BE IC (CTR) Analog & Digital IC design & Applicatio

Rev 2007

QP Code:544800 1|12|201

(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 ICμA741 **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_0 =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 flops. **5**
   (c) Design a circuit which generates the output voltage .Use standard values for resistors. **5**

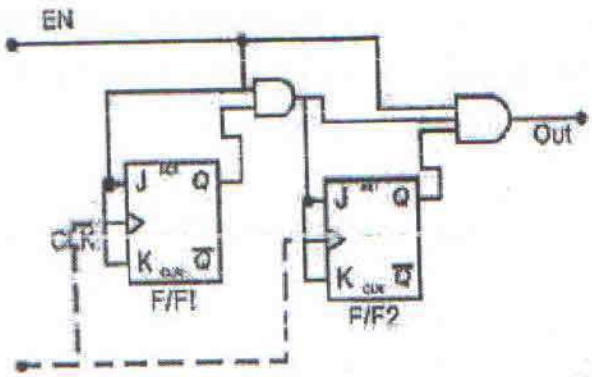
[Turn Over

5. (a) What are the performance parameters of DAC? Explain R-2R ladder type of DAC. **10**

(b) Implement MOD 78 counter using IC7492 and IC7493. Explain the working. **5**

(c) Explain how IC74194 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 **5**

(c) Explain the operation of sample and hold circuit. Draw its input and output waveforms **5**

7. Write short notes on:- **20**

i. Log amplifier

ii. FPGA and CPLD

iii. Concept of switched capacitor filter

iv. VCO IC566

Sem IV (old) (Extc) Principles of communication Engg. (OTR)

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 : **20**
   (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 & SSBCC 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

(b) Draw the block diagram of superheterodyne receiver & describe function of each block. **10**

6. (a) State sampling theorem for bandpass signal. Compare ideal & practical sampling. **10**

(b) Explain the block diagram of Adaptive delta modulation with waveforms. How does it reduce slope overload error? **10**

7. Write a short note on **any four** : **20**

(1) AGC
(2) ISB Transmission
(3) Companding
(4) Quantization
(5) Pulse code modulation

S.E IV EXTC OTR. 21/12/2016.

Electromagnetic waveTh.

Q.P. Code : 545100

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions out of the remaining **six** questions.
(3) Assume suitable **data** wherever **necessary**.
(4) Support your **answers** with neat **sketches** wherever **necessary**.

1. Answer any **four**.
   (a) State and explain vector form of Coulomb's law. Hence find the force exerted by a charge of 2 μc at origin on another charge of 0.5μc placed at (1,-1, 1). **5**
   (b) State and explain :- **5**
   (i) Divergence theorem (ii) Stoke's theorem
   (c) Explain the concept of scalar and vector magnetic potential with their expressions. **5**
   (d) Derive wave equation from Maxwell's equations. **5**
   (e) Explain different types electromagnetic wave polarizations. **5**

2. (a) Derive expression for electric field intensity due to an infinitely long line charge with charge density ρ_e coul/m. **10**
   (b) Derive the expression for Energy stored in a electrostatic field. **10**

3. (a) What is displacement current density ? Give an example. State modified form of Ampere's circuital law. **10**
   (b) State and prove Gauss's law for steady electric fields. **10**

4. (a) Find potential and electric field between two semi infinite plates placed along +ve x-axis and another at 60^0 with x-axis with an infinitesimal gap at origin. The plate at 60^0 is having a potential of 60 V. Use Laplace's equation, assuming $\rho v = 0$ **10**
   (b) Derive the boundry conditions for electrostatic fields. **10**

5. (a) State Maxwell's equations for time varying fields. Explain their significance. **10**
   (b) Derive poynting theorem. Explain the significance of each term. **10**

6. (a) Derive wave equation and its solution in losing dietectric. **12**
   (b) Find the depth of penetration for copper at a frequency of 2.4 GHz. The resistivity of copper is 1.68×10^{-8} Ωm and $\mu r = 1$. **8**

7. Write short notes on any **two**. **20**
   (a) Electric field and potential of a dipole
   (b) Method of images
   (c) Boundry conditions for steady magnetic fields.

Sem-IV EXTC (OLD) 8/12/16

Electronic Device & Circuits-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 CE-CE amplifier for following parameters Av ≥ 1600, $F_L \leq 20$ Hz, Si≤10, VO=4 Volts Use BC 147B transistor. **15**
   (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. Output power = 8 watts. RL = 8 Ω, VCC = 15 V. **15**
   (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**

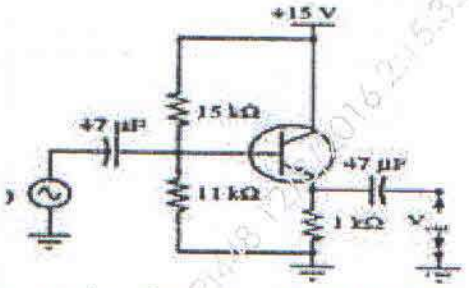


fig.1

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 Assume hie= 3KΩ and hfe= 200 for both the BJT'S. Neglect hre and hoe. **10**

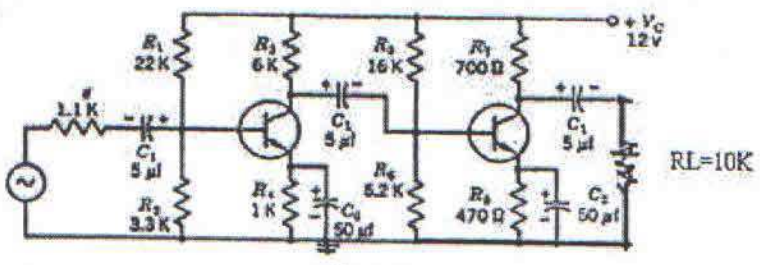


fig.2

[TURN OVER

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. **10**

   (b) Explain the concept of negative feedback and explain its effect on gain,input and output impedance In voltage shunt feedback network. **10**

7. Write a short note on following. **20**
   (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	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	$V_{CE}^{(sus)}$ 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_{CE} max.	θ_{j-a} °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
BC147A	0·25	0·1	0·25	50	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
2N 525(PNP)	0·225	0·5	0·25	85	30	50	—	6	125	115	180	220	125	220	260	0·9	—	—
BC147B	0·25	0·1	0·25	50	45	—	—	—	100	35	—	65	—	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

−Vcs 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
Ios 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
Ios typ. mA	7·5	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
Ios 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_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{fs} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{j-a}
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

Sem-IV EXTC (OLD)
E-DC-II
8/12/16
3

— SE Sem IV (EXTC) (old) – Applied Maths – IV
OTR 24/11/16

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 4^A. 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 $J_{3/2} = \sqrt{\frac{2}{\pi x}}\left(\frac{\sin x}{x} - \cos x\right)$ 5

(d) Find the constants a ,b c ,d and e If 5
$f(z) = (ax^4 + b\,x^2y^2 + cy^4 + dx^2 - 2y^2) + i\,(4x^3y - exy^3 + 4xy)$ 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 $J_4(x) = \left(\frac{48}{x^3} - \frac{8}{x}\right)J_1(x) + \left(1 - \frac{24}{x^2}\right)J_0(x)$ 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.

3. (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 6

$\int_c \frac{z+1}{z^2(1-4z^2)}dz$ 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 6

(c) Evaluate by Gauss's Divergenee theorem, to evaluate $\iint_s \bar{N}.\bar{F}ds$ where 8

$\bar{F} = 2xi + xyj + zk$ over the region bounded by the Cylinder $x^2 + y^2 = 4$, $z = 0$, $z = 6$

5. (a) Verify Laplace's equation for $u = \left(r + \frac{a^2}{r}\right)\cos\theta$ also find v and f(z) 6

(b) Show that the matrix $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$ 6

is derogatory and find its minima equation

(c) Expand $f(x) = 1$ in $0 < x < 1$ in a series as $1 = \sum \frac{2}{\lambda_n J_1(\lambda_n)} J_0\left(\lambda_n(x)\right)$ where. 8

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

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

(b) If $A = \begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$ then P.T. 3tan A=Atan3 6

(c) By using stokers theorem, evaluate $\int_c \left(x^2 + y^2\right) i + \left(x^2 - y^2\right) j$ where c is the 8

boundary of the region enclosed by circles. $x^2 + y^2 = 4$, $x^2 + y^2 = 16$

7. (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 $\int_0^{\infty} \frac{1}{x^4+1} dx$, 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