SE|EXTC|IV old.
A.M-IV 15|5|2015

QP Code : 4134

(OLD COURSE)

(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) Show that the map of real axis of the Z plaine is a circle under the transformation $W = \frac{2}{Z+i}$ Find its centre and the radius. **5**

(b) Verify cayley Hamilton theorem and hence find A^{-1} for $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ **5**

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

(d) Evaluate $\int \bar{F} d\bar{r}$ where $\bar{F} = 2x\hat{i} + (xz - y)\hat{j} + 2zk$ from 0(0,0,0) to P(3,1,2) along the line OP. **5**

2. (a) Find an analytic function f(z)=u+iv where $u + v = e^x(\cos y + \sin y)$ **6**

(b) If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then prove that $A^{100} = \begin{bmatrix} 201 & -400 \\ 100 & -199 \end{bmatrix}$ **6**

(c) Prove that $\bar{F} = (y^2 \cos x + z^3)\hat{i} + (2y \sin x - 4)\hat{j} + (3xz^2 + 2)\hat{k}$ is conservative field and also find **8**

(i) scalar potential for $\bar{F}$

(ii) the work done in moving an object in this field from (0,1,-1) to $\left(\frac{\pi}{2}, -1, 2\right)$.

[TURN OVER

3. (a) Show that the given function $f(z)=\frac{x^2y^5(x+iy)}{x^4+y^{10}}, z\neq 0$ 6

$= 0 \qquad z = 0$

is not analytic at the origin although Cauchy Riemann's equations are satisfied

(b) Evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-2)(z-3)} dz$ where 'c' is the circle $|z|=4$ 6

(c) Show that matrix $A=\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ is diagonalisable. 8

4. (a) Reduce the quadratic form $5x^2+26y^2+10z^2+6xy+4yz+14zx$ to normal form through congruent transformation 6

(b) Find the bilinear transformation which maps the points 1, -i, 2 on z plane onto 0, 2, -i respectively on W plane. 6

(c) Expand $f(z)=\frac{1}{z^2(z-1)(z+2)}$ about z = 0 for 8

(i) $|z|<1$ (ii) $1<|z|<2$ (iii) $|z|>2$

5. (a) Use Gauss divergence theorem to evaluate $\iint_s \overline{N}.\overline{F}\ ds$ where 6

$\overline{F} = 4x\hat{i} + 3y\hat{j} - 2z\hat{k}$ and S is the surface bounded by x=0, y=0, z=0 and 2x+2y+z=4

(b) Expand f(x)=1 in (0<x<l) in a series as $1=\sum \frac{2}{\lambda n J_1(\lambda n)} J_0(\lambda n x)$ where 6

$\lambda_1, \lambda_2, \ldots\ldots\lambda n\ldots\ldots$ are positive roots of Jo(x)=0

(c) Evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$ 8

S.E. EXTC (IV) (old) ADIC Design & Appln 21/5/15.

(OLD COURSE) QP Code : 4136

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

(2)Attempt any **four** questions out of remaining Six questions.

(3)Figures to the right indicate full marks.

(4)Assume suitable data whenever required.

(3 Hours) Total Marks:100

Q.1 a) Explain the principal of Antilog filter. 5

b) Compare Moore Machine and Mealy Machine. 5

c) Draw and Explain Schmitt Trigger. 5

d) Write the difference between Synchronous and Asynchronous sequential circuit. 5

Q.2 a) Explain the basic requirement of Instrumentation Amplifier and find output voltage expression for Instrumentation Amplifier using three Op-Amp. 10

Q.2 b) Design second order KRC high pass filter with cut off frequency F0=1KHz and Q=5. Draw circuit diagram. 10

Q.3 a) Design the circuit for an astable multivibrator to generate the output signal with frequency of 1KHz and duty cycle of 75% using IC 555.
Assume value of c=0.1μF. 10

Q.3 b) With the neat diagram explain positive Ramp generator using IC 566. 10

Q.4 a) Draw and explain the block diagram of IC 810 audio power amplifier. 10

Q.4 b) Explain the operation of sample and hold circuit and also draw input output waveforms. 10

Q. 5a) Write the VHDL code for 8 bit Shift Register. 10

Q. 5b) Design mealy state machine for sequence detector for the string 1110 10

Q. 6a)Design modulo 10 counter with the counting sequence
5,6,7,8,9,10,11,12,13,14,5,6,7,8 9....14... Using MSI 74X163 10

Q.6b) Explain Op-amp as a comparator and its applications 10

Q. 7 Write short note on any three. 20

a. Xilinx 4000 FPGA
b. Sequential circuit documentation standards
c. Function Generator IC 8038
d. Types of memory devices

RJ-Con. 9972-15.

S.E. Sem IV (old) (EXTC). 27/5/15

EDC-II.

(OLD COURSE) **QP Code :4140**

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

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.

Q1. a Design two stage R-C coupled CE amplifier using BJT BC147A for the following specifications: Av ≥ 1000, V_{CC}=18V, output voltage Vo=3.5V, $S_{ICO} \leq 10$, and lower cutoff frequency F_L=20Hz. Determine expected voltage gain Av, Rin,, Ro. 20

Q2. a Design two stage R-C coupled CS amplifier using JFET BFW-11 for the following parameters: Av ≥ 150, output voltage Vo=4.1v, V_{GSQ}=-0.75V, and lower cutoff frequency F_L=20Hz. Determine expected voltage gain Av, input impedance Rin, and output impedance Ro. 20

b For the differential amplifier shown in fig.1 determine: Operating point, Differential mode gain Ad, Common mode gain AC, CMRR, output voltage if V_{S1}=20mV (Peak to peak) at 1KHz and V_{S2}=10mV (Peak to peak) at 1KHz for the differential amplifier. Assume the transistor is with hie=3.2kΩ, hfe=100 and V_{BE}=0.71V. 10
(Rc=3.9kΩ,Rs=100Ω,RE=5.7kΩ,VCC=12V,-VEE=-12V)

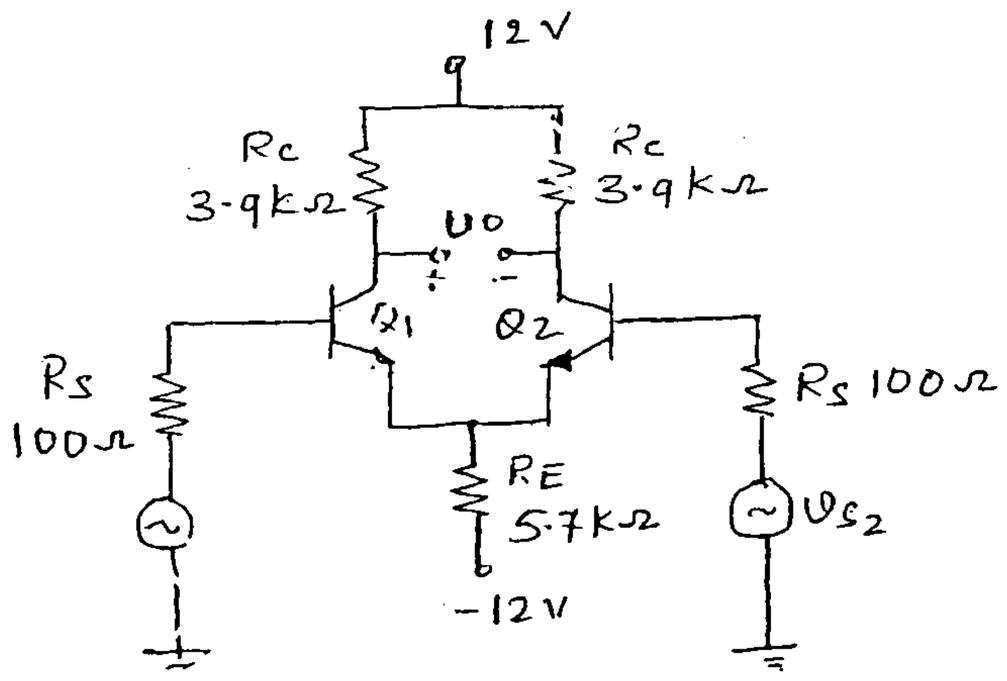

Fig.2

Q3. a Explain why amplifiers are cascaded in practical amplifiers? Draw two stages CE amplifier and derive the expression for overall voltage gain, current gain and input and output impedance. 10

RJ-Con.:10842-15.

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B For two stage CS amplifier shown in fig.2.Determine i) Overall mid-band voltage gain, ii) Input impedance, and iii) Output impedance. iv) If an input signal of 10mV is applied, find the value of output voltage across a load resistance of 10k connected at the output. Assume identical JFETs with g_m=2.5mS, r_d=∞. [V_{DD}=20V,R_D=2.2KΩ,R_G=3MΩ,R_S=500Ω,C_1=C_2 =C_3=1uf,C_{S1}=C_{S2}=50uf] 10

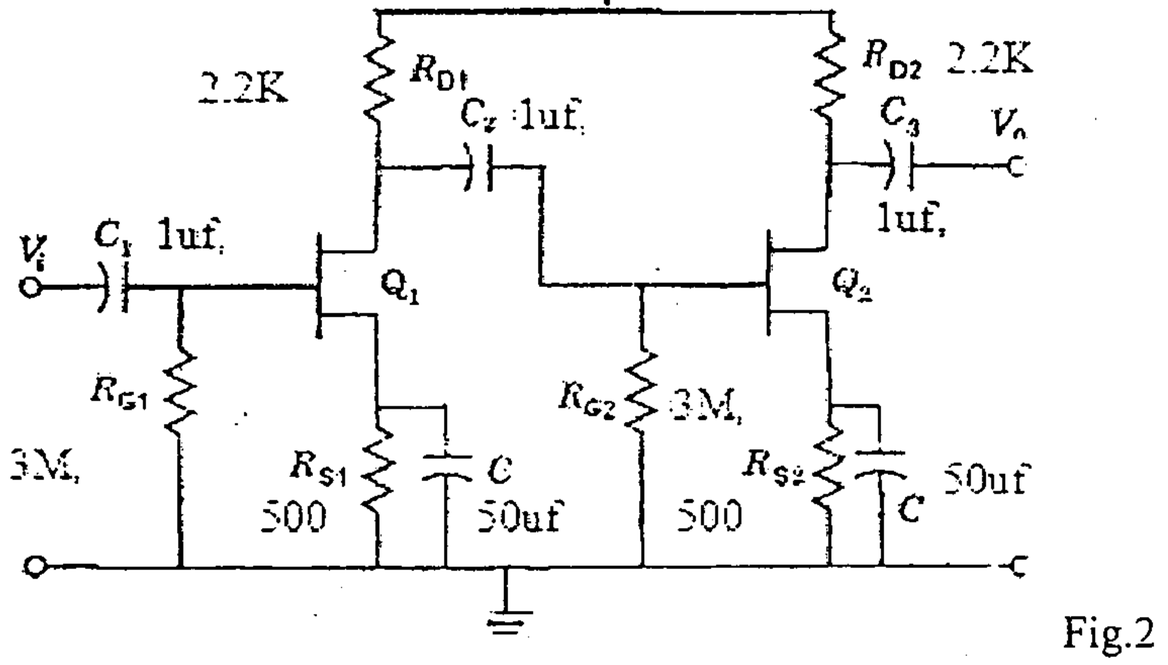

Fig.2

Q4. a What are the different types of feedback topologies? Draw any one and Derive the expression **for** A_{VF}, R_{IF}, R_{OF} and Bandwidth with feedback . 12

b Explain the principle of operation of RC phase shift oscillator and derive the expression for the frequency of oscillation using BJT. 08

Q5 a Write down the advantages and disadvantages of negative feedback amplifier. 08

b For the cascode amplifier shown in fig.3 determine V_{B1}, V_{B2}, I_{CQ}, Av, Ri and Ro. BJT parameters:β=hfe=120,hie=1.2k. 12

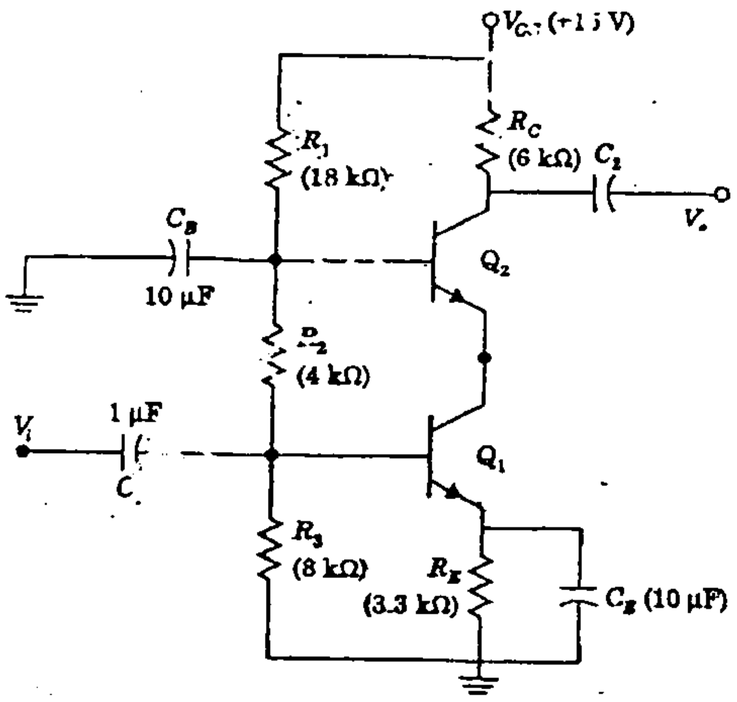

Fig.3

Q6	a	Draw the circuit diagram for transformer coupled class A power amplifier and derive the expression for maximum conversion efficiency.	10
	b	With neat sketch, explain the working of Collector coupled Astable multivibrator.	10
Q7		Write a short note on following.	20
	a	Clapp oscillator.	
	b	Darlington Emitter follower	
	c	Coupling used in multistage amplifiers.	
	d	Class AB push-pull power amplifier.	

Transistor type	Pdmax @ 25°C Watts	fcmax @ 25°C Amps	$V_{ce}^{(sat)}$ volts d.c.	V_{cbo} volts d.c.	V_{ceo} (Sus) volts d.c.	V_{cex} (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 min.	typ.	h_{fe} max.	V_{be} max.	θ_{j-c} °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	5·9	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	1·1	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	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	25	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	θjc
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—IFET 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
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_{os} max. Volts	V_{os} max. Volts	V_{os} 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_{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

2-6-14

S.E. sem IV old EXTC June 2015

sub:- PCE

Q.P. Code : 4143

(OLD COURSE)

(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 & state clearly.

1. Answer the following **(any four)**:- **20**
   (a) What is the purpose of AFC loop in FM?
   (b) What is aliasing? How can it be removed?
   (c) Explain FM noise traingle
   (d) Explain quantization with the help of suitable diagram.
   (e) Draw spectrum of AM wave. DSBSC & SSBSC wave.

2. (a) Draw the block diagram of an AM superhetrodyne receiver. Describe its operation & function of each stage. **10**

   (b) Define Amplitude Modulation & derive the equation for amplitude Modulated wave. **10**

3. (a) With the help of neat diagram & Phasor diagram explain the working of Foster seekly discriminator. **10**

   (b) Find the carrier & modulating frequencies, the modulation index & the maximum deviation of the FM wave represented by the voltage equation $e = 12\sin(6 \times 10^8 t + 5\sin 1250t)$. What power will this FM wave dissipate in a 10Ω resistor. **10**

4. (a) Explain how PAM signal can be generated & demodulated. **10**

   (b) Explain the working of balanced ring modualater to generate DSBSC signal. **10**

5. (a) Compare - **10**
   (1) Am & FM (ii) FM & PM

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

6. (a) State & prove sampling theorem. **10**

   (b) Draw the block diagram of pulse code modulation & explain each block. **10**

7. Write short notes on **any four** : **20**
   (a) Vestigial side band transmission.
   (b) Pre emphsis & De-emphasis.
   (c) Squelch circuit
   (d) PWM & PPM
   (e) Selectivity? Sensitivity.

EXTC S.E. EXTC (SEM IV) (OLD)
ELECTROMAGNETIC WAVE THEORY

(OLD COURSE) **QP Code : 4146**

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

1. Question no. 1 is compulsory.
2. Attempt any four questions from remaining six questions.
3. Figure to right indicate full marks.
4. Use suitable data, whenever necessary and justify the same.

1: Attempt any four

(a) State and explain Gauss's law. [05]

(b) Given the potential field, $V = 2x^2y - 5z$, and a point P(4,3,6), find the values at point P, i) The potential V, ii) The electric field intensity $\bar{E}$, iii) The electric field density $\bar{D}$, iv) The volume charge density ρ_v. [05]

(c) Ampere's circuital law.[05]

(d) Derive the dielectric-dielectric boundary condition for electrostatics field.[05]

(e) State and explain Biot Savart law. [05]

2. (a) Find the force on a point charge of $50\mu C$ at (0,0,5)m due to charge of $500\pi\mu C$ that is uniformly distributed over the circular disk $r \leq 5m, z = 0m$. [10]

(b) Explain depth of penetration (skin depth). Find the skin depth at frequency 1.6MHz in Aluminum whose $\sigma = 38.2mS/m$ and $\mu_r = 1$. Also find propagation constant and velocity in this medium (Assume $\alpha = \beta = 1/\delta$).[10]

3. (a) The magnetic field intensity is given in a certain region of space as, $\bar{H} = \frac{x+2y}{z^2}\bar{a}_y + \frac{2}{z}\bar{a}_z A/m$. i) Find $\nabla \times \bar{H}$, ii) find $\bar{J}$, iii) use $\bar{J}$ to find total current passing through the surface, $z = 4$, $1 \leq x \leq 2$, $3 \leq y \leq 5$ in the $\bar{a}_z$ direction, iv) Show that the same result is obtain using other side of Stoke's theorem. [10]

(b) State and explain Maxwell's equation in integral and differential form. [10]

4. (a) Derive Helmholtz's wave equation for electric field. [10]

(b) Let $\mu = 3\times10^{-5}H/m$, $\epsilon = 1.2\times10^{-10}F/m$, and $\sigma = 0$ everywhere. If $\bar{H} = 2cos\,(10^{10}t - \beta x)\,\bar{a}_z A/m$. Use Maxwell's equations to obtain expression for $\bar{B}, \bar{D}, \bar{E}$, and β.[10]

5. (a) Let the fields, $\bar{E} = 1800cos\,(10^7\pi t - \beta z)\,\bar{a}_x V/m$ and $\bar{H} = 3.8cos\,(10^7\pi t - \beta z)\,\bar{a}_y A/m$, represent uniform plane wave propagating at velocity of $1.4 \times 10^8 m/s$ in perfect dielectric. Find i) β, ii) λ, iii) η, iv) $\mu_r \& \epsilon_r$. [10]

(b) Define poynting vector and explain each term in its integral form. [10]

6. (a) Derive Laplace's and Poission's equation [10]

(b) Use laplace equation to find capacitance of coaxial cable of inner radius 'a' and outer radius 'b' meter, given $V = V_0$ at $r = a$ and $V = 0$ at $r = b$. [10]

7. Write short notes (any four)[20]

(a) Image theory.

(b) Wave impedance for free space.

(c) Polarization in electromagnetic wave.

(d) Magnetic vector potential.

(e) Continuity equation.

—:END:—