QE REM - IV EXTC CBGS

CS / EXTC / IV / CBGS
28-12-2016
Sub :- CS

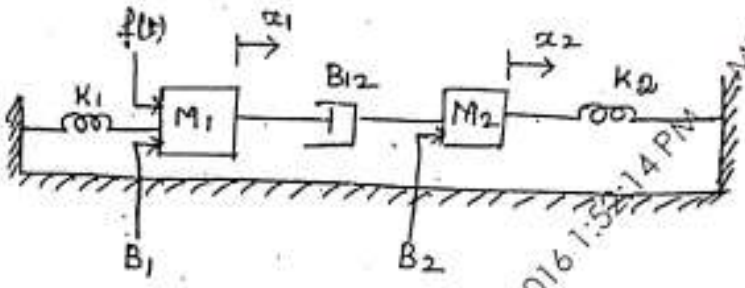
Q.P. Code : 546200

(3 Hours) [Total Marks : 80

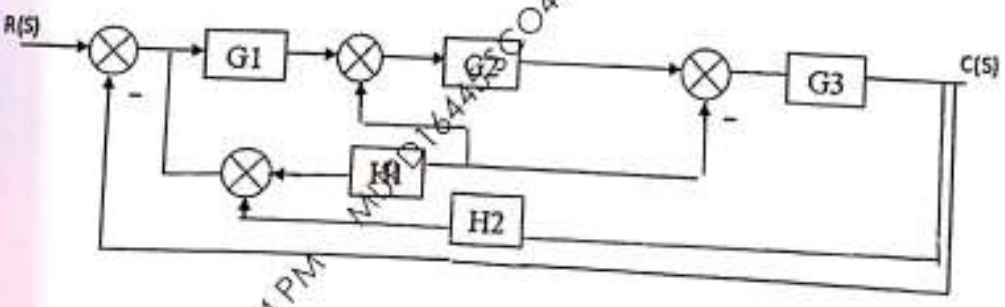
N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **three** questions from **remaining** questions.
(3) Assume suitable **data** if **necessary**.

1. (a) Differentiate between feed back and feed forward control system. 5
(b) What are the basic properties of signal flow graph? 5
(c) Compare Lead compensator and Lag compensator. 5
(d) Explain different performance index for optimal control problems. 5

2. (a) Obtain the transfer function of the Mechanical System : 10



(b) Using the block diagram reduction Technique find the transfer function of the given system: 10



3. a) Obtain the state variable model of the Transfer function : 10

$$\frac{Y(s)}{U(s)} = \frac{3s+4}{s^2+5s+6}$$

b) Explain controllability and observability analysis of LTI system. Using example. 10

[TURN OVER

4. (a) Sketch the root locus for given system with unity feedback. **10**

$$G(s)\frac{k(s+9)}{s(s^2+4s+11)}$$

(b) Use the Routh stability criterion to Determine the range of 'k' for stability of unity feed back system whose open Loop transfer function is **10**

$$G(s)=\frac{k}{s(s+1)(s+2)}$$

(a) Sketch the polar plot for the open loop-transfer function given by **10**

$$G(s)=\frac{1}{s^2(1+s)(1+2s)}$$

(b) Sketch the Bode plot for the following Transfer function

$$G(s)=\frac{75(1+0.2s)}{s(s^2+16s+100)}$$

(a) Explain the frequency domain specifications. **7**
(b) Explain the concept of Neuro-Fuzzy adaptive control system. **6**
(c) Write short note on : Steady state errors in feed back control system and their types. **7**

SE Sem IV/CBGS/SRS/EXTC/ Dec 2016

Sub:- S & S

Q. P. Code : 546102

N.B.:

1. Question no.1 is compulsory
2. Attempt any three questions out of the remaining five.
3. Assume suitable data wherever necessary.

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[20]

Q 1] Answer the following

a) Determine if the following system is memoryless, causal, linear, time invariant

$y(t) = t\,x(t)$

b) Explain in brief ROC (Region of Convergence) conditions of Laplace transform.

c) Explain Gibbs phenomenon. What is a Gibbs oscillation?

d) Explain relation between Fourier Transform and Laplace transform.

e) Determine if the given sequence is periodic or not. If periodic, find out fundamental period.

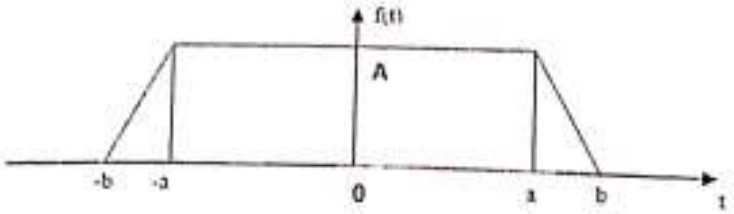
$$x[n] = \sin\left(\frac{6\pi}{7}n + 1\right)$$

Q 2] a) Find the response of the time invariant system with impulse response h[n]={1, 2, 1, -1} to an input signal x[n]= {1,2,3,1} using convolution as well as using Z transform. Verify your answers. [10]

b) Determine inverse Laplace Transform of [10]

$$X(s) = \frac{3s^2 + 8s + 23}{(s+3)(s^2 + 2S + 10)}$$

Q 3] a) Determine the Fourier Transform of the trapezoidal function shown in the figure below. [10]



b) Find the inverse Z transform of the following function [10]

$$X(z) = \frac{1}{1 - 0.8z^{-1} + 0.12z^{-2}}$$

for the following ROCs

a) $|z| > 0.6$

b) $|z| < 0.2$

c) $0.2 < |z| < 0.6$

TURN OVER

Q 4] a) Find out DTFT of the following [8]

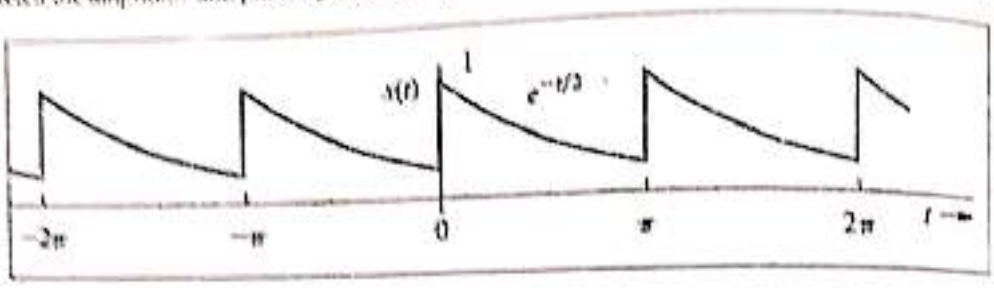
i) x[n]= {1, -1, 5, 2}

ii) x[n] = $-a^n u[-n-1]$, where $|a| < 1$

b) An LTI system is described by the following equation. Determine the transfer function and impulse response of the system. Sketch the poles & zeros of the z-plane. [8]

x[n] - 4x[n-1] + 3x[n-2] = x[n-1]

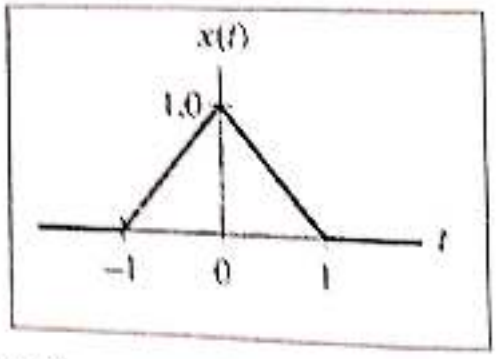
Q 5] a) Find Complex Trigonometric Fourier Series for the signal x(t) shown in the following figure. Sketch the amplitude and phase spectra for x (t). [8]



b) The impulse response of a CT system is given below. Determine the unit step response of the system using convolution theorem of Laplace Transform. [10]

h(t)= u(t+2) + u(t-2)

Q 6] a) A CT signal has been shown below. Sketch the following signals [8]



i) x(t-4) ii) x(4-t) iii) x(-2t+2) iv) x(0.5t)

b) State and prove appropriate mathematical derivation, 'convolution in time domain' property and 'time reversal' property of Z transform. Also comment on importance of these properties in the field of communication and signal processing. [8]

XXX XXX XXX

PCE / EXTC / IV / 0616
15-12-2016

Q.P. Code : 545004

(3 Hours) [Total Marks : 100

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

1. Answer **any four** of the following :
   (a) What is the purpose of AFC loop in FM.
   (b) Explain the use of limiter in FM receiver.
   (c) Compare TDM & FDM.
   (d) Draw the spectrum of AM wave, DSBSC & SSBSC wave.
   (e) Explain noise triangle in FM.

2. (a) Define amplitude modulation & derive the equation for amplitude modulated wave. 10
   (b) Explain the following with reference to radio receivers : 10
   (i) Image frequency
   (ii) Squelch circuit
   (iii) Double conversion
   (iv) Tracking error

3. (a) Draw the schematic of ratio detector & describe its operation. 10
   (b) A 20 MHz carrier is modulated by 400 Hz audio sine wave. If the carrier voltage is 5V & maximum deviation is 20 kHz. Write the equation for this frequency modulated wave. If the modulating frequency is now changed 5kHz & carrier voltage is changed 10V, all else remaining constant, write equation for this wave. Calculate the power dissipated across 200 Ω resistor by both FM waves. 10

4. (a) Explain the working of balanced ring modulator to generate DSBSC signal. 10
   (b) Explain how PAM signal can be generated & demodulated. 10

5. (a) Compare : 10
   (i) AM & FM
   (ii) FM & PM

TURN OVER

(1)

St Sem - IV Extc (Sss)

WTP/Extc/IV/Cass

15-12-16

Sub :- WTP

QP CODE : 546003

(3 Hours) (Total Marks : 80)

NOTE :

1. Question No.1. is **compulsory**. Attempt any **four** out of **five** in it.
2. Attempt any **three** out of remaining **five**.
3. Assume suitable data, wherever **necessary** and **justify** the same.
4. Figures to the right indicate marks.

1. A) Given the potential $V = 2x^2y - 5z$ (V) and a point P (-4, 3, 6), find (2+2+1)
   a) Electric field intensity at P
   b) Electric flux density at P
   c) Volume charge density at P

   B) State the Maxwell's equations for good dielectric in integral and point form. Also state their significance. (5)

   C) Explain Super refraction. (5)

   D) With the help of neat schematic diagram, explain the working of an Electromagnetic Pump. (5)

   E) Compare MOM, FEM and FDM. (5)

2. A) Two extensive homogeneous isotropic dielectrics meet on plane $z = 0$. (5+5)
   For $z > 0$, $\varepsilon_{r1} = 4$ and for $z < 0$, $\varepsilon_{r2} = 3$.
   A uniform electric field $\vec{E}_1 = 5\hat{a}_x - 2\hat{a}_y + 8\hat{a}_z$ (kV/m) exists for $z \geq 0$. Find,
   a) $\vec{E}_2$ for $z \leq 0$.
   b) The angles E_1 and E_2 make with the interface.

   B) State Poynting theorem. Write its final expression and explain the meaning of each term. (5)

   C) Obtain the reflection and transmission coefficient of a perpendicular polarized wave incident between a dielectric-dielectric boundary with an oblique incidence. (5)

3. A) Determine the potential at the free nodes in the potential system of Fig.1. using Finite Difference Method (Band Matrix Method). (10)

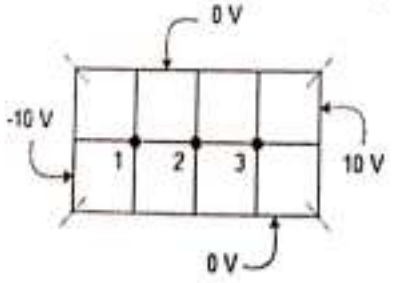


Fig.1.

   B) Derive Helmholtz equations for electromagnetic fields in free space. (5)

(TURN OVER

C) For the normal incidence, determine the amplitudes of reflected and transmitted $\vec{E}$ and $\vec{H}$ at interface of two regions at $z = 0$. (5)
Given: Incident $E_i = 1.5 \times 10^{-3}$ (V/m); $\varepsilon_{r1} = 8.5$; $\mu_{r1} = 1$; $\sigma_1 = 0$.
Second region is free space.

4. A) State and derive FRISS transmission equation. (10)
B) Calculate skin depth and wave velocity at 1.6 MHz in aluminum with the conductivity 38.2 mS/m and $\mu_r = 1$. (5)
C) What is ionosphere? Which layers are present during day and night time? Where maximum attenuation of electromagnetic waves takes place inside the ionosphere? (5)

5. A) Obtain an expression for MUF in terms of d, H and f_c. (5)
If a high frequency communication link is to be established between two points on the Earth 2000 km away, and the reflection region of ionosphere is at height of 200 km and has critical frequency of 5 MHz, then calculate the MUF for the given path.
B) The receiving antenna is located at 80 km from the transmitting antenna. The height of transmitting antenna is 100 m. Find the required height of receiving antenna. (5)
C) Explain the formation of inversion layer in troposphere. (5)

6. A) Consider a two element mesh as shown in Fig.2. Using FEM determine the potentials at free nodes. (10)

Node	(x, y)
1	(0.8, 1.8)
2	(1.4, 1.4)
3	(2.1, 2.1)
4	(1.2, 2.7)

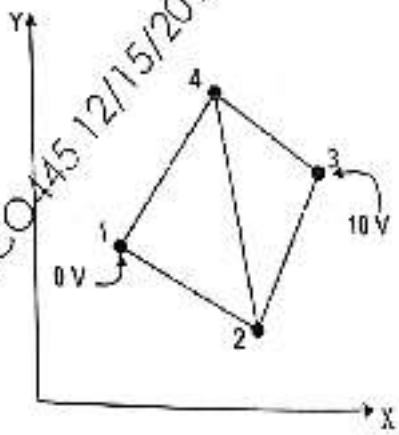


Fig.2.

B) Define critical frequency as a measure of ionospheric propagation and determine critical frequency for reflection at vertical incidence if the maximum value of electron density is 1.24×10^6 per CC. (5)
C) Explain formation of duct and condition for duct propagation. (5)

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BE SEM-IV EXTC (Old) NOV-DEC-2016

EPC-II / EXTC / IV / OLD

08-12-16

Qub :- EDC-II

Q.P. Code : 544901

(3 Hours) [Total Marks : 100

N.B. : (1) Question No.1 and 2 is compulsory.
(2) Answer any **three** from remaining questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable data if required.

1. (a) Design a two stage RC coupled CB-CE amplifier for following parameters: 15
Av ≥ 1600, $F_L \leq 20$ Hz, Si≤10, VO=4 Volts Use BC 147B transistor.
(b) Obtain gain of the designed amplifer with RE Unbypassed of the stage-1 5

2. (a) Design a class B power Amplifier with the following specifications: 15
Output power = 8 watts, RL = 8 Ω, VCC = 15 V.
(b) Calculate the overall efficiency at the full load 5

3. (a) Derive the expression for gain, input impedence and output impedance of two stage FET based CS-CS amplifier with Rs bypassed. 10
(b) Obtain Avf, Rif and Rof for the amplifier shown in the figure using concept of negative feebdack. Assume hfe = 150, hie = 1.5KΩ 10

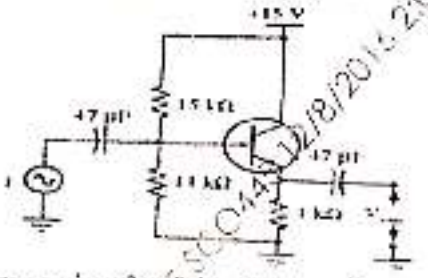


fig.1

4. (a) A. Derive the expression for gain, input resistance and output resistance for balanced input unbalanced Output Diff-amp using BJT transistor. 10
(b) Explain concept of LC oscillator and hence explain Hartley oscillator. 10

5. (a) With the help of circuit diagram explain the operation of transistorized ASTABLE multivibrator with appropriate waveforms. 10
(b) Obtain the lower cut off frequency of the amplifier circuit shown in figure. 2 10
Assume hie= 3KΩ and hfe= 200 for both the BJT'S. Neglect hre and hoe.

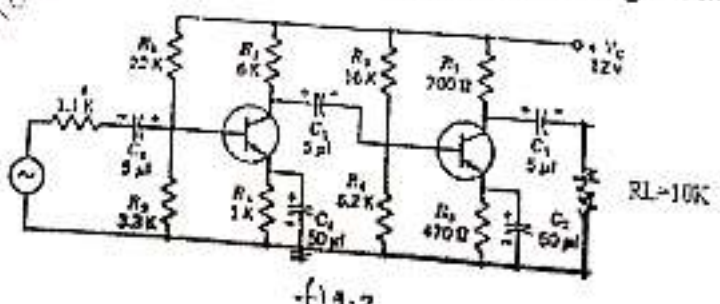


fig.2

6. (a) Compare the various types of power amplifier (4 points) and hence derive the expression for efficiency of complimentry symmetry CLASS B power amplifier. 1

(b) Explain the concept of negative feedback and explain its effect on gain,input and output impedance In voltage shunt feedback network. 1

7. Write a short note on following.
   (a) Types of coupling in amplifier network
   (b) Cross over distortion in CLASS B power amplifier.
   (c) Heat sink in power amplifier
   (d) UTP and LTP in Schmitt trigger.
   (e) Miller theorem.

Transistor type	$P_d$max @ 25°C Watts	$I_C$max @ 25°C Amps	V_{ce} sat volts d.c.	V_{ceo} volts d.c.	V_{cer} (5Ω) volts d.c.	V_{cex} (5Ω) volts d.c.	V_{ecx} volts d.c.	V_{ebo} volts d.c.	T_j max °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal h_{fe} min.	Small Signal h_{fe} typ.	h_{fe} max.	V_{BE} max.	C_{ob} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN 055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN 149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	35	50	—	6	175	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	25	30	—	—	—	100	35	—	65	—	65	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	175	200	290	450	240	330	500	0·9	—	—

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

BFW 11—JFET MUTUAL CHARACTERISTICS

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

N-Channel JFET

Type	V_{ds} max. Volts	V_{dg} max. Volts	V_{gs} max. Volts	P_d max. @25°C	T_j max.	I_{dss}	g_{os} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·33°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW

(10)

BE SEM - IV EXTC (CBGS) NOV-DEC-2016

MP/EXTC/IV/CBGS
08-12-16

Sub :- MP

Q.P. Code : 545901

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

N.B. : (1) Q 1 is compulsory. Solve any 3 questions out of remaining

1. (a) Write features of 80486. 4
   (b) Differentiate between minimum and maximum modes of 8086. 4
   (c) Describe pin diagram of 8085 microprocessor. 4
   (d) Sketch read and write bus cycle of 8086 with example. 4
   (e) Explain in brief about programmable peripheral interface 8255. 4

2. (a) Describe the various addressing modes supported by 8086 with examples. 10
   (b) Explain with suitable examples the following instructions of 8086. 10
   i) CBW ii) TEST iii) LAHF iv) XLAT v) LEA

3. (a) Write an assembly language program of 8086 to find out factorial of number N and also draw Flowchart. 10
   (b) Discuss the functions of general purpose registers of 8086. Explain the function of each register and instruction support for these functions. 10

4. (a) Describe the function of following pins in 8086 Microprocessor. 10
   1) NMI 2) READY 3) ALE 4) QS0 and QS1 5) S0, S1, S2
   (b) Explain pin diagram of ADC 0808/0809 and method of interfacing to 8086 microprocessors. 10

5. Design 8086 microprocessor based system using minimum mode with the following specifications. 20
   (i) 8086 microprocessors working at 10 MHz
   (ii) 32Kb EPROM using 8 k Devices
   (iii) 32 Kb SRAM using 8 k devices
   Clearly show memory map with address range. Draw the neat schematic.

6. (a) Explain direct memory access (DMA) controller 8257 and its method of interfacing with 8086 microprocessor with a suitable example. 10
   (b) Describe in brief and compare architecture of 80286 and 803 86 microprocessors. 10

(10)

BE ELEX C CBGS NOV-DEC-2016

Q.P. Code : 545800

Duration: 3 Hours (Revised Course) Total Marks: 80

N.B. : 1) Q.1. is compulsory.

2) Attempt any three from the remaining.

Q.1. a) If $f(x)$ is an algebraic polynomial in x and λ is an eigen value and X is the corresponding eigen vector of a square matrix A then $f(\lambda)$ is an eigen value and X is the corresponding eigen vector of $f(A)$. (5)

b) Find the extremal of $\int_{x_0}^{x_1}(x+y')y'dx$ (5)

c) Express $(6,11,6)$ as linear combination of $v_1=(2,1,4), v_2=(1,-1,3), v_3=(3,2,5)$. (5)

d) Evaluate $\int_C \frac{z}{(z-1)^2(z-2)}dz$, where C is the circle $|z-2|=0.5$ (5)

Q.2. a) Find the curve $y=f(x)$ for which $\int_0^{\pi}(y'^2-y^2)dx$ is extremum if $\int_0^{\pi} ydx=1$. (6)

b) Evaluate $\int_0^{2\pi}\frac{\cos 3\theta}{5+4\cos\theta}d\theta$ (6)

c) Find the singular value decomposition of $\begin{bmatrix}2 & 3\\ 0 & 2\end{bmatrix}$ (8)

Q.3. a) Verify Cayley Hamilton theorem for $A=\begin{bmatrix}3 & 10 & 5\\ -2 & -3 & -4\\ 3 & 5 & 7\end{bmatrix}$ and hence, find the matrix represented by $A^6-6A^5+9A^4+4A^3-12A^2+2A-I$. (6)

b) Construct an orthonormal basis of R^3 using Gram Schmidt process to S={[3,0,4],[-1,0,7],[2,9,11]} (6)

c) Find all possible Laurent's expansions of $\frac{z}{(z-1)(z-2)}$ about $z=-2$ indicating the region of convergence. (8)

[Turnover

Q.4. a) Reduce the quadratic form $2x^2 - 2y^2 + 2z^2 - 2xy - 8yz + 6zx$ to canonical form and hence, find its rank, index and signature and value class. (5)

b) If $\phi(\alpha) = \int_C \frac{4z^2 + z + 5}{z - \alpha} dz$, where C is the contour of the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$, find the values of $\phi(3.5), \phi(i), \phi'(-1), \phi''(-i)$

c) Using Rayleigh–Ritz method, solve the boundary value problem $I = \int_0^1 (y'^2 - y^2 - 2xy)dx$; $0 \le x \le 1$, given $y(0) = y(1) = 0$. (8)

Q.5. a)Find the extremal of the function $\int_0^{\pi/2} (2xy + y^2 - y'^2)dx$; with $y(0) = 0, y(\pi/2) = 0$ (5)

b) Find the orthogonal matrix P that diagonalises $A = \begin{bmatrix} 4 & 2 & 2 \\ 2 & 4 & 2 \\ 2 & 2 & 4 \end{bmatrix}$ (6)

c) Using Cauchy's Residue theorem, evaluate $\oint_C \frac{z^3 + 3}{z^2 - 1} dz$ where C is the circle (i) $|z - 1| = 1$

(ii) $|z + 1| = 1$. (5)

Q.6. a) Find the sum of the residues at singular points of $f(z) = \frac{z}{(z-1)^2(z^2-1)}$ (5)

b) If $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$, prove that $A^{50} - 5A^{49} = \begin{bmatrix} 4 & -4 \\ -2 & 2 \end{bmatrix}$ (5)

c) (i) Check whether W={(x,y,z) | y=x+z, x,y,z are in R} is a subspace of R^3 with usual addition and usual multiplication.

(ii) Find the unit vector in R^3 orthogonal to both u=(1,0,1) and v=(0,1,1).

QP Code:5 11800

(3 Hours) [Total Marks :100

N.B. : (1) Question no. 1 is compulsory.
(2) Attempt any four questions from the remaining six questions.
(3) Assumptions made should be clearly stated.
(4) Assume any suitable data wherever required but justify the same.
(5) Figures to the right indicate marks.
(6) Illustrate answer with sketches wherever required.
(7) Answers to questions should be grouped and written together.
(8) Use a blue/black pen to write answers. Use of pencil should be done only to draw sketches and graphs.

1. (a) Define the following with respect to OPAMP and specify its values for the IC μA741 20
   i. Input offset voltage
   ii. CMRR
   iii. PSRR
   iv. Slew rate
   (b) Compare active and passive filters
   (c) Give the difference between Moore machine and Mealy machine
   (d) Explain the following terms in relation to PLL
   i. Lock range
   ii. Capture range

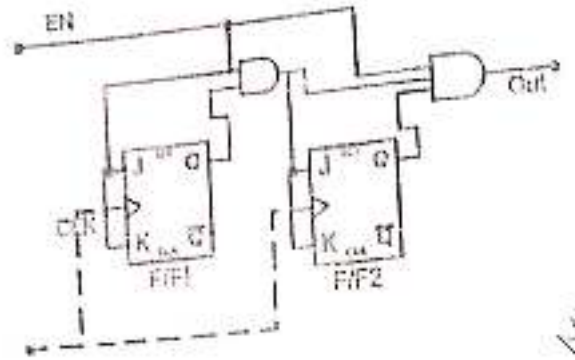
2. (a) Implement a circuit using 555 timer IC that generates a square wave of 50 % duty cycle. Explain the working and draw the waveforms at the output terminal and across the capacitor. Derive the equation for the time period. 10
   (b) With the help of a block diagram explain IC565 10

3. (a) Using equal components, design a second order band pass KRC filter with f_o =2KHz and BW=400Hz. What is its resonant gain? 5
   (b) Draw the circuit of instrumentation amplifier with dual op-amps. Find expression for the output voltage. 10
   (c) Explain in detail the various documentation standards of sequential circuits. 5

4. (a) Write the VHDL Code for 8 bit shift right register. 10
   (b) Design a sequential circuit using Mealy machine to detect an overlapping sequence 1110 using JK flip flop. 5
   (c) Design a circuit which generates the output voltage .Use standard values for resistors. 5

(c) Explain how IC 74194 can be used as a ring counter 5

6. (a) Draw the state table and state diagram for the following circuit 10



(b) Explain non inverting Schmitt trigger circuit

(c) Explain the operation of sample and hold circuit. Draw its input and output waveforms

7. Write short notes on:-
   i. Log amplifier
   ii. FPGA and CPLD
   iii. Concept of switched capacitor filter
   iv. VCO IC566

(10)

BE (EXTC) - IV EXAM (CBGS) NOV - DEC - 2016
SE EXTC / IV / AE-II / CBGS
24/11/16
Sub - AE - II

QP CODE : 545704

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

N.B: (1) Question No.1 is compulsory.
(2) Solve any three questions from the remaining five.
(3) Figures to the right indicate full marks
(4) Assume suitable data if required and mention the same in the answer sheet.

1. Solve any five:- 20

(a) Compare series and shunt voltage regulators
(b) Differentiate between two transistor(BJT) and three transistor (BJT) current sources
(c) What is cross-over distortion? How it is overcome.
(d) Derive expression for the output voltage of differentiator.
(e) BJT has parameters f_t=200MHz at I_C=1.5mA, β=200,C_μ=0.2pF. Calculate bandwidth f_β and capacitance C_π of BJT.
(f) Draw and explain in brief frequency response of Common Emitter Amplifier.

2. (a) In the common-base circuit shown in Fig 2a, the transistor parameters are: β=100, V_{BE}(on)=0.7V, V_A=∞, Cπ=10pF and Cμ=1pF. (i) Determine the higher cut off frequencies corresponding to the input and output portions of the equivalent circuit. (ii) Calculate the small signal mid band voltage gain. 10

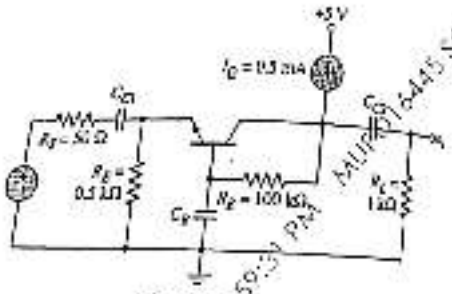


Fig 2a

2. (b) For the circuit in Fig 2b, the transistor parameters are: Kn=1mA/V^2, V_{TN}=0.8V, Cgs=2pF and Cgd=0.2pF. Determine: (i) the Miller Capacitance (ii) the higher cut-off frequency (iii) the mid band voltage gain 10

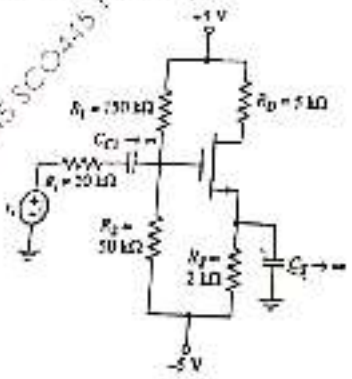


Fig. 2b

TURN OVER

3. (a) Draw circuit diagram of two stage Common Emitter Amplifier (CE-CE) and deriv
expression for overall voltage gain, current gain, input resistance and output resistan
using hybrid-π equivalent circuit.
3. (b) The transistor parameters for the circuit shown in Fig 3b are: β =100, $V_{BE(on)}$=0.7
and V_A=∞. (i) Determine R_B such that I_E=150μA. (ii) Find differential gain Ad, Comm
Mode gain Ac for one sided output at Vo_2.

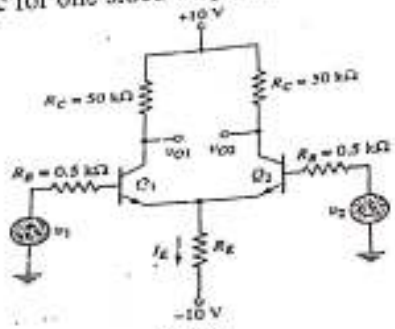


Fig 3b

4. (a) Explain working of first order low pass filter with help of circuit diagram and
derive expression for its voltage gain and cut-off frequency.
4. (b) Explain working of transformer coupled Class-A power Amplifier and der
expression for its efficiency.
5. (a) Draw circuit diagram of subtractor using OpAmp and derive expression for its ou
voltage.
5. (b) Draw the circuit diagram of MOSFET based differential amplifier and de
expression for differential voltage gain, common mode gain, and CMRR.
6. Write short notes on any four
   (a) Darlington Configuration
   (b) Transistorized series regulator
   (c) Widlar Current sources
   (d) Cascode Amplifier
   (e) Class AB Power Amplifier

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(10)

BE SEM - RE (Old) EXTC
SE EXTC / IV / OLD / APR-IV
24/11/16
BE - APR - IV

QP Code :544702

(3 Hours) [Total Marks :100

N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any four questions from the remaining six questions.
(3) Figures to the right indicate full marks.

1. (a) If $A = \begin{bmatrix} \frac{3}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{3}{2} \end{bmatrix}$ then find A^n. 5

(b) Evaluate $\int_c (x^2 + ixy)dz$ from $z = 1-i$ to $z = 2+4i$ along the curve $y = x^2$ 5

(c) Prove that $J_{\frac{1}{2}} = \sqrt{\frac{2}{\pi x}}\left(\frac{\sin x}{x} - \cos x\right)$ 5

(d) Find the constants a ,b c ,d and e If 5
$f(z) = (ax^4 + b x^3y^1 + cy^4 + dx^2 - 2y^2) + i(4x^3y - cxy^3 + 4xy)$ is analytic

2. (a) Find the eigenvalues and eigen vectors for the matrix $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ 6

(b) Prove that $J_{\frac{7}{2}}(x) = \left(\frac{48}{x^3} - \frac{8}{x}\right)J_1(x) + \left(1 - \frac{24}{x^2}\right)J_0(x)$ 6

(c) Obtain the Tylors and laurents series of f(z). Where $f(z) = \frac{z^2 - 1}{z^2 + 5z + 6}$ about 8
$z = 0$, indicating the region of convergence in each case.

(a) Show that the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ 6
is diagonalisable and write the diagonal form

(b) Evaluate $\int_0^{2\pi} \frac{1}{17 - 8\cos\theta} d\theta$,using contour inteqration. 6

(c) Verify Green's theorem for $F = (x^2 - xy)i + (x^2 - y^2)j$ and C is the closed curve bounded by $x^2 = 2y$ and $x = y$ 8

[TURN OVER

4. (a) Using Residue theorem, to evaluate

$\int_c \frac{z+1}{z^3(1-4z^2)}dz$ where c is the circle $|z| = 1$

(b) Show that the matrix $A = \frac{1}{2}\begin{bmatrix} \sqrt{2} & -i\sqrt{2} & 0 \\ -i\sqrt{2} & -\sqrt{2} & 0 \\ 0 & 0 & 2 \end{bmatrix}$ is unitary

(c) Evaluate by Gauss's Divergence theorem, to evaluate $\iint_s \vec{N} \cdot \vec{F}\, ds$ where $\vec{F} = 2xi - xyj + zk$ over the region bounded by the Cylinder $x^2 + y^2 =$

5. (a) Verify Laplace's equation for $u = \left(r + \frac{a^2}{r}\right)\cos\theta$ also find v and f(

(b) Show that the matrix $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$

is derogatory and find its minima equation

(c) Expand $f(x) = 1$ in $0 < x < 1$ in a series as $1 = \sum \frac{2}{\lambda_n J_1(\lambda_n)} J_0(\lambda_n x)$

Where $\lambda_1, \lambda_2, \ldots, \lambda_n$ ..... are the roots of $J_0(x) = 0$.

6. (a) Find the analytic function $f(z) = u + iv$ such that $u - v = \frac{\cos x + \sin x - e^{-y}}{2\cos x - e^{y} - e^{-y}}$

(b) If $A = \begin{bmatrix} -1 & 4 \\ -2 & 1 \end{bmatrix}$ then P.T. 3tan A=Atan3

(c) By using stokes theorem, evaluate $\int_c (x^2 + y^2)\, i + (x^2 - y^2)$ boundary of the region enclosed by circles. $x^2 + y^2 = 4, x^2 + y^2$

(a) Find the bilinear transformation which maps the points z=1,i, -1 form the z plane onto the points w = 0, 1, ∞ in w plane 6

(b) Evaluate $\int_0^\infty \frac{1}{x^2+1} dx$, using contour integration 6

(c) Reduce the quadratic form $8x^2 + 7y^2 - 3z^2 - 12xy - 8yz + 4xz$ to canonical form through congruent transformation and find its rank, index and signature. 8