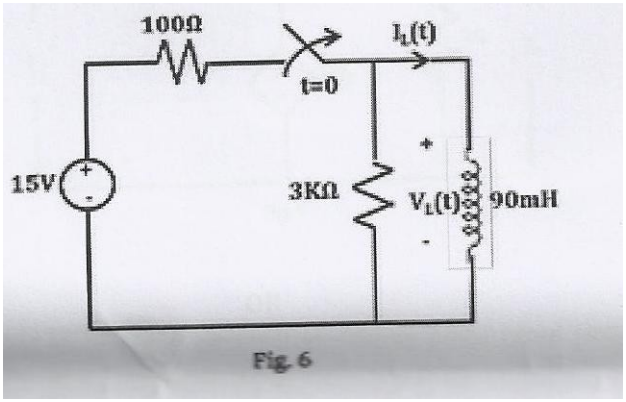


Fig. 6

Q.8

(a)What are initial conditions?Explain the significance of initial conditions.(4)

(b)In the circuit shown in Fig.7 assuming zero initial conditions to be zero.Determine the expression for $I_c(t)$ and $V_c(t)$ along with relevant waveforms .The switch closed at t=0. (6)

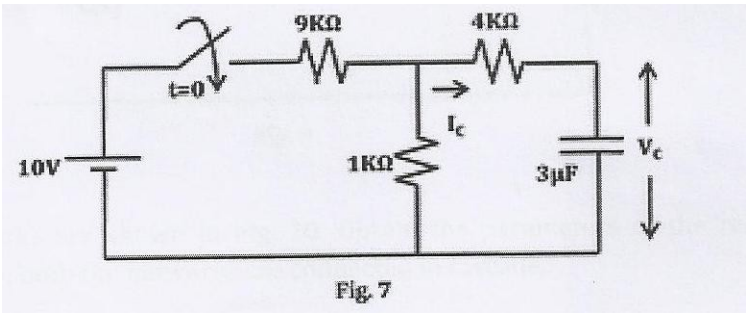


Fig. 7

(c)Obtain the inverse Laplace: (6)

(i) $F(S)=\frac{s^2+3}{(x^2+2x+5)(x+2)}$ (ii) $F(S)=\frac{7x+3}{(z^3+3z^2+2z)}$

Q.9

(a)Explain in detail the interconnection of two networks. (8)

(b)Obtain h-parameter for the network shown in Fig.8.Comment on reciprocity & symmetry of the network shown. (8)

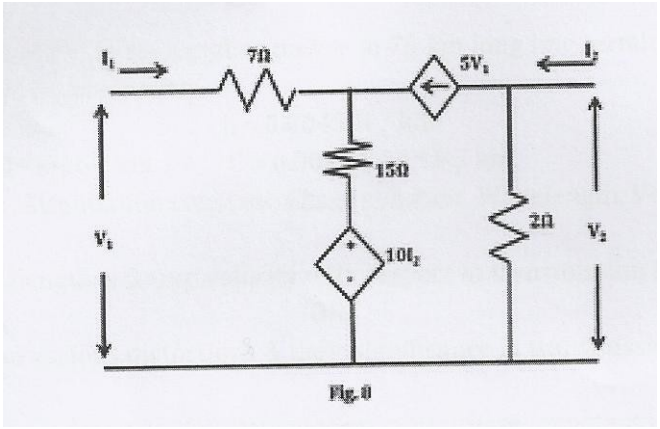


Fig.8

OR

Q.10

(a)For the circuit shown in Fig.9 obtain point input impedance Z(s).Plot the pole-zero plot for driving point input impedance. (8)

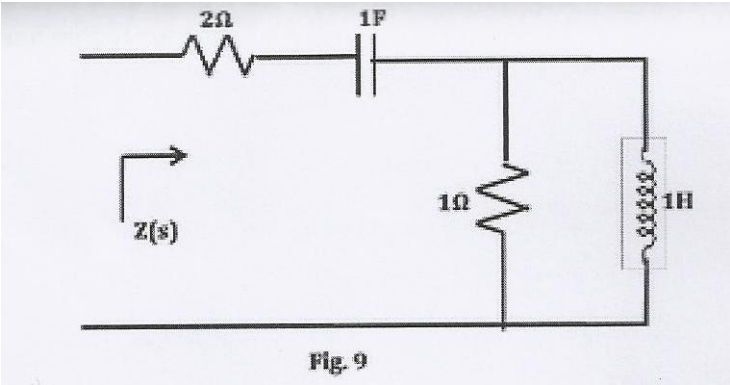


Fig. 9

(b)Two networks are shown in Fig.10.Obtain the parameters of the resulting circuit when both the networks are connected in cascade. (8)

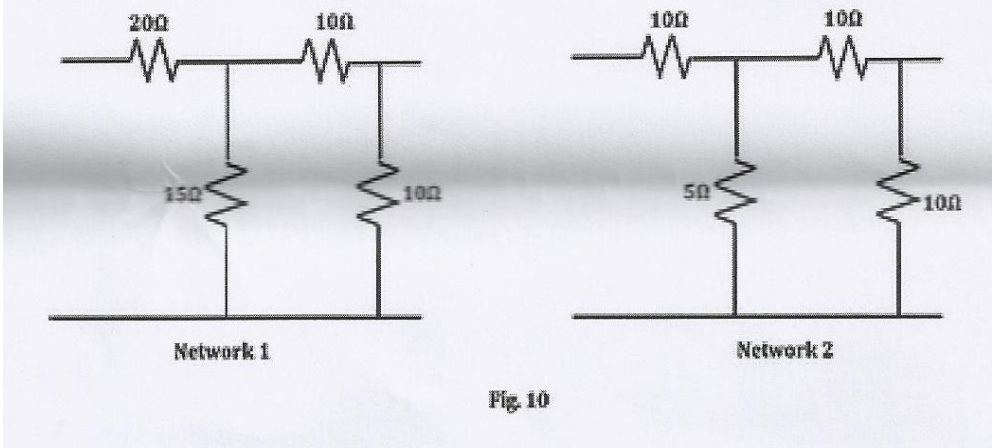


Fig. 10

Q.11

(a)Discuss the primary and secondary constants of a transmission line. (6)

(b)A generator of 1V,1KHz supplies power to 75 km long line terminated in Z_0 and having following constants. (8)

R=10.4 Ω/km L=0.0045H/km

G= $0.8\times10^{-6} mho/km$ c = $0.0052\times10^{-6} F/km$

Calculate Z_0 attenuation & Group velocity Phase constant Wavelength,Velocity.

(c)Define wavelength & group velocity with respect to transmission line. (4)

OR

Q.12

(a)Comment on various distortion & their significance in transmission lines. (6)

(b)Derive the expressions for attenuation and phase constants for unloaded underground cables. (6)

(c)A co-axial cable has Z_0 =50<00 and $\alpha = 1.2\text{dB}/km.$ A 20 km length of this cable is terminated with Z_0 and the input power to the line is 0.5W.Find the output power and output current. (6)

UNIVERSITY OF PUNE
[4362]-165
S. E.(E & TC and Electronics)Examination - 2013
POWER DEVICES & MACHINES
(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :3]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **Q1 or Q2, Q3 or Q4, Q5 or Q6** from section I and **Q7 or Q8, Q9 or Q10, Q11 or Q12** from section II.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
(6) Assume suitable data, if necessary.

SECTION-I

Q1 a) Draw the construction diagram of power BJT & explain its steady state characteristics. [7]

b) Compare power diode with ordinary diode? [4]

c) Draw & explain reverse characteristics of a power diode with mathematical analysis [7]

OR

Q2 a) Draw construction diagram of IGBT & explain its switching characteristics. [7]

b) The bipolar transistor is specified to have β_F in the range of 8 to 40. [6]

The load resistance is R_C=11Ω. The dc supply voltage is V_{CC}=200V and the input voltage to the base circuit is V_B=10V. If V_{CE}(sat)=1V and V_{BE}(sat) =1.5V, find

i) the value of RB that results in saturation with an ODF of 5,

ii) the β_{forced} and iii) the power loss P_T in the transistor.

c) Draw and explain Gate Drive Circuit for IGBT. [5]

Q3 a) Draw two transistor analogy of SCR. Derive an expression for I_A [5]

b) Explain holding current & latching current in SCR [4]

c) Why UJT triggering is preferred? Draw & explain synchronized UJT triggering circuit for SCR. [7]

OR

Q4 a) Draw & explain steady state characteristics of TRIAC. [5]

b) Explain AC phase control circuit using TRIAC& DIAC with o/p waveforms. [5]

c) The gate triggering circuit of a SCR has a source voltage of 15V and the load line has a slope of -120 V/A. The minimum gate current to turn on the SCR is 40mA. If average gate power dissipation is 0.4 W, calculate: [6]

i) Triggering voltage ii) Triggering current iii) Gate series resistance

Q5 a) Draw & explain single phase fully controlled bridge converter for R-L load with all waveforms. Also derive expressions for average output voltage & rms output voltage. [10]

b) A Single phase fully controlled bridge rectifier is given 230V, 50Hz supply. The firing angle is 90° and load is highly inductive. If load current is continuous of 10A, determine i) Average & rms output voltage [6]

ii) Active power iii) Reactive power

OR

Q6 a) Draw & explain single phase full wave AC voltage controller for R load & derive an expression for its output voltage. Also draw the following waveforms: i) gate pulses ii) output voltage iii) output current, iv) voltage across SCR1 v) voltage across SCR2 [10]

b) A single phase full wave ac voltage controller has a resistive load of R=10Ω and the input voltage is V_S=230V(rms). 50Hz. The delay angles of thyristors T1 and T2 are equal: $\alpha 1=\alpha 2=\pi/2.$ determine [6]

i) the rms output voltage & current ii) the input PF, iii) rms current of each SCR

SECTION-II

Q7 a) What is a DC chopper? Explain different control techniques in dc chopper. [6]

b) A chopper circuit is operating on TRC principle at a frequency of 2KHz on 220V DC supply. If the load voltage is 170V, calculate: [6]

i) Conduction period of chopper ii) Blocking period of chopper

iii) rms o/p voltage

c) Explain with block schematic working of Off-line UPS. [6]

OR

Q8 a) Explain 1- bridge inverter for R-L load with circuit & waveforms. [8]
derive expression o/p rms voltage.
b) Compare SMPS with UPS. [4]
c) Single phase full bridge inverter is operated from 100V dc supply and is supplying power to pure resistive load of R=20Ω, calculate: [6]
i) rms o/p voltage & current ii) first four harmonics
iii) output rms power

Q9 a) A 4-pole, lap wound DC motor has 540 conductors. Its speed is 1000 rpm. The flux per pole is 25 m Wb. It is connected to 230V dc supply, armature resistance is 0.8Ω. find: [6]
i) Back e.m.f.
ii) Armature current iii) Torque developed
b) Explain torque-speed & torque-current characteristics for dc shunt motor [4]
c) Explain construction of a dc motor with neat diagram [6]

OR

Q10 a) Explain construction, working & characteristics of universal motor. [8]
b) Explain with neat schematics construction of ac motor in detail. [8]

Q11 a) Explain construction, characteristics of ac servomotor. [6]
b) State various protection methods for motors. Explain in detail. [6]
c) Compare voltage (potential) transformer with current transformer. [4]

OR

Q12 a) Explain construction, working of BLDC motor also draw it's characteristics. [5]
b) Compare stepper motor with dc motor. [3]
c) Draw & explain various types of 3-phase transformer connection in detail. [8]

University of Pune

S.E.(E & TC, Electronics)

Engineering Mathematics -III

(2008 pattern)

Time-Three hours Maximum Marks-100

Note:

(1)In Section I attempt Q 1 or Q 2 , Q 3 or Q 4 , Q 5 Or Q 6
Section II attempt Q 7 or Q 8, Q 9 or Q 10 , Q 11 or Q 12

(2)Answers to the two sections should be written in separate answer books.

(3)Neat diagram must be drawn necessary.

(4)Figures to the right indicate full marks.

(5)Assume suitable data wherever necessary.

(6)Use of Non – Programmable electronic pocket calculator is allowed.

SECTION-I

Q.1 (a)Solve the following (any three) [12]

(i) $(D^2+3D+2)y=e^{-x}+x^2$

(ii) $(D^2-2D+1)y=xe^x\sin x$

(iii) $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+2y=(logx)^2-\log(x^2)$

(iv) $\frac{dx}{x(2y^4-z^4)}=\frac{dy}{y(z^4-2x^4)}=\frac{dz}{z(x^4-y^4)}$

(b)Solve the system of equations. [5]

$2\frac{dx}{dt}+3y=sint\,,\ 2\frac{dy}{dt}+3x=\cos t$

OR

Q.2 (a)Solve the following (ant three) [12]

(i) $(D^3-3D+2)y=sinx$

(ii) $(D^2+2D+1)y=e^{-x}\log x$ (by variation of parameters)

(iii) $(D^2+9)y=cosec\,3x$

(iv) $(2x+3)^2\frac{(d^2y)}{(dx^2)}+(2x+3)\frac{dy}{dx}-2y=24x^2$

(b)An uncharged condenser of capacity C is charged the applying e.m.f. Of value $E\sin\frac{t}{\sqrt{LC}}$ through the inductance L and negligible resistance. Find the charge at any time t. [5]

Q.3

(a) If $v=x^2-y^2+\frac{x}{x^2+y^2}$ then find u such that f(z)=u + iv is analytic and also find f(z) in terms of z. [5]

(b)By using Cauchy's integral formula evaluate $\oint_c(\frac{e^z}{Z^2+1})dz$ over=| z-1| =1. [6]

(c)Show that under the transformation $w=\frac{i-z}{i+z}$,x-axis in z-plane is mapped onto the circle |w|=1. [5]

OR

Q.4

(a)Prove that the analytic function with constant argument is constant. [5]

(b)By using Cauchy's residue theorem evaluate $\oint_c\frac{e^{2z}}{z(z-1)^2}dz$ over |z|=3. [5]

(c)Find the bilinear transformation which maps the points o,-i,-1 of z-plane onto the points i,1,o of w-plane. [6]

Q.5

(a)Find z-transform of following (any two) [6]

(i) $f(k)=4^k e^{-5k} k$, $k\geq 0$

(ii) $f(k)=3(2)^k+4(-1)^k$, $k\geq 0$

(iii) $f(k)=e^{-3k}\sin 2k\, cos2k$, $k\geq 0$

(b)Using Fourier integral representation show that

$$\int_0^\infty \frac{1-\cos\lambda\pi}{\lambda}\sin\lambda x\, d\lambda = \begin{cases}\frac{\pi}{2} & 0<x<\pi \\ 0 & x>\pi\end{cases}$$ [6]

(c)Solve the difference equation: [5]

$f(k+1)-4f(k)=4^k, f(0)=0, k\geq 0$

OR

Q.6(a)Find inverse z-transform of following (any two) [6]

(i) $F(z)=\frac{z^3}{(z-3)(z-2)^2}$,| Z|>3

(ii) $F(z)=\frac{1}{z^2-z-6}$, |z|>3

(iii) $F(z)=\frac{z}{(z-2)(z+4)^2}$ (by inversion integral method)

(b)Find the Fourier transform of [6]

$$f(x)=\begin{cases}x^2 & |(x)|\leq 3 \\ 0 & |(x)|>3\end{cases}$$

(c)Solve the integral equations. [5]

$$\int_0^{\infty} f(x)\sin\lambda x\,dx = e^{-\lambda} \quad , \quad \lambda > 0$$

SECTION-II

Q.7(a)For the following tabulated data. [5]

x	0	1	2	3	4
y	1	5	25	100	250

Find y at x=0.5 using Newton's forward difference formula

(b)Evaluate $\int_o^{\pi} \left(\frac{\sin^2\theta}{5+4\cos\theta}\right) d\theta$ by simpson's 3/8th rule,taking $h=\frac{\pi}{6}$ [5]

(c)Use Runge-Kutta method of fourth order to solve. [6]

$\frac{dy}{dx}=\frac{1}{x+y}$, $x_0=0, y_0=1$ to find out y at x=0.2 taking h=0.2

OR

Q.8(a)Find Lagrange's interpolating polynomial passing through set of points (0,2),(2,-2),(3,-1).Use it to find $\frac{dy}{dx}$ at x=2. [5]

(b)Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using simpson's 1/3rd rule,taking h=1/4. [5]

(c)Using modified Euler's method solve equation. [6]

$\frac{dy}{dx}=x-y^2$, y(0)=1, to calculate y at x=0.2 taking h=0.2

Q.9

(a)Find the directional derivative of $\phi=e^{2x}cosyz$ at the origin in the direction tangent to the curve x=2sint,y=2 cost,z=2t at $t=\pi/4$. [6]

(b)Find the angle between the normals to the surface $xy=z^2$ at (1,2,1)and at (3,2,3). [6]

(c)Prove that $(2xy+z^3)i+x^2j+3xz^2k$ is conservative force field.Find its scalar potential ϕ such that $\bar{F}=\nabla\phi$. [5]

OR

Q.10(a)If the directional derivative of $\phi=axy+byz+czx$ at (1,1,1)has maximum magnitude 8 in a direction parallel to y-axis,find the values of a,b,c. [5]

(b)Prove that the vector field $\bar{F}=\frac{x_i+y_j}{x^2+y^2}$ is solenoidal as well as irrotational. [4]

(c)With usual notations prove(any two)the following. [8]

(I) curl $(u\,rad\,\phi)=\bar{0}$

(ii) $\nabla\times[\bar{a}\times(\bar{b}\times\bar{r})]=\bar{a}\times\bar{b}$, $\bar{a}$ and $\bar{b}$ are constant vectors.

(iii) $\nabla^2 f(r)=\frac{d^2f}{dr^2}+\frac{2}{r}\frac{df}{dr}$

Q.11(a)Find the work done in a moving particle once round the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$,z=0,under the force field $\bar{F}=(2x-y-z)i+(x+y-z)j+(3x-2y+4z)k$ If field conservative? [6]

(b)Verify stoke's theorem for $\bar{F}=xy^2i+yj+z^2xk$ for the surface of rectangular lamina bounded by x=0,x=1,y=0, y=2,z=0. [6]

(c)Show that $\int\int_v\int\frac{dv}{r^2}=\int_s\int\frac{(\bar{r}.\hat{n})}{r^2}ds$ [5]

Or

Q.12

(a)Using Green's theorem evaluate $\oint(xy-x^2)dx+x^2dy$ along the curve c formed by

y=0,x=1 and y=x.

[6]

(b)Evaluate $\int\int_s (x^3 i + y^3 j + z^3 k).d\bar{s}$ over the surface of the sphere $x^2+y^2+z^2=25$ [6]

(c)Maxwell's equations are given by

$\nabla.\bar{E}=0$ $\nabla\times\bar{E}=\frac{-\partial H}{\partial t}$, $\nabla\times\bar{H}=\frac{\partial \bar{E}}{\partial t}$, $\bar{V}.\bar{H}=0,$ show that $\bar{E}$ and $\bar{H}$ satisfy

$$\nabla^2 u=\frac{\partial^2 u}{\partial t^2}$$ [5]

UNIVERSITY OF PUNE

[4362]-167

S. E. (E&TC/ Electronics) Examination 2013

INTEGRATED CIRCUITS AND APPLICATIONS

(2008 Course)

[Total No. of Questions:] **[Total No. of Printed pages :7]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(1) *Answers any 3 questions from each section*

(2) *Answers to the two Sections should be written in separate answer-books*

(3) *Neat diagram must be drawn wherever necessary.*

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

SECTION I

Q.1a) Draw the block diagram of op-amp and explain the function of each block in detail. [6]

b) Explain the following related to Dual input balanced output differential amplifier [8]

i)Operation in Common mode and Difference mode

ii) Transfer Characteristics

c) Explain the concept of active load. [2]

OR

Q.2a) Which are the different methods used for CMRR improvement. Explain any one method with neat circuit diagram. [8]

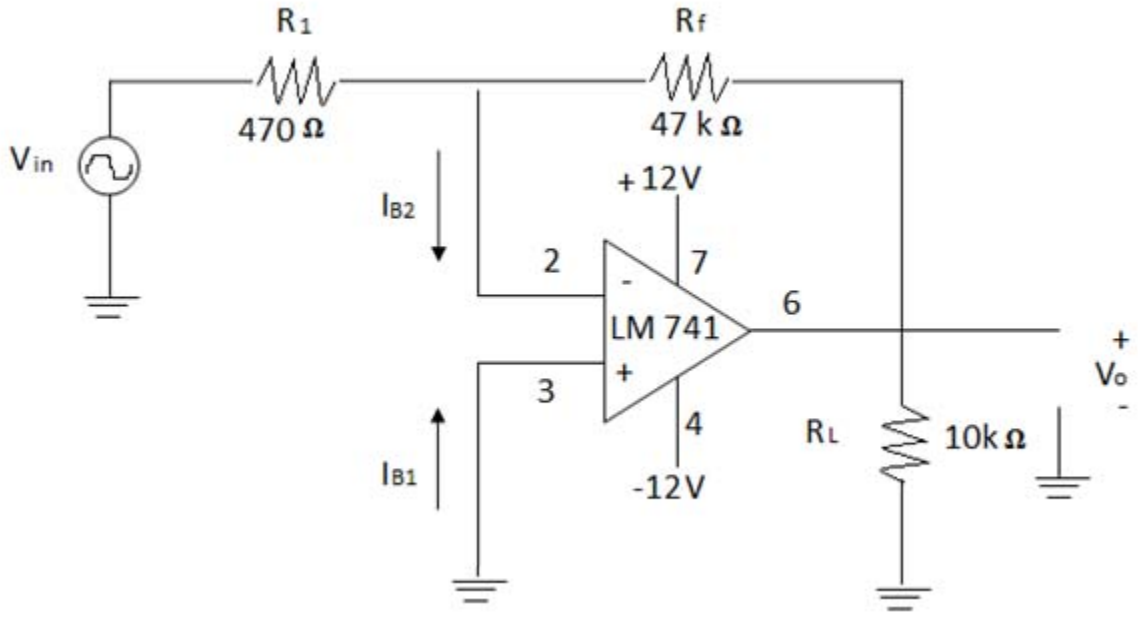
b) Write short notes on [8]

1) V_{BE} Multiplier Circuit 2) Basic Current Mirror Circuit

Q.3a) For the inverting amplifier using op-amp LM 741 is shown in figure below, determine the maximum possible output offset voltage due to [4]

1) Input offset voltage(V_{io}) 2) Input bias current(I_B)

Assume V_{io}= 6mV , I_B = 500nA



b) Define the following parameters of an Op-Amp. Give their typical values for IC 741. [4]

1) CMRR 2) Gain-bandwidth product

3) Slew Rate 4) Input Offset voltage.

c) Explain the method of Op-amp powering. [4]

d) Justify whether using IC 741, it is possible to amplify a square wave peak to peak value 500mv, with a rise time of 4μS or less, to a peak to peak amplitude of 5V [4]

OR

Q.4a) Explain the different types of noises associated with op-amp. Draw the op-amp noise model and derive the expression for output noise voltage. [8]

b) What is the full power bandwidth of the op-amp? Give its expression. [2]

c) What is the need of frequency compensation in an op-amp? Explain the three break frequency model of op-amp. [6]

Q.5a) Design a practical differentiator for the input signal having maximum frequency of operation 150 Hz. [6]

b) Write a short note on high sensitivity I-V converter. [6]

c) Explain summing differentiator using op-amp. [6]

OR

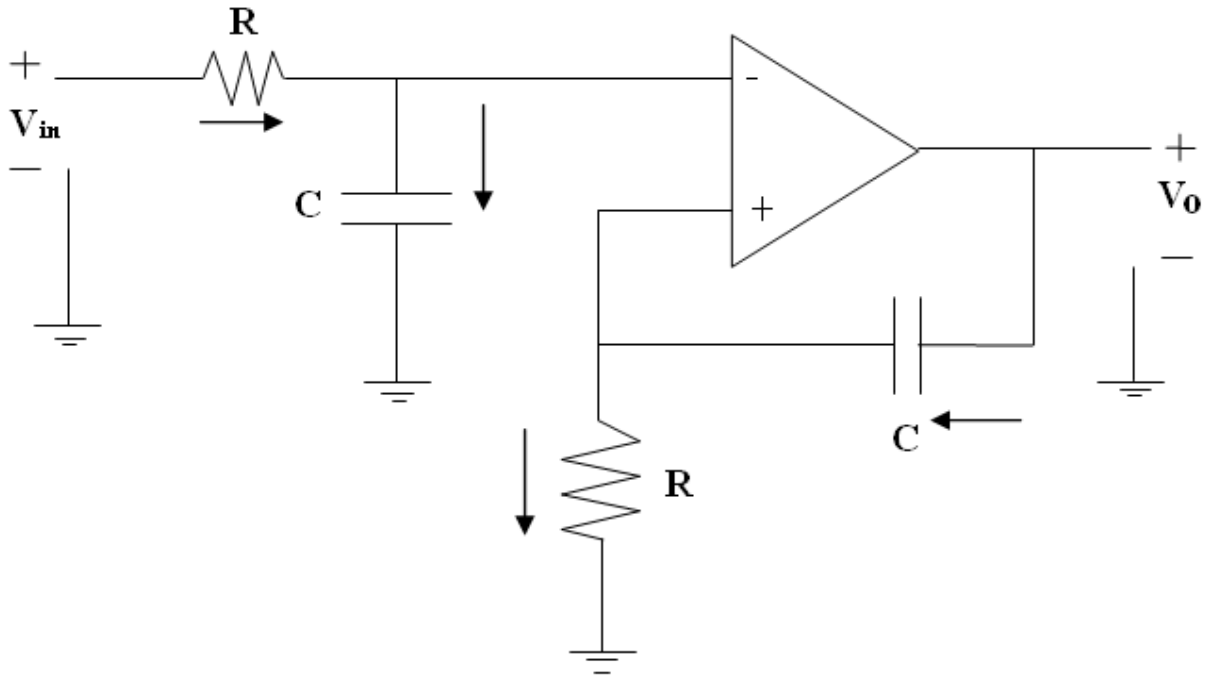
Q.6a) Explain Op- amp as a [6]

1) Unity Gain Amplifier

2) Subtractor

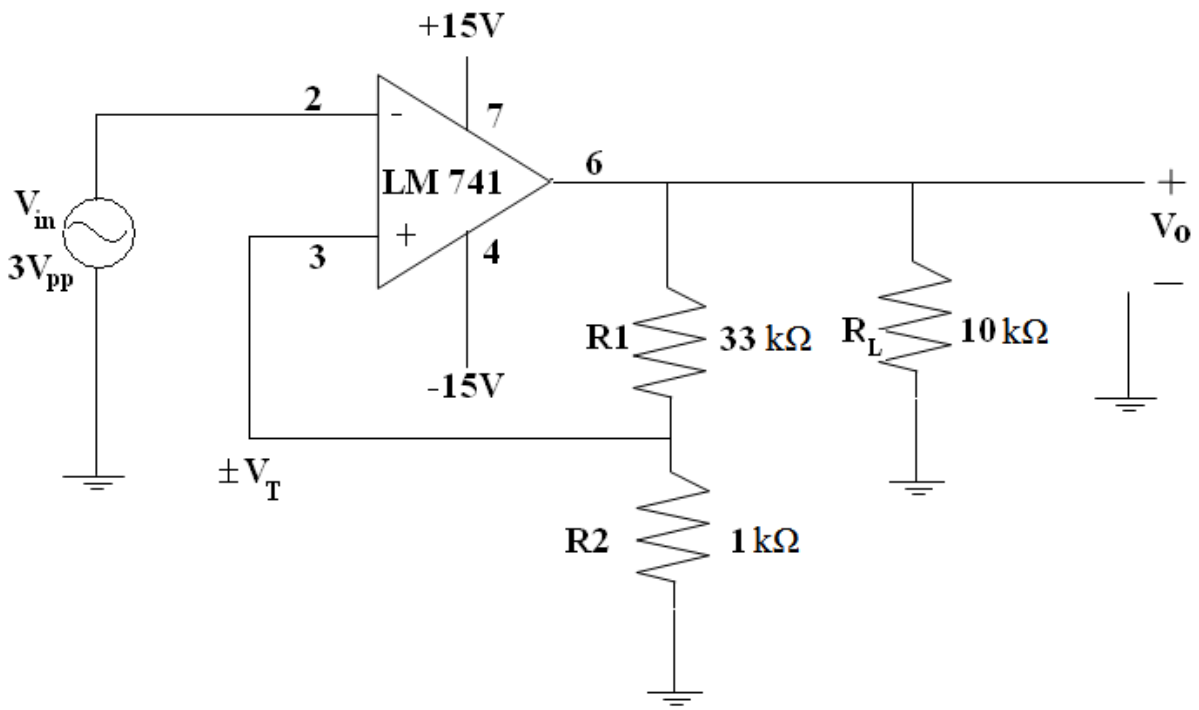
b) Explain op-amp integrator with SET, RUN and HOLD mode. [6]

c) Calculate the output voltage for the following op-amp based circuit. [6]



SECTION II

Q7.a) For the Inverting Schmitt trigger shown in fig. below Calculate UPT, LTP and hysteresis width. Draw input and output waveforms. Also comment on Hysteresis loop. [6]



b) Explain the following [5]

1) Sample and hold circuit using op-amp.

2) Power supply performance parameters

c) Explain with appropriate circuit diagram and waveforms, how [7]

comparator can be used as a square and triangular waveform generator.

Also derive the equation of output frequency

OR

Q.8a) Explain the zero crossing detectors using op-amp with necessary [4]

waveforms.

b) Explain the Concept of active guard drive related to instrumentation [6]

amplifier.

c) Explain the operation of non-saturating type of precision Full wave rectifier with necessary waveforms. [8]

Q.9a) Explain the operation of frequency to voltage converter with neat diagram. [8]

b) List the various methods of A to D Conversion. Explain successive approximation type ADC with neat block diagram. [6]

c) List various specifications of DAC. [2]

OR

Q.10a) With the help of neat circuit diagram, explain the operation of Sigma Delta Converter. [8]

b) Draw neat diagram of voltage mode R-2R ladder type DAC and explain [8]

Q.11a) Explain the following [8]

1) Digital Phase comparator used in PLL

2) Advantages of Active filter over passive filters

b) Write a short note on [8]

1) Graphic equalizer

2) PLL as a FSK Demodulator

OR

Q.12a) Give the specifications of PLL IC NE 565 with a neat internal block diagram. Also mention the design equations for the same. [6]

b) Explain the op-amp based Active Tone Control. [4]

c) Explain the first order active High Pass Filter with required gain equation. Draw the frequency response curve [6]

UNIVERSITY OF PUNE

[4362-168]

S.E.(E&TC and Electronics) Examination 2013

Electromagnetics

(2008 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 5]**

Instructions:

(1)Answers to the two section must be written in separate answer books.

(2)Neat diagrams must be drawn whenever necessary.

(3)Figures to the right indicate full marks.

(4)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator and steam tables is allowed.

(5)Assume suitable data whenever necessary

SECTION-I

Q.1 (a)Derive an expression for electric field intensity due to an infinite sheet of charge placed along XY plane.The charge distribution has uniform charge density of $\rho_s c/m^2$. (9)

(b)A uniform line charge density of 20 nc/m lies on z.axis between z=1 and z=3m.No other charge is present.Find electric field intensity $(\bar{E})$ at

(i)origin

(ii)A point P(4,0,0). (9)

OR

Q.2 (a)State Gauss's Law and derive Maxwell's first equation from the same. (9)

(b)If $\bar{D}=4x^3\hat{a}_x-2z\hat{a}y-2y\hat{a}_z c/m^2$,find

(i) $\nabla.\bar{D}$

(ii) $\rho_u at\ P(x,y,z)$

(iii)The total charge lying within the region -1 <x,y,z <1

(iv)The total charge lying within that region without finding ρ_v ,first.(9)

Q.3 (a)State and prove the relationship between Electric field intensity $\bar{E}$ and Electric potential(V). (8)

(b)Consider a parallel plate capacitor having d=5mm.Area s = $80cm^2$ and $\epsilon_r = 10$. (8)

(i)Find Capacitance 'C'

(ii)If a d.c. Voltage source of 50 V is now placed across the capacitor ,find the electric field intensity $(\bar{E})$,flux density $\bar{D}$ charge q and total energy stored.

(iii)The d,c voltage source is now disconnected and the dielectric carefully removed from the capacitor,find q, $\bar{D}, \bar{E}$ and total energy stored.

(iv)Find the new potential between the plates.

OR

Q.4 (a)Derive the expression foe the electric field intensity at a point P' in space,due to an electric dipole. (8)

(b)Three point charges -4μc,5μc and 3μc are located at (2,-1,3),(0,4-2) and (0,0,0)respectively.Find the potential at a point p(-1,5,2),Assuming zero potential at infinity. (8)

Q.5 (a)A thin ring of radius 5cm is placed on the plane z=1cm.so that its center is at (0,0,1cm).If the ring carries a direct current of 50mA along $\hat{a}_\varphi$ direction ,find $\bar{H}$ at P(0,0,-1cm)using Biot-Savart's law. (8)

(b)Derive an expression for $\bar{H}$ for a finite line current using Ampere's current law. (8)

OR

Q.6 (a)State and explain Stoke's theorem.Also explain physical significance of curl. (8)

(b)Given points A(1,2,4),B(-2,-1,3) and C(3,1,-2),let a differential current element

with I=6A and $|d\bar{L}|=10^{-4}m$ be located at A.The direction of $d\bar{L}$ is from A to B.Find $d\bar{H}$ at 'c'. (8)

SECTION-II

Q.7 (a)Derive the boundary conditions for electric field at an interface between dielectric and dielectric material. (8)

(b)Derive extensive homogeneous isotropic dielectric meet on a plane z=0 for $z\geq 0, Er_1=4$ and for $z\leq 0, Er_2=3$ .A uniform electric field $\bar{E}_1=5\hat{a}_x-2\hat{a}_y+3\hat{a}_z Kv/m$ exists for $z\geq 0$ find. (10)

(i) $\bar{E}\ for\ z\leq 0$

(ii)The angles $\bar{E}_1$ & $\bar{E}_2$ make with the interface

(iii) The energy densities in J/m^3 in both the di electrics.

(iv)The energy within a cube of side 2 meters centered at(3,4,-5).

OR

Q.8 (a)Define the magnetic boundary conditions as the condition that, $\bar{H}$ or $\bar{B}$ field must satisfy at the boundary between,two different media. (8)

(b)The xy-plane serves as the interface between two different media.Medium 1 $(z\leq 0)$ is filled with a material with a material whose μ_r =6and medium 2 $z\geq 0$ is filled with a material whose μ_r =4.If the interface carries current $(1/\mu_0)\hat{a}y$ mA/m and $\bar{B}_2=5\hat{a}_x+8\hat{a}_z mwb/m^2$ find $\bar{H}_1$ and $\bar{B}_1$. (10)

Q.9 (a)What is the significance of (8)

(i)Faraday's law

(ii)Displacement current

Explain the maxwell's equations for time varying Electromagnetic fields. (8)

(b)In free space $\bar{E}$ =20 $\cos(wt-50x)\hat{a}y\ v/m$ calculate. (8)

(i) $\bar{J}d$

(ii) $\bar{H}$

(iii)Angular frequency

(iv)work done

OR

Q.10 (a)The electric field and magnetic field in free space are given by

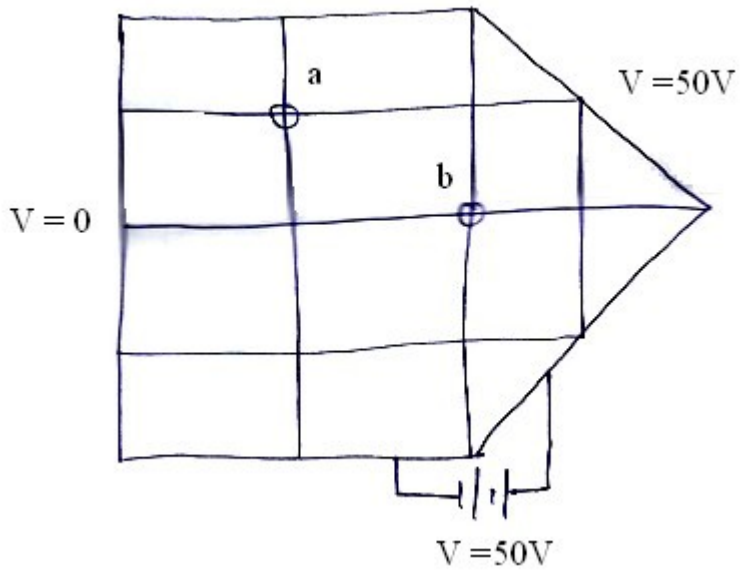
$$\bar{E}=\frac{50}{\rho}\cos(10^6 t+\beta Z)\hat{a}_{\varphi}(V/M)$$

$$\bar{H}=\frac{H_0}{\rho}\cos(10^6 t+\beta Z)\hat{a}_{\rho}(A/M)$$

Express these in Phasor form and determine the constants H_0 and B_1 .Such that the fields satisfy Maxwell's Equations. (8)

(b)Derive Helmholtz's wave Equations for lossy deelectric ,with the help of these equations .Explain, propogation constant, Attenuation constant,Phase shift constant and intrinsic impedance of the medium. (8)

Q.11 (a)Determine the potential at the free nodes in the potential system of the figure,using the finite difference method(solve upto five itterations). (8)



(b)Explain the steps involved for the graphical representations of Electric field lines and equipotential lines. (8)

OR

Q.12 Write a short note on (any two). (16)

(a)Finite Element method

(b)Method of moments

(c)Method of Images.

UNIVERSITY OF PUNE
[4362-169]
S.E.(E & TC/ Electronics) Examination-2013
Data structures
(2008 pattern)

Time-Three hours **Maximum Marks-100**
[Total No. of Question=12] **[Total no. of printed pages= 4]**

Instructions:

(1)Answer 3 questions from Section-I and 3 questions from Section-II.
(2)Answers to the two sections should be written in separate answer books.
(3)Neat diagrams must be drawn whenever necessary.
(4)Figures to the right indicate full marks.
(5)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator and steam tables is allowed.

SECTION-I

Q.1 (a)What is time complexity of an algorithm? (6)
Explain with suitable example.

(b)What will be output of following code? (6)
Justify your answer.

```
for(i=o;i<3;i++)
        {
                for(j=0;j<3;j++)
                {
                 a[i][j]=10 * (i+j);
                printf("%d",a[i][ j]);
                }
        printf("\n");
        }
printf('%d%d",i,j);
```

(c)Write an algorithm for linear search technique. (6)

OR

Q.2 (a)Discuss the different phases of creating program. (6)

(b)what will be the output of following code? (6)
Justify your answer.

```
Void f(int x,int * p)
```

```
{
        x =x +10 ;
        * p = * p+x ;
}
void main( )
{
        int a=10,b=20;
        f(a, &b);
        printf("%d %d ",a,b);
}
```

(c)Sort following data using bubble sort & Insertion sort.Comment on number of comparisons & number of swaps /shifts required. (6)

35 17 2 13 10

Q.3 (a)Define a structure which can store real & imaginary parts of a complex number.Declare two variables of the types of this structure. Store two complex numbers in them & Display them. (4)

(b)What is string?How do you declare a string variable in C?Write & explain the functions strlen,strcpy. (6)

(c)Write various bitwise operators used in C.Explain with suitable example the bitwise OR operator. (6)

OR

Q.4 (a)Write difference between array & structure. (4)

(b)Explain following terminologies. (6)

(i)Data type

(ii)Data structure

(iii)Abstract Data Type.

(c)If a structure type variable is passed to a function by address,how will you access the elements of structure in the function? Explain with suitable example. (6)

Q.5 (a)Write an algorithm to search an element in the singly linked List. (4)

(b)What is doubly linked list?compare it with singly linked list in terms of pros and cons. (6)

(c)Represent following polynomial using (6)

$GLL: 10x^6 + 8xy^5 + 15xz$

OR

Q.6 (a)Write an algorithm to display the data stored at odd numbered nodes in a singly linked list. (6)

(b)What is Circular Linked List?Compare it with Singly linked list in terms of pros and cons. (6)

(c)Discuss the node structure in GLL used to represent a polynomial. (4)

SECTION-II

Q.7 (a)Write an algorithm to convert infix expression to postfix. (6)

(b)When a queue is implemented using array,if rear becomes maximum size of queue , we cannot insert element even when there is space available. Suggest a solution to this problem.Justify your answer. (6)

(c)Explain Descending order priority queue .what is its application? (4)

OR

Q.8 (a)Given following infix expression,find their prefix & postfix notations. (6)

(i)a * b/c*d – e/f

(ii)(a+b)/(c+d)

(iii)a+b+c+d

(b)Compare stacks & queues. (4)

(c)Two stacks are to be used.One stores 10,20,30.Another stores 100, 200,300.Write a program to implement this. (6)

Q.9 (a)Define a Tree. What is binary tree?
Explain with suitable figures three types of binary trees. (6)

(b)Draw a binary tree store following expression. (4)

(a - b)/((c*d) + e)

(c)Write a non-recursive function for inorder tree traversal. (6)

OR

Q.10 (a)For the following data draw binary search tree. (6)

10 20 30 28 26 24 25

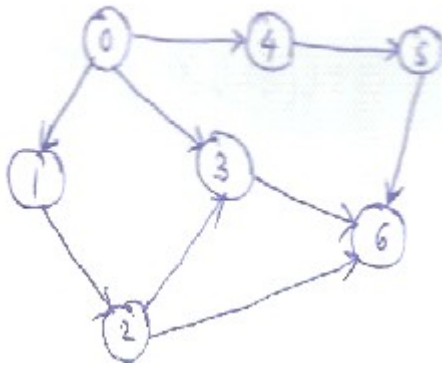
(b)Explain the concept of AVL tree with a suitable example.. (4)

(c)Write a non-recursive function for preorder traversal of binary tree. (6)

Q.11 (a)Define graph. Discuss types of graph. (4)

(b)Write an algorithm to count indegree & outdegree of a node in the graph using adjacency matrix. (6)

(c)For the graph given below write BFS & DFS traversal starting from vertex 0. (6)



OR

Q.12 (a)Using Dijkstra's algorithm find the shortest path between A to C for the graph given below. Show all steps/calculations to arrive at final result. (8)

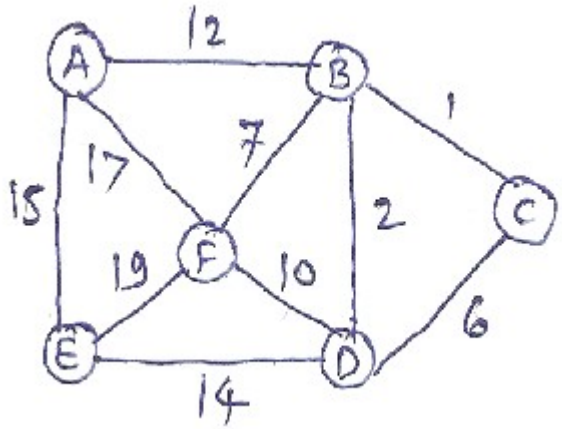


figure 12 (a)

(b)Write Kruskal's algorithm.For the graph given in Q.12(a) find minimum spanning tree using Prim's and Kruskal's algorithm. (8)

[Total No. of Questions: 12] **[Total No. of Printed Pages: 3]**

UNIVERSITY OF PUNE
[4362]-170
S. E. (E & TC/ ELECTRONICS) Examination – 2013

COMMUNICATION THEORY
(204191) (2008 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1. *Answers to the two sections should be written in separate answer-books.*
2. *Black figures to the right indicate full marks.*
3. *Neat diagrams must be drawn wherever necessary.*
4. *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5. *Assume suitable data, if necessary.*
6. *Answer any three questions from Section I and any three questions from Section II*

SECTION -I

Q.1 A) Derive the expression for AM, Sketch the waveform and explain power relations for DSB-FC [10]

B) A carrier wave Vc = 4 Sin (2π x 500 x 103t) is AM modulated by audio wave v_m = 0.2 Sin 3[(2π x 500t) + 0.1 Sin 5(2π x 500t)] Determine the upper and lower sidebands and sketch the complete spectrum of the modulated wave. Estimate total power in sidebands. [8]

OR

Q.2 A) An amplitude modulated signal is given by Φ_{AM} = 10cos(2π x 106t) + 5 Cos (2π x 106t). Cos (2 π ×103t)+Cos(2π x 106t).Cos(4 π x 103t) Find various frequency components present and the corresponding modulation Indices. Draw the spectrum and find Bandwidth also calculate Total modulation index and Total Modulated Power [10]

B) Explain Independent sideband system with help of block diagram. [8]

Q. 3	A)	Design and draw the block diagram of an Armstrong indirect FM modulator to generate an FM carrier with a carrier frequency of 98.1 MHz & Δ_f = 75 KHz. A narrowband FM generator is available at a carrier frequency of 1000KHz & Δ_f = 10 Hz with the oscillator having an adjustable frequency in the range of 10-11 MHz. Frequency doublers, triplers are available.	[8]
	B)	Derive an expression for frequency and phase modulated wave. Sketch the Waveforms.	[8]
		OR	
Q. 4	A)	An angle modulated signal is described by the equation $\psi_{EM}(t)= 10 \text{ Cos } (2\pi f_C t + 4 \sin 2 \pi fm t)$ where f_c = 10 MHz and fm =1000Hz i) Determine the Modulation Index. Estimate the transmitted signal bandwidth ii) Repeat(i) fm is doubled	[8]
	B)	Explain the Direct method for FM generation with block diagram	[8]
Q. 5	A)	Explain the tracking methods in Super heterodyne radio receiver	[8]
	B)	In a broadcast super heterodyne radio receiver, the loaded Q of the aerial coupling circuit at input of mixer is 125. If intermediate frequency 465KHz. Calculate i) Image Frequency and its rejection at 1 MHz. and 30MHz ii) The IF required to make the Image rejection ratio as good at 30MHz as it is at 1MHz.	[8]
		OR	
Q. 6	A)	Draw the block diagram of FM super heterodyne radio receiver. Explain working of each block mentioning the typical frequencies at different points.	[8]
	B)	The frequency Span to be received is from 525-1650KHz. If cmin of tuning circuit is limited to 50pf by a trimmer of 25pf. Calculate the value of padder capacitor. The max value of variable capacitor is 450pf, IF is 465KHz.	[8]

SECTION II

Q. 7	A)	Two resistors of 20K and 50K are operating at room temperature at bandwidth of 100 KHz, calculate thermal noise voltage generated by: i) Each resistor ii) Resistor in series iii) Resistor in parallel	[8]
	B)	Explain different types of Internal Noise.	[8]
		OR	
Q. 8	A)	Explain i) Noise figure ii) Noise factor iii) Noise temperature iv) SNR	[8]
	B)	In a radio receiver RF amplifier and Mixer are connected in cascade. The RF amplifier has Noise Figure of 9dB and power gain of 15dB. The mixer has Noise figure 20dB. Calculate the overall Noise figure for this cascade connection.	[8]
Q. 9	A)	Explain the performance of AM in presence of noise	[8]
	B)	Explain the need of Pre-emphasis and De-emphasis with their respective frequency response in FM	[8]
		OR	
Q. 10	A)	Explain the performance of FM in presence of noise	[8]
	B)	Explain the performance of DSBSC in presence of Noise	[8]
Q.11	A)	Compare Digital Pulse Modulation Methods.	[10]
	B)	Explain aliasing and different ways to avoid aliasing.	[8]
		OR	
Q. 12	A)	Explain Delta Modulation & Adaptive Delta Modulation.	[8]
	B)	A 1KHz sine wave is sampled and transmitted using 12bit PCM and DM system. If 25 cycle of the signal are digitized find: i) Signaling rate ii) Bandwidth required iii) Total number of bits transmitted.	[10]

UNIVERSITY OF PUNE

[4362-170A]

S.E.(Electronics and E&TC) Examination 2013

Control Systems

(2003 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 4]**

Instructions:

(1)Answer to the TWO sections should be written in separate answer books

(2)Neat diagrams must be drawn whenever necessary.

(3)Figures to the right indicate full marks.

(4)Use of electronic pocket calculator is allowed.

(5)Assume suitable data whenever necessary.

SECTION-I

Q.1 (a)Define the following with an example foe each. (8)

(i)Linear system

(ii)Nonlinear system

(iii)Feedback system

(iv)Feed Forward system.

(b)Reduce the following block diagram shown in Fig.1 into a single equivalent block by block reduction techniques. (8)

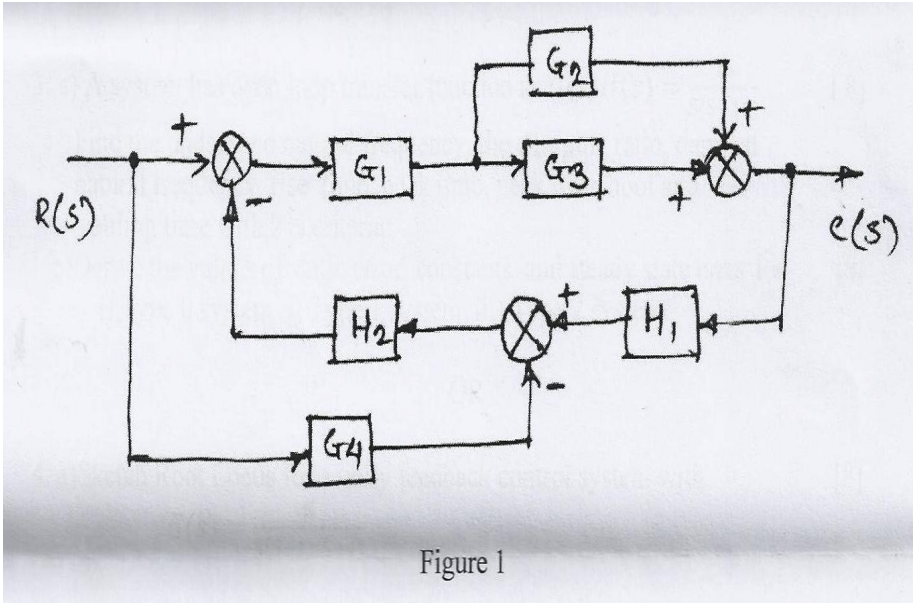


Figure 1

OR

Q.2 (a)Distinguish between the following. (8)

(i)Feedback and Feed forward control system

(ii)Open loop and Closed loop control system

(b)Using Mason;s gain formula find the gain of the following system shown in the fig 2. (8)

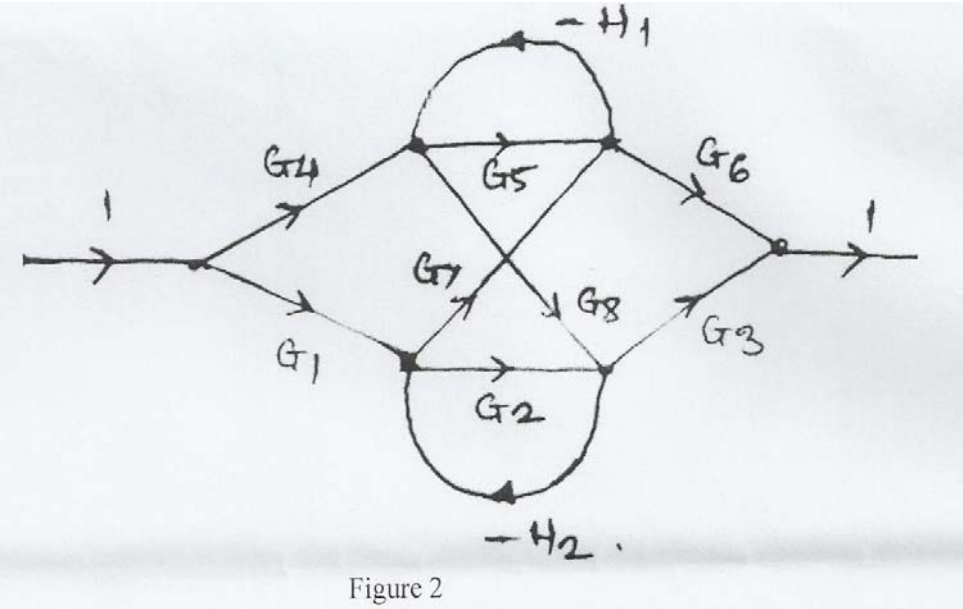


Figure 2

Q.3 (a)A system has open loop transfer function as $G(s)H(s)=\frac{16}{S(s+16)}$ find the undamped natural frequency ,the damping ratio,damped settling time with 2 % criteria. (8)

(b)Derive the values of static error constants and steady error for (8)

(i)Type 0 system (ii)Type 1 system (iii)Type 2 system

OR

Q.4 (a)Sketch Root Locus foe a unity feedback control system with

$$G(s)=\frac{K}{S(S+1)(S+4)} \quad .$$ (8)

(b)Draw the response of an under damped second order system with unit step excitation.show the various specification clearly and define them. (8)

Q.5 (a)A unity feedback control system has $G(S)=\frac{K}{S(S+2)(S+20)}$

Sketch the Bode plot and find the phase margin and gain margin if K=40.K=400 , K=4000.Comment on the stability. (12)

(b)Write frequency domain specifications in Bode plot. (6)

OR

Q.6 (a)Design a Lead Compensator using Bode plot for the transfer function. (10)

$$G(s)=\frac{10}{S(S+1)}$$

To meet the following specification Phase Margin 50^0 .

(b)Sketch the Nyquist plot and comment on the closed loop stability for the unity feedback system. $G(s)=\frac{K}{S(S+2)(S+10)}$ (8)

SECTION-II

Q.7 (a)What is transition matrix?State the properties of transition matrix. (8)

(b)Explain the state model for Multiple Input Multiple Output(MIMO) control systems with the help of a block diagram. (8)

OR

Q.8 (a)State and Explain the following terms. (8)

(i)State

(ii)State Variable

(iii)State vector.

(b)What is controllability and observability. (8)

Q.9 (a)Explain the construction and working of basic piezoelectric pressure transducer. (8)

(b)Explain the signal conditioning circuit used for thermistor. (8)

OR

Q.10 (a)Explain the construction and principle of strain guage. (8)

(b)Write a short note on Synchors. (8)

Q.11 (a)Compare on/off and PID controller. (8)

(b)Draw a ladder diagram for automatic washing machine. (10)

OR

Q.12(a)Draw and explain the architecture of PLC. (8)

(b)Draw a ladder diagram for an elevator and explain it. (10)

UNIVERSITY OF PUNE

[4362]-170C

S. E. (E& T C/ Electronics) Examination 2013

ELECTRICAL CIRCUITS AND MACHINES

(2003 Pattern)

[Total No. of Questions:] **[Total No. of Printed pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(1) *Answer **Q1 or Q2, Q3, or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12***

(2) Answers to the two Sections should be written in separate answer-books

(3) Neat diagrams must be drawn wherever necessary.

(4) Figures to right indicate full marks.

(5) Assume suitable data, if necessary.

(6) *Use of logarithmic tables, slide rule, Molllier charts, electronic pocket calculator and steam tables is allowed.*

Q.1 a)Explain with neat circuit diagram procedure for conducting O.C & S.C. Test on a single phase trans former. How the readings obtained are useful for Calculating efficiency and regulation. [12]

b)Sketch the equivalent Circuit of a single phase transformer [4]

OR

Q.2 a)The following results were obtained for 50KVA, 2400/120V, 50Hz, single phase transformer after performing O.C & S.C Test on it [12]

i)O C Test (LV side)

v_1 =120v, Io =9.65 A, Pi = 396 watt

ii)S.C Test (H.V. side)

Vsc =92V , Isc =20.8 A Psc =810 watt

Determine (1)The circuit constants.

2)Efficiency at 0.8 F.L lagging P.F. and

3)Regulation at F L 0.8 lagging P.f.

Q.2 b) Compare single phase Auto Trans-former with single phase Two winding trans former. [4]

Q.3 a) Derive an emf equation of a D.C Generator [6]

b) Sketch and Explain Basic characteristics of D.C Shunt motor and Series motor [12]

OR

Q.4 a) Explain with neat diagram working of Three Point Starter [12]

b) A 230V DC Series motor has an armature circuit resistance of 0.2 ohm and Series field resistance of 0.1 ohm At rated voltage, the motor draws current of 40 A & runs at a Speed of 1000 rpm Find the speed of the motor for a line current of 20 A at 230 v. Assume that the Flux at 20 A line current is 60% of the Flux at at 40 A line current. [6]

Q.5 a) Explain the method of measuring reactive power in a 3-phase 3 wire balanced load circuit using one wattmeter. [8]

b) A balanced 3 phase star connected load is fed from a three phase 400 v, 50Hz AC supply. The current drawn is 25 Amp lagging and total active power consumed by load is 15 kw. Determine a)resistance & inductance of the load per phase b)total reactive power c)total apparent power. [8]

OR

Q.6 a) Two wattmeters are connected to measure the power supplied to a 3 phase, 500v circuit indicate total input to be 10 kw The power [8]

factor is 0.3 lagging Find the reading on each watt-meter.

Q.6 b) Write a short note on [8]

"Energy Audit"

SECTION II

Q.7 a) Derive an expression for torque developed by 3- phase induction motor [6]

b) A 3 phase 4 pole induction motor supplies a useful torque of 160 N-m at 5% slip . The stator losses are 1000 watt & mechanical losses are 500 watt. Calculate i) rotor input ii)motor input and iii)the efficiency of the motor. [10]

OR

Q.8 a) Sketch and Explain the torque slip characteristic of a 3- phase induction motor. [8]

b) Sketch and explain working of star- Delta starter used for 3 phase induction motor [8]

Q.9 a)Define & Derive the expressions for i)Pitch factor & ii) Distribution factor for an Alternator. [8]

b)Explain with neat circuit diagram Synchronous impedance method for determining voltage regulation for an Alternator [8]

OR

Q.10 a) A- 3 phase, 50Hz 20 pole salient pole alternator with star connected winding has 180 slots on the stator. There are 8 conductors per slot & Coils are full pitched. If flux per pole is 25 mwb sinusoidally distributed calculate i) the speed ii) the generated emf per phase and iii) the line value of emf. [8]

b) Why synchronous motor is not self starting ? What is the method to make it self starting. [8]

Q.11 Write short note on [18]

i)AC & DC Servomotor comparision

ii)Single phase shaded pole induction motor.

iii) Universal motor.

OR

Q.12 Write short note on [18]

i)Hysteresis motor.

ii) Reluctance motor.

iii)Stepper motor.