(2)

S.E ExTC (old)

07/06/2017

R-2007

Q.P. Code :18424

[Time: Three Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Attempt any four questions from remaining six.
3. Assume suitable data if necessary.

Q. 1 Answer the following **20**

a) State and explain Coulomb's law. Give an example.

b) State and explain Gauss's law. Give an application.

c) Explain method of images.

d) State ampere's law and derive expression for the field of an infinite current carrying conductor using Ampere's law.

Q. 2 a) Find the expression for electric field intensity due to an infinite line with charge charge density of ρ_lc/m. **10**

b) Show that the electro static energy stored in a parallel plate capacitor is given by $\frac{1}{2}CV^2$ where symbols have usual meaning. **10**

Q. 3 a) Prove that static electric field is irrotational and the static magnetic field is solenoidal. **10**

b) Derive Poison's and Laplace's equation. Give their application. **10**

Q. 4 a) Define scalar and vector magnetic potential. Give their expression and unit. Give the magnetic vector potential $A = -\rho^2/4\,\hat{az}$; calculate the total magnetic flux crossing the surface $\emptyset = \pi/2$, $1 \leq \rho \leq 2$m, $0 \leq 2 \leq 2$m. **10**

b) Find the expression for the inductance of coxial cable length L where inner conductor has radius 'a' and the outer has radius 'b'. **10**

Q. 5 a) Three point charges of 3, 4 and 5 coulombs are located in free space a three corners of an equilateral triangle of 5cm side. Find the energy in the system. **10**

b) Explain Biot- Savart's law. Determine magnetic field intensity H for a straight current carrying conductor of finite length. **10**

Q. 6 a) Explain Maxwell's equations in differential and integral from; for static fields. Explain the significance of each equation. **10**

b) What is a Poynting vector? Derive and explain Poynting theorem. **10**

Q. 7 a) Derive the wave equation from Maxwell's equations. Explain and derive its solution in free space charge free region. **10**

b) A plane wave propagating through a medium with $\epsilon_r=8$, $\mu_r=2$, has $\bar{E} = 0.5\, e^{-z/3} \sin(10^8 t - \beta z)\hat{a}x$ v/m **10**

Determine

i) β

ii) The loss tangent

iii) Intrinsic impedance

iv) Wave velocity

v) H field.

S.E. Sem-IV (old) EXTC 15 May, 2017 (3)

Applied Maths-IV

Q.P. Code :16320

(3 Hours) **[Total Marks:100]**

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

(2)Attempt **Any FOUR** questions out of the remaining **SIX questions.**

(3) Figures to the right indicate full marks.

1(a) If $A=\begin{bmatrix}2 & 4\\ 0 & 3\end{bmatrix}$ then find eigenvalues of $6A^{-1}+A^3+2I$ where I is 2x2 identity matrix **[5]**

(b) Prove that real and imaginary parts of analytic function f(z)=u+iv are harmonic functions **[5]**

(c) If a vector field $\overline{F} = (x+2y+az)\hat{i}+(bx-3y-z)\hat{j}+(4x+cy+2z)\hat{k}$ is irrotational then find values of a,b,c **[5]**

(d) Prove that $J_{\frac{-1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\cos x$. **[5]**

2(a) Verify Green's theorem in plane for $\int (x^2-y)dx+(2y^2+x)dy$ where C is the closed curve of the region bounded by $y=4$ and $y=x^2$. **[8]**

(b) If $A=\begin{bmatrix}2 & 3\\ -3 & -4\end{bmatrix}$ then find A^{50} **[6]**

(c) Show that the map of the real axis of the Z plane is a circle under the transformation $w=\frac{2}{z+1}$. Find the center and the radius **[6]**

3(a) Show that the matrix $A=\begin{bmatrix}3 & -1 & 1\\ -1 & 5 & -1\\ 1 & -1 & 3\end{bmatrix}$ is diagonalizable. Find the transforming matrix and the diagonal matrix. **[8]**

(b) Evaluate $\int_o (ydx+xdy)$ along $y=x^2$ from O(0,0) to B(1,1) **[6]**

(c) Evaluate $\int_c \frac{2z^2+1}{(z+1)(z-2)}dz$ where C is circle |z|=3. **[6]**

[TURN OVER]

4(a) Reduce the given quadratic form $21x^2 + 11y^2 + 2z^2 - 30xy + 12xz - 8yz$ to canonical form and find rank and signature , [8]

(b) Evaluate by Residue theorem,

$$\int_0^{2\pi} \frac{d\theta}{5 + 3\sin\theta}$$ [6]

(c) Prove that $J_{\frac{5}{2}}(x) = \sqrt{\frac{2}{\pi x}}\left\{\frac{3 - x^2}{x^2}\sin x - \frac{3}{x}\cos x\right\}$ [6]

5(a) Expand $f(z) = \frac{2}{(z-1)(z-2)}$ about z=0 when i) $|z|<1$ ii) $1<|z|<2$ iii) $|z|>2$ [8]

(b) Using Cayley Hamilton theorem find A^{-1} and A^4 where $A = \begin{bmatrix} 1 & 2 & 2 & 1 \\ -1 & 3 & 0 & 1 \\ 0 & -2 & 1 & 2 \end{bmatrix}$ [6]

(c)Find the bilinear transformation which maps the points z= 2,1,0 from the Z plane on to the points 1,0,i in W plane [6]

6(a) By using Stoke's theorem evaluate $\int_C \{(x^2 + xy)\vec{j}\}.d\vec{r}$ where C is the boundry of the region enclosed by x=0,y=0,x=a,y=b [8]

(b) Given $A = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 2 & 2 & 2 \end{bmatrix}$, Is the matrix A derogatory ? [6]

(c)Using Milne Thompson's method construct the analytic function whose real part is $x^4-6x^2y^2+y^4$ [6]

7(a) Evaluate $\iint_S (ax^2 + by^2 + cz^2)ds$ using Gauss Divergence theorem, where S is the sphere $x^2+y^2+z^2=1$ [8]

(b) Find the image of a circle |z|=2 under the transformation w= z+3+2i.Also draw the figure [6]

(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 $\lambda_1, \lambda_2 \ldots$ $\ldots \lambda_n \ldots$ are positive roots of $J_0(x) = 0$ [6]

S.E. Sem-IV (OLD) EXTC

Or : 25/5/17 (02)

Q.P. Code : 544904

(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 two stage R-C coupled CE amplifier for the following parameters: Av ≥ 1100, S_{ICO} <10, and V_{cc} = 16V. Use transistor BC147A. Calculate voltage gain, input impedance, output impedance, and stability factor. **20**

2. a) Design class A transformer coupled power amplifier for output ac power 5 Watts, load resistance R_L = 10 Ω, Vcc = 10V Sico≤10. Calculate overall efficiency at full load. **10**

b) For the differential amplifier shown in fig.1 determine : **10**
i) D C bias conditions.
ii) Differential mode gain Ad.
iii) Common mode gain AC.
(Assume β = 100)

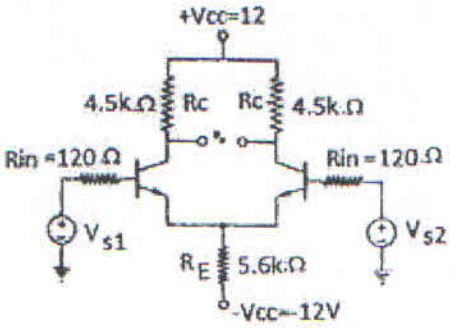

Fig. 1

3. a) A three stage RC coupled amplifier uses FET with the following parameters: g_m = 2.2 mA/V, r_d = 10k Ω, R_D = 9.8k Ω, R_G = 1.0M Ω, coupling capacitor Cc = 0.005 μf and Cs = ∞. Evaluate **10**
i) The overall mid-band voltage gain dB
ii) Lower 3-dB frequency of individual stages and
iii) Overall lower 3-db frequency.

b) Draw two stage CS-CS amplifier and derive the expressions for i) Overall mid-band voltage gain, ii) Input impedance, and iii) output impedance. **10**

[TURN OVER]

Q.P. Code : 544904

4. a) For the feedback amplifier shown in fig2, (i) Identify the type of feedback and (ii) Derive the expression for A_{VF}, R_{IF} and R_{OF} using negative feedback approach. **10**

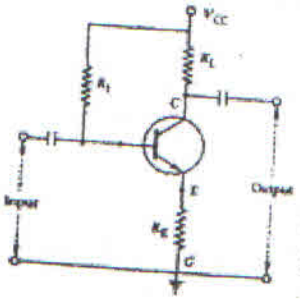

Fig.2

b) Draw a Wein bridge oscillator using BJT and Derive the expression for the frequency of oscillation and the value of gain required for sustained oscillation. Why negative feedback is used in Wein bridge oscillator? **10**

5. a) What are the different topologies of negative feedback amplifier and explain the effect of input and output impedance with feedback for the same. **10**

b) Write a short note on cascade amplifier using BJT. **10**

6. a) For class B push-pull power amplifier derive the expression for maximum efficiency. **10**

b) With neat sketch, explain the working of an astable multivibrator. On what factors does the frequency of the output signal depend? **10**

7. Write a short note on following. **20**

a) Crystal Oscillator and its application.

b) BJT High frequency equivalent circuit.

c) Crossover distortion in power amplifier.

d) Class C power amplifier.

Q.P. Code : 544904

Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 25°C Amps	$V_{CE}^{(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{EBO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small - Signal h_{fe} min.	typ.	max.	V_{BE} max.	θ_{jc} °C/W	Derate above 25°C W/°C
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	0·03
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

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

BFW 11—JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
I_{DS} max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
I_{DS} typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	1·7	0·8	0·2	0·0	0·0	0·0	0·0
I_{DS} min. mA	4·0	3·0	2·2	1·6	1·0	0·5	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0

N-Channel JFET

Type	V_{GS} max. Volts	V_{DS} max. Volts	V_{DG} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{mo} (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	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW

S.E - Sem. IV EXTC (OLD).
Analog & Digital IC Design & Application.

19/5/17

Q.P. Code: 13362

[Time: - 3 Hours] [Marks: 100]

Please check whether you have got the right question paper.

N.B:
1. Question No. 1 is compulsory.
2. Solve any four questions from Question no 2 to Questions no 7.
3. Assume suitable data if necessary.
4. Figures to right indicate full marks.

1. Attempt **any four** 20
   a) Explain current amplifier with grounded load.
   b) Explain Flas ADC.
   c) Explain Sample and Hold Circuit.
   d) What are the universal Filter.
   e) Explain the following term in relation to PLL:-
      i. Lock range
      ii. Capture range

2. a) Obtain the transfer function for KRC low pass filter and draw the circuit. Calculate the component value if fo=2kHz. And Q = 4. 10
   b) Explain VCO IC 556 and its features. 10

3. a) What is Instrumentation amplifier, explain it with three opamp, and write down advantages and disadvantages of it. 10
   b) Explain astable multivibrator with internal circuit and find expression for output frequency and duty cycle of IC 555. 10

4. a) Draw the internal block diagram of IC XR 2206 and explain it. 10
   b) Draw the circuit of basic integrator using op-amp. Find expression for output voltage. Explain disadvantage of basic integrator. 10

5. a) Write VHDL code for a four bit up counter. 08
   b) A fundamental-mode circuit is to have two inputs and a single output, which becomes '1' only upon the ocurrance of the last in the following sequence of input combination, otherwise z = o. 12
   X1 x2 : 0 0 0 1 1 1 1 0 Construct primitive flow table

6. a) Draw the block diagram of internal architecture of XC 9500. 10
   b) Explain inverting Schmitt trigger and the expression for the hysteresis voltage with transfer characteristics. 10

TURN OVER

7. Write short notes on: 20

a) Explain FPGA
b) Differentiate between static RAM and Dynamic RAM
c) Log Amplifier

OLD/OTR (02) 1/Oct/17

Q.P. Code :13138

[Time: Three Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B:
1. Question no 1 is compulsory
2. Answer four question from remaining six question
3. Assume suitable data if necessary

Q.1 Answer any four question 20

a) Explain aliasing? What is aperture effect?
b) Explain quantization? What is quantization error?
c) Why is over modulation in AM system undesirable?
d) Differentiate between FM and PM
e) Explain what double spotting is and how it arises?

Q.2 a) Sketch the circuit diagram of a practical diode detector and explain the operation how is AGC obtained from this detector? 10

b) The antenna current of AM broadcast transmitter modulated to the depth of 40% by an audio sine wave is 11 Ampere. It increases to 12 ampere as a result of simultaneous modulation by another audio sine wave. What is the modulation index due to this second wave? 10

Q.3 a) Explain the operation of foster seely discriminator with the help of circuit diagram and phasor diagram 10

b) What are the different methods of FM generation? Explain the operation of the balanced slope detector 10

Q.4 a) Draw the block diagram of a phase cancellation SSB generator and explain how the carrier and the unwanted side band are suppressed. What changes are necessary to suppress the other sideband? 10

b) Draw and explain diagram of a super heterodyne radio receiver with waveforms at output of each block. 10

Q.5 a) Discuss the slope over load and granular noise error in delta modulation. How it can be compensated in adaptive delta modulation? 10

b) Explain the generation and detection of pulse width modulation with the help of a block diagram. 10

Q.6 a) Draw the block diagram of the transmitter and receiver of a pulse code modulation system with different waveforms and explain the function of each block. 10

b) Explain pulse amplitude modulation system with help of block diagram. 10

Q.7 Write short notes on any four :- 20

a) Noise figure and noise factor
b) ISB receiver
c) Sampling theorem
d) TRF receiver
e) Companding in PCM

****