05/06/13 S.E. (Extc) Sem- IV (Rev) EINT m/D-13

AGJ 1st half (h+) 8

Con. 6655-13. **GS–7473**

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

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

1. Solve any **four** :– **20**
   (a) Derive the equation of Electric potentail due to Electric dipoles.
   (b) A point charge of 100 μc is located at origin. Find electric potential at (1,2,3) m.
   (c) State and explain Gauss's law.
   (d) Find out the total charge present in the closed surface defined by $0 \leq x \leq 1$, $0 \leq y \leq 1, 0 \leq z \leq 1$ if $\rho_v = \frac{10x^2}{4} C/m^3$.
   (e) State and explain Divergence theorem.

2. (a) Derive Poisson's and Laplace's equation. **10**
   (b) Derive the equation for Electric field intensity due to infinite surface charge or plane charge. **10**

3. (a) Show that – (i) $\nabla \cdot \overline{D} = 0$ for the field of po int change **10**
   (ii) $\nabla \cdot \overline{E} = 0$ for the field of uniform line ch arg e.
   (b) Evaluate both sides of divergence theorem for the field $\overline{D} = 2xyz\,\hat{a}_x + 3y^2z\,\hat{a}_y + x\,\hat{a}_z$ **10**
   for the region defined by $-1 \leq x \leq 1, -1 \leq y \leq 1$ and $-1 \leq z \leq 1$.

4. (a) State and explain continuity equation and displacement current. **10**
   (b) Derive the equation for Magnetic field intensity due to finite straight line current carrying conductor. **10**

5. (a) Explain stoke's theorem and Ampere circuital law. **10**
   (b) Find 'H' inside and outside of a solid cylindrical conductor of radius 'a' meter where I is uniformly distributed over the cross section. **10**

6. (a) State and derive the equations for Poynting theorem. **10**
   (b) Derive the Electromagnetic wave equation for good conductor. **10**

7. Write short notes on any **two** :– **20**
   (a) Boundary condition in Electrostatic and magnetostatic
   (b) Reflection of uniform plane wave
   (c) Wave impedance for free space.

S.E. Sem IV (R) EXTC May 2013 27/5/13

Principles of Commn. Engg.

P3-upq-Feb.-13KL-125 A4 E

Con. 6600–13. **GS–7245**

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

N.B. :(1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six**.
(3) Make **suitable** assumption wherever **necessary** and clearly **justify** them.

1. Answer the following (any **four**) :— **20**
   (a) Explain Tracking in AM receiver.
   (b) What are the causes of fold over distortion ? How can it overcome
   (c) Explain how PPM is generated from PWM.
   (d) List the advantages of digital communication over analog communication system. Explain in brief.
   (e) Explain pre-emphasis and De-emphasis in brief with the help of circuit diagram.

2. (a) Why is frequency moduation preferred for stereophonic broadcasting ? Explain in brief. **5**
   (b) An AM broad casting station operates at its maximum allowed total output of 100 kW at 90% modulation. How much of this power is the intelligence signal ? **5**
   (c) Explain high power AM–DSBFC modulater with schematic diagram. **10**

3. (a) Explain measurements of Receiver Performance in detail. **10**
   (b) What is noise ? List the types of noise and explain each in brief. **10**

4. (a) Explain in detail pulse width modulation (PWM) with the help of circuit diagram. **10**
   (b) Explain Delta modulation. Draw the output signal waveform ? Also differentiate Delta modulation and Adaptive Delta Modulation. **10**

5. (a) The Signal to Noise ratio of an AM system is 25dB. The highest audio frequency transmitted is 30 kHz. If the transmitted carrier power is reduced by one-tenth and FM with a deviation of $\pm$ 15 kHz is employed, what signal to noise ratio is obtained. **10**
   (b) Explain foster Seeley discriminator with the help of schematic diagram. **10**

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6. (a) Explain VSB transmission. **5**

(b) What is superheterodyne dune tracking. Explain in brief. **5**

(c) The output voltage of a transmitter is given by 500 (1 + 0·4 sin 3140 t) sin 6·28t. **10**
This voltage is fed to a load of 600 Ω resistance. Then Calculate—

(i) Carrier frequency

(ii) Modulation frequency

(iii) Carrier Power

(iv) Mean power output

(v) Peak power output.

7. Write short notes (any **four**) :— **20**

(a) FM noise triangle

(b) Ratio Detector

(c) Squelch Circuit

(d) Primam causes of ISI

(e) AVG and AGC.
AVC

LEDC - II EXTC - Sem IV

21|5|13

Con. 8880–13. GS–7128

(3 Hours) [Total Marks : 100

N.B. (1) Question No.1 and 2 are **compulsory**.
(2) Attempt **three** questions from remaining **five** questions.
(3) Assume suitable **data** if **necessary**.

1. (a) Design two stage cascaded amplifier to meet following specifications. **20**
$AV \geq 600$, $Ri \geq 1\ M\Omega$, $S_{ICO} \leq 10$, $f_L = 20Hz$ and $V_o = 3V$
What would be the voltage gain of the designed circuit if both bypass capacitors are removed ? To design, use suitable transistor from data sheet.

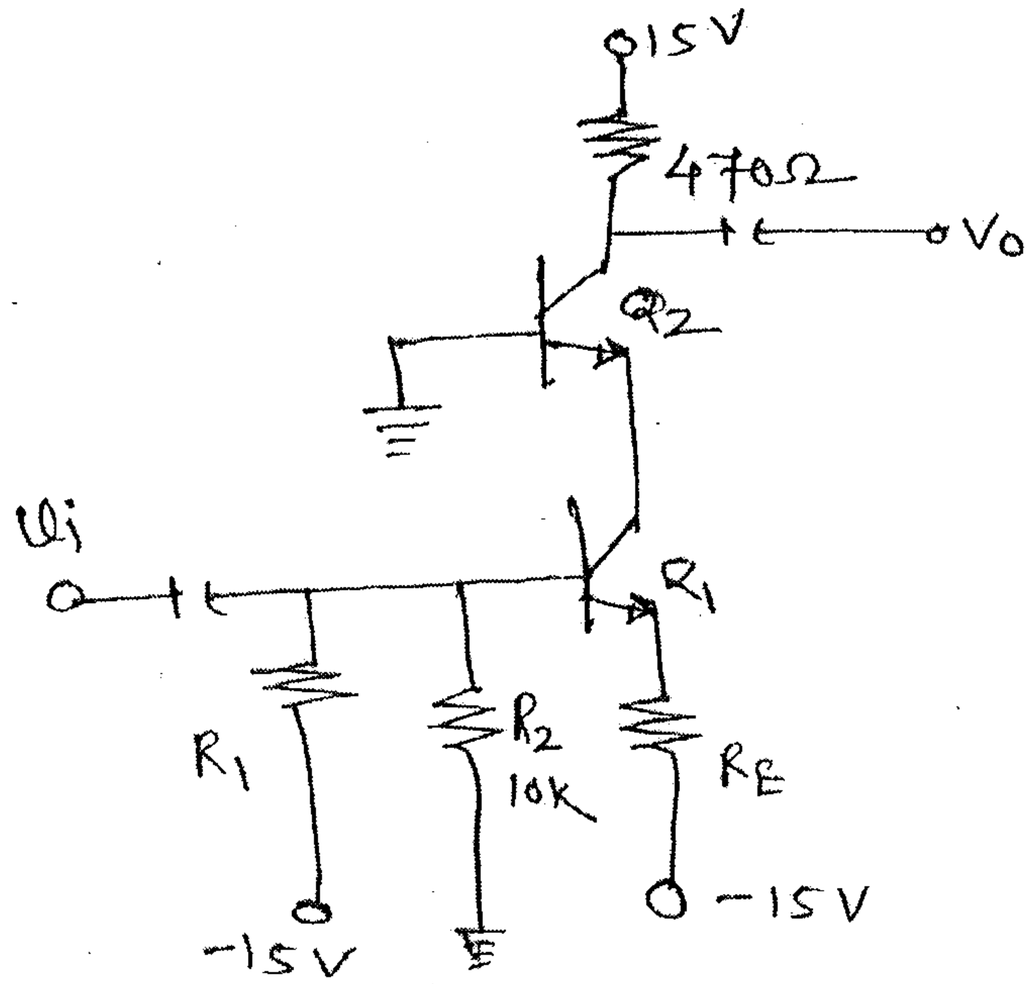
2. (a) Design a class B push-pull power amplifier with appropriate biasing to minimize cross over distortion and using transformer coupling for 8 W output. Using 12 V d.c. supply. Assume $R_L = 5\Omega$. **15**
For the designed circuit, find efficiency at full load.
(b) A BJJ has gm = 38 m℧ , rb'e = 5·9 kΩ, hie = 6 k, rbb' - 100Ω, Cb'c = 12 pF, cb'e = 63 pf and hfe = 224 at 1 kHz. Calculate α and β cut-off frequencies and f_T. **5**

3. (a) Explain Miller's Theorem. **5**

(b) For a cascaded amplifier, show that overall lower 3dB frequency $F_{LT} = \frac{f_L}{\sqrt{2^{1/n} - 1}}$ and higher 3dB frequency $f_{HT} = f_H \sqrt{2^{1/n} - 1}$ with 'n' stages. **10**

(c) Determine maximum safe power dissipation in a transistor if the rated power is 25W, $T_{jmax} = 175°c$. The transistor is mounted on a heat sink with $\theta_{cs} = 1°$ c/w and $\theta_{SA} = 5°$ c/w. **5**

4. (a) For the cascode amplifier circuit shown in **figure**, determine the values of resistors R_E and R_1, such that the operating point is $I_{CQ} = 10$ mA and $V_{CEQ} = 10V$. **10**
Given that the values of $R_2 = 10$ k, $\beta = 100$ and V_{BE} of each transistor is 0.7V.



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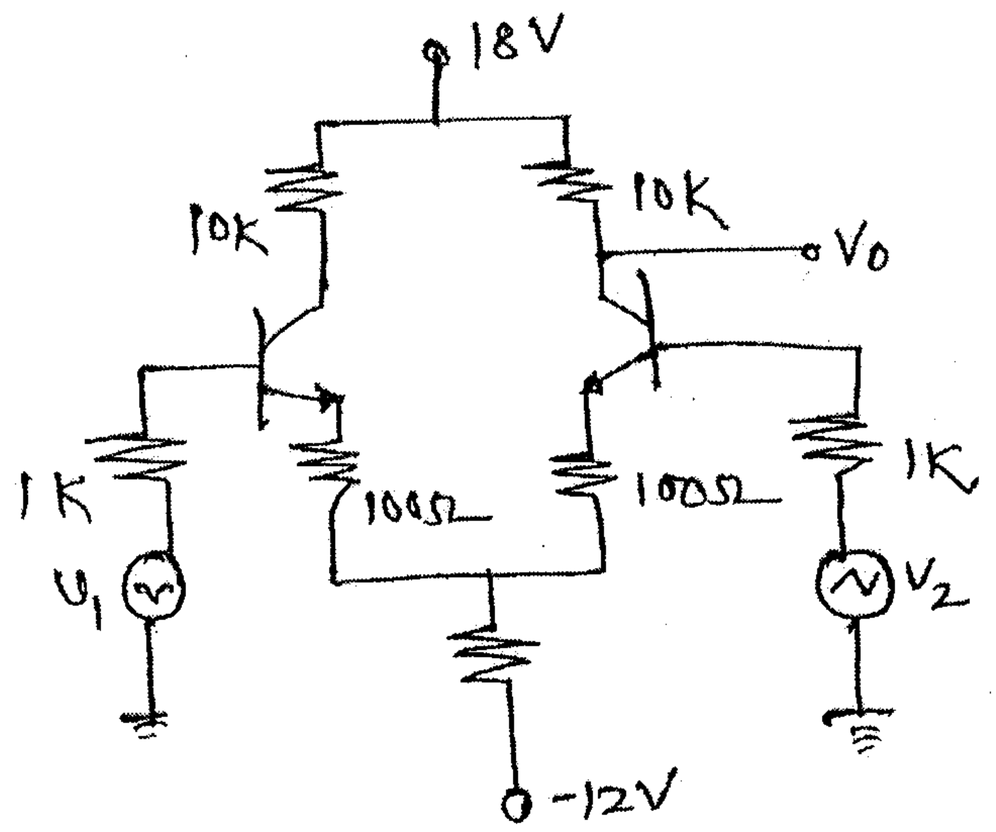
(b) Draw the circuit of Darlington configuration and derive the ex
gain and Input Resistance.
Also explain Principle of Bootstrapping with the help of appr

5 (a)

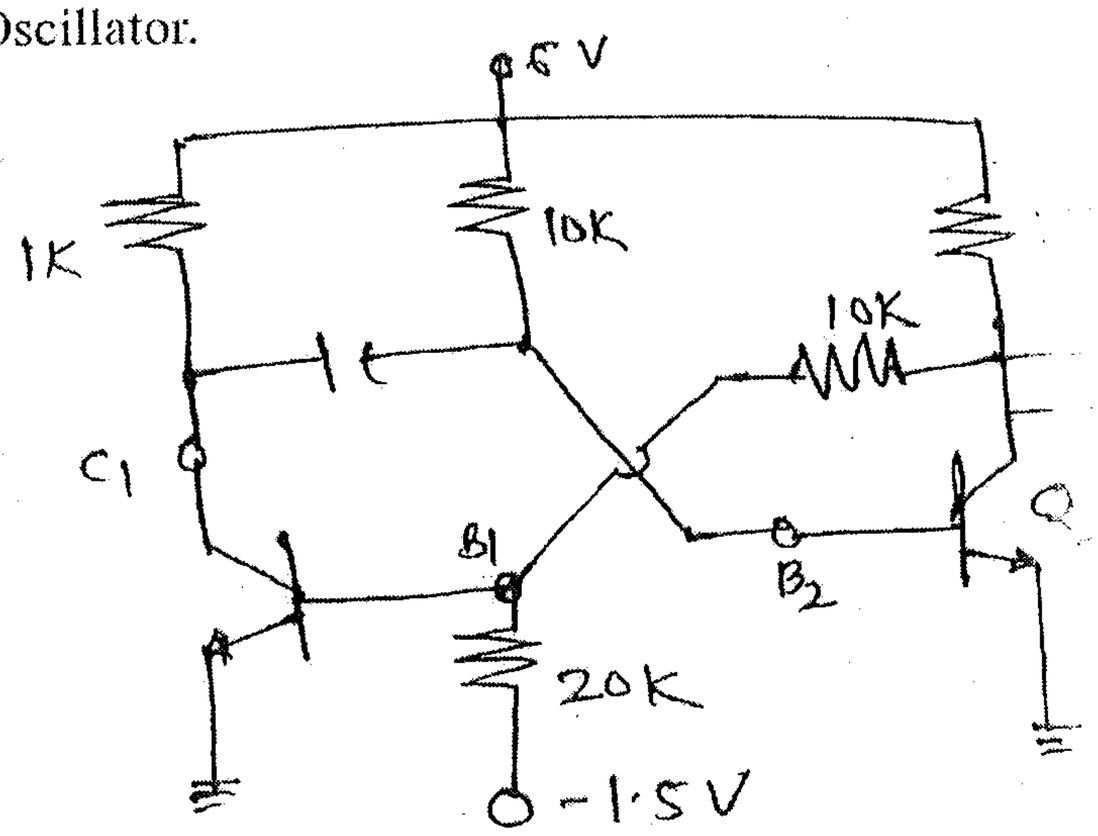


V_{BE}
βac
Find
(i)
(ii)
(iii)
(iv)

5 (b) Derive the expression for Rif and Rof using equivalent circuit f
(i) Voltage series negative feedback
(ii) Current shunt negative feedback.

6. (a) Explain Barkhausen's criteria. Also derive the expression for freque
of wein Bridge Oscillator.
(b) Write short notes on :–
(i) Colpitt's Oscillator
(ii) Clapp Oscillator.

7. (a)



For the above circuit, compute voltage levels and sketch the wavefo
at B_1, C_1, B_2 and C_2 for permanant state and quasi Stable state.
Use silicon transistors with $r_{bb'} = 100\ \Omega$ and $h_{FE} = 30$.

(b) Explain the various negative feedback topologies.

DBEC DATA SHEET

Transistor type	*Pdmax @ 25°C Watts*	*Icmax @ 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_{BEO} *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_{ja} *°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
*BC*147A	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	—	—	—	—
*BC*147*B*	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 147*A*	2·7 *K* Ω	18μ ℧	$1·5 \times 10^{-4}$	0·4°C/mw
2*N* 525 *(PNP)*	1·4 *K* Ω	25μ ℧	$3·2 \times 10^{-4}$	—
BC 147*B*	4·5 *K* Ω	30μ ℧	2×10^{-4}	0·4°C/mw
ECN 100	500 Ω	—	——	——
ECN 149	250 Ω	—	——	——
ECN 055	100 Ω	—	——	——
2*N* 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_{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

BE- SEM IV (Rev) May 2013
(EXTC)
A.D.I.C. - design & applications

1st Half-13-Mina - (b)-88

14/5/2013

Con. 6488-13.

GS-7017

(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 any **suitable** data wherever **required** but justify the **same**.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Explain capture range, lock range and pull in time with reference to PLL. **5**
(b) Explain log amplifier. **5**
(c) List ideal characteristics of op-amp. **5**
(d) Explain the working of Schmitt trigger. **5**

2. (a) Explain with neat diagram the working of IC 555 as monostable multivibrator state and explain any two applications. **10**
(b) (i) Draw and explain block diagram of CPLD. **6**
(ii) Give features of XC 9500 family. **4**

3. (a) Design a Second order KRC band reject filter with f_0 = 50 Hz and bandwidth = 6 Hz. **10**
(b) Explain in detail any two applications of Instrumentation amplifier. **10**

4. (a) Write VHDL Code for 4-bit down counter. **10**
(b) (i) Explain various documentation standards of sequential circuits. **6**
(ii) Explain switch de-bouncing. **4**

5. (a) Explain with output derivation the working of inverting and non-inverting adder circuit. **10**
(b) Draw and explain the functional block diagram of IC XR–2206. **10**

6. (a) Draw the block diagram of IC 565 PLL. Explain in detail FSK demodulation using PLL. **10**
(b) Design a sequence detector to detect a serial input sequence of 1010. Use JK Flip-flops. **10**

7. Write short notes on :— **20**
(a) Dual slope A/D Converter
(b) LM 380 audio amplifier
(c) General architecture of FPGA
(d) V to I converter using grounded load.

EXTC Sem IV Rev 9/5/2013

Maths

Applied Mathematics-IV

48 : 1st half.13-AM(v)

Con. 6430-13. **GS-6900**

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

(b) Show that matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$ is non-derogatory. **5**

(c) Evaluate $\oint_c \frac{1}{\left(z^3-1\right)^2}dz$ where 'c' is $|z-1| = 1$ **5**

(d) Evaluate $\int_A^B \left(3x^2y-2xy\right)dx+\left(x^3-x^2\right)dy$ along $y^2 = 2x^3$ from A(0, 0) and B(2, 4) **5**

2. (a) Prove that $xJ_n^1(x) = -nJ_n(x) + xJ_{n-1}(x)$ **6**

(b) Show that the matrix $A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$ is diagonalizable. Also find the transforming matrix and diagonal matrix. **7**

(c) Evaluate $\int\int_c (\nabla \times \bar{F})\cdot d\bar{s}$ where **6**

$\bar{F} = (2x-y+z)i+\left(x+y-z^2\right)j+(3x-2y+4z)k$ and 's' is the surface of the cylinder $x^2 + y^2 = 4$ bounded by the plane $z = 9$ and open at the other end.

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3. (a) Evaluate $\int_c \frac{z+1}{z^3-2z^2}dz$ where 'c' is 7

(i) the circle $|z-2-i|=2$

(ii) the circle $|z-1-2i|=2$

(b) Show that $\overline{F} = \left(ye^{xy}\cos(z)\right)i+\left(xe^{xy}\cos(z)\right)j-\left(e^{xy}\sin(z)\right)k$ is irrotational and find 7

the scalar potential for $\overline{F}$ and evaluate $\int \overline{F}\cdot d\overline{r}$ along the curve joining the points

(0, 0, 0) and $(-1, 2, \pi)$

prove that

(c) $$\int J_3(x)dx = \frac{-2J_1(x)}{x} - J_2(x)$$ 6

4. (a) Define Analytic function. State and prove Cauely-Riemann equation in polar co-ordinates. 7

(b) Verify Gauss-Divergence Theorem. Evaluate for $\overline{F} = (2x)i + (xy)j + z(k)$ over the region bounded by the cylinder $x^2 + y^2 = 4$, $t = 0$, $t = 6$ 7

(c) If $A = \begin{bmatrix} 1 & 2 & -2 \\ 0 & 2 & 1 \\ 0 & 0 & -1 \end{bmatrix}$ find A^{100} 6

5. (a) Define conformal mapping. Find Bilinear transformation which maps the prints $z = 0, i, -1$ onto $w = i, 1, 0$. 7

(b) Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{x^6+1}dx$ 7

(c) If $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. Find the characteristic roofs and characteristic vectors of 6

$A^3 + I$

6. (a) Find all possible Laurent's series expansion of the function $f(z) = \dfrac{1}{z^2(z-1)(z+2)}$ 7

about $z = 0$ for (i) $|z|<1$, (ii) $1<|z|<2$, (iii) $|z|>2$

(b) If $f(z) = u + iv$ is analytic and $u+v = \dfrac{2\sin(2x)}{e^{2y}+e^{-2y}-2\cos(2x)}$ find $f(z)$. 7

(c) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and hence find the matrix 6

$2A^5 - 3A^4 + A^2 - 4I$.

7. (a) Prove that the circle $|z| = 1$ in the z-plane is mapped onto the cordinate in the w-plane under the transformation $w = z^2 + 2z$. 7

(b) Reduce the following quadratic form to Canonical form and find its rank and signature 7

$$x_1^2 + 2x_2^2 + 3x_3^2 + 2x_1x_2 - 2x_1x_3 + 2x_2x_3$$

(c) Verify Green's Theorem for 6

$\displaystyle\int_C \left(\frac{1}{y}dx + \frac{1}{x}dy\right)$ where 'c' is the boundary of the region defined by

$x = 1$, $x = 4$, $y = 1$ and $y = \sqrt{x}$.