SE EXTC TV (Rev)
Analog & Digital IC Design & Application

Con. 3049-11. RK-1914

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions from remaining.
(3) Assume **suitable** data if **necessary**.
(4) In all **five** questions to be attempted.
(5) Draw **neat** circuit diagram wherever **necessary**.

1. (a) Find output voltage for a difference amplifier. **5**
   (b) Explain Generalized impedance converter. **5**
   (c) Explain sample and Hold circuit. **5**
   (d) Explain antilog amplifier. **5**

2. (a) Explain astable multivibrator with internal circuit and find expression for ouput frequency and duty cycle of IC 555. **10**
   (b) Write the VHDL code for synchronous decade counter with rising clock edge and asynchronous clear input. **10**

3. (a) Explain instrumentation amplifier with three op-amp and find expression for the output voltage, also write advantage and disadvantage of instrumentation amplifier. **10**
   (b) Design a melay machine for overlap sequence detector for the string 1101. The output must be1 when the input matches this string. **10**
      (i) Draw the state diagram
      (ii) Write its transition and ouput table
      (iii) Draw its logic diagram.

4. (a) Design a second order KRC highpass filter with cut-off frequency Fo = 1 kHz and Q = 5 and draw circuit diagram. **10**
   (b) Explain servo tracking type ADC. **5**
   (c) Find the ouput voltage and conversion resolution of 8 bit R-2R ladder DAC for an input data of 11011101 with reference voltage of 10V. **5**

5. (a) Explain diagram of IC 8038 with internal block. Find expression for duty cycle of 8038 IC. **10**
   (b) Design IC 566 for frequency 10 kHz. Find change in modulation voltage if frequency is varied from 9 kHz – 10 kHz. **10**

6. (a) Draw the block diagram of internal architecture of XC 9500 family CPLD and explain. **10**
   (b) Explain inverting Schmitt trigger and find expression for the hysteris voltage with transfer characteristics. **10**

7. (a) Explain VI converter with grounded load. **5**
   (b) Explain the various documentation standards of sequential circuits. **5**
   (c) Explain temperature compensated log amplifier. **5**
   (d) Differentiate between Static RAM and Dynamic RAM. **5**

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SE EXTC IV (Rev)
Electronic Devices & Circuits II

Con. 3365-11. RK-1923

(3 Hours) [Total Marks : 100

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.

Q.1 Design a two stage RC coupled CE amplifier using BC147A for the following specifications- Av=1000, S≤8, fL≤15Hz,Vcc=16v.Find Vo(max),Ri & Ro of the designed circuit.

Given:hie=2.7KΩ,hoe=18μ℧,hfe=200,hre=$1.5*10^{-4}$ .Draw the diagram with their designed values. **(20 Marks)**

Q.2 a) Show the effect of low frequency & high frequency on coupling and bypass capacitors. **(10 Marks)**

b)Design a class B power amplifier with the following specifications:Output power=10watts,RL=8Ω,Vcc=12v.Calculate the overall efficiency at the full load.

(10 Marks)

Q.3 a) The following circuit has the parameters:Rc=4KΩ,R'=40KΩ,Rs=10KΩ,hie=1.1KΩ,hfe=50,hre=hoe=0.Identify the topology & find Avf,Rif,Rof,R'if,R'of. **(12 Marks)**

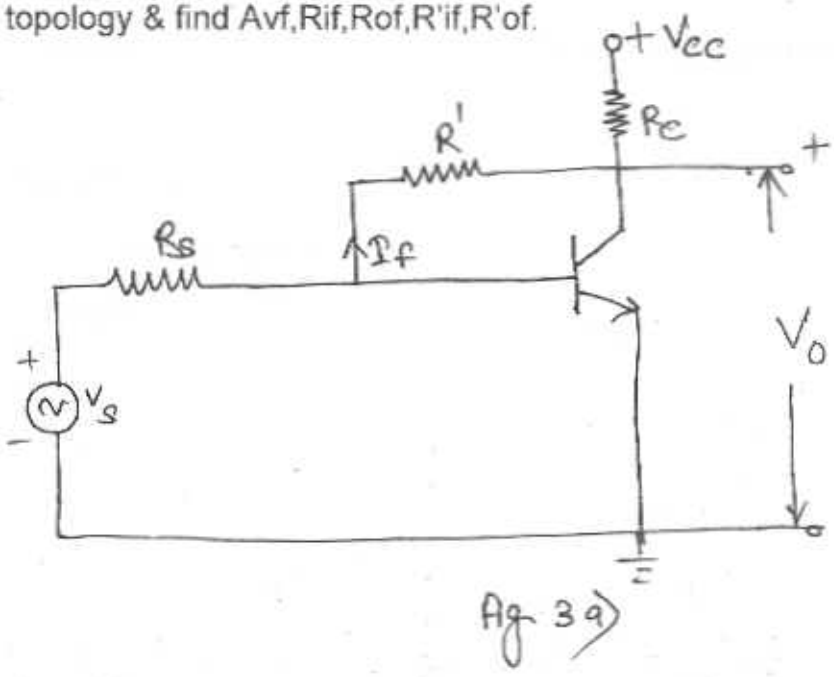

Fig 3a)

Q.3 b) Explain the various feedback topologies. **(8 Marks)**

Q.4 a) Derive an expression for the frequency of oscillation of a transistorized RC phase shift oscillator. **(12 Marks)**

b)Design a RC phase shift oscillator using FET having gm=8000 μ℧,rd =40 KΩ to generate a signal of 1.5 KHz. **(8 Marks)**

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Q.5 a) Draw a transistorized collector coupled astable multivibrator & explain its working with the waveforms. **(10 Marks)**

b)What is heat sink?why it is required for power amplifier?show the relationship between thermal & electrical analogy with a neat sketch.**(10 Marks)**

Q.6 a) Determine voltage gain,input impendance and output impedance for a cascaded BJT amplifier shown in figure below.Also determine output voltage if a 10KΩ load is connected to the output. **(12 Marks)**

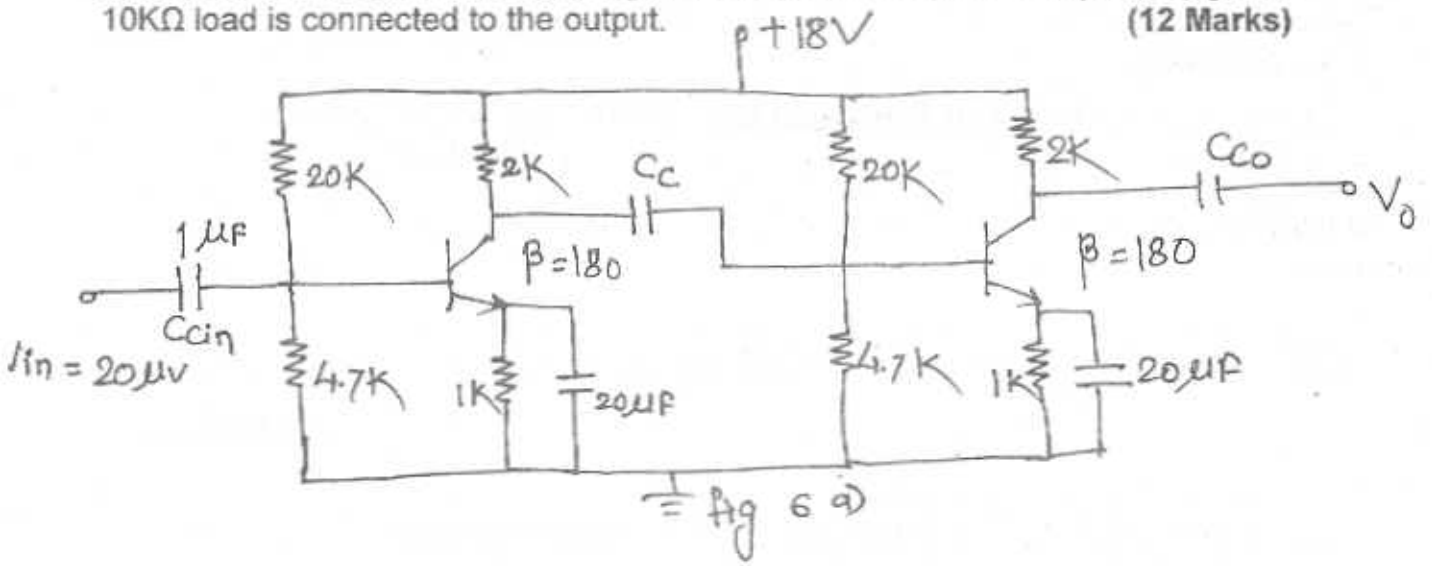

fig 6 a)

Q.6 b) Explain the operation of a Schmitt trigger with a neat sketch. **(8 Marks)**

Q.7 a) Write short notes on-

i)Darlington Pair. **ii)**Clapp oscillator **(10 Marks)**

b)Determine the lower cutoff frequency for the network shown below :

Given : IDss = 8mA, Vp = -4v.Assume rd = ∞. **(10 Marks)**

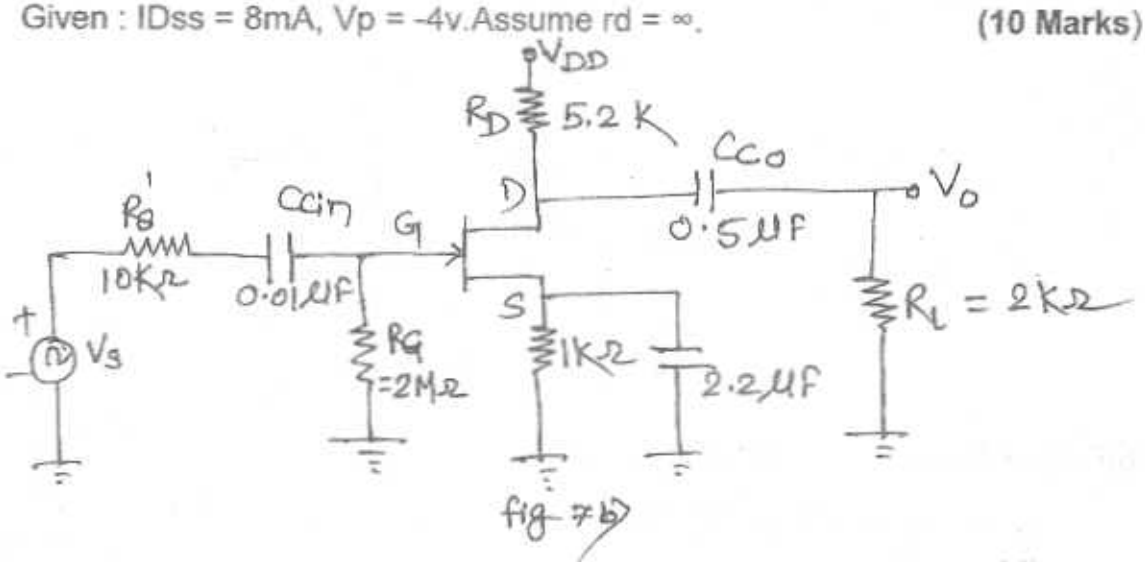

fig 7b)

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SE EXTC IV (Rev)
Electronic Devices & Circuits II

Con. 3365-11. RK-1923

(3 Hours) [Total Marks : 100

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.

Q.1 Design a two stage RC coupled CE amplifier using BC147A for the following specifications- Av=1000, S≤8, fL≤15Hz,Vcc=16v.Find Vo(max),Ri & Ro of the designed circuit.

Given:hie=2.7KΩ,hoe=18μʊ,hfe=200,hre=1.5*10^{-4} .Draw the diagram with their designed values. **(20 Marks)**

Q.2 a) Show the effect of low frequency & high frequency on coupling and bypass capacitors. **(10 Marks)**

b)Design a class B power amplifier with the following specifications:Output power=10watts,RL=8Ω,Vcc=12v.Calculate the overall efficiency at the full load.

(10 Marks)

Q.3 a) The following circuit has the parameters:Rc=4KΩ,R'=40KΩ,Rs=10KΩ,hie=1.1KΩ,hfe=50,hre=hoe=0.Identify the topology & find Avf,Rif,Rof,R'if,R'of. **(12 Marks)**

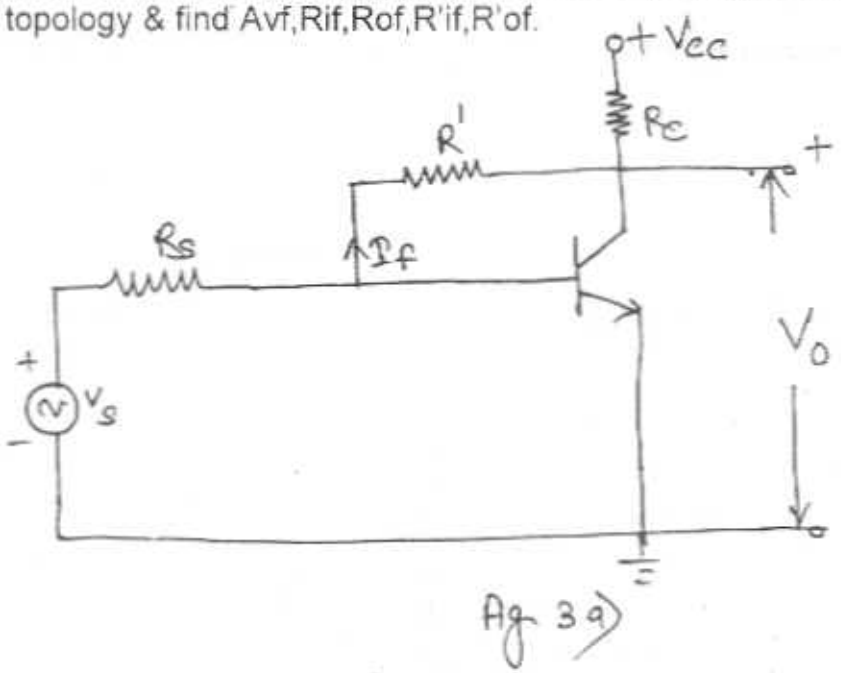

Fig 3 a)

Q.3 b) Explain the various feedback topologies. **(8 Marks)**

Q.4 a) Derive an expression for the frequency of oscillation of a transistorized RC phase shift oscillator. **(12 Marks)**

b)Design a RC phase shift oscillator using FET having gm=8000 μʊ,rd =40 KΩ to generate a signal of 1.5 KHz. **(8 Marks)**

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S.E. EXTC IV (Rev)
Principles of Communication Engg.

Con. 3376-11. RK-1917

(3 Hours) [Total Marks : 100

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 if **necessary**.

1. Answer the following:- 20
   (a) What is Pre-emphasis? Why is it used? Sketch and explain pre-emphasis circuit.
   (b) Differentiate between narrowband FM and wideband FM.
   (c) Describe briefly the forms of noise to which a transistor is prone.
   (d) What is image frequency and how does it arise? On which factors image rejection depends?

2. (a) An amplifier operating over the frequency range of 455 kHz to 460 kHz has a 200kΩ input resistor. What is the RMS noise voltage at the input to this amplifier if the ambient temperature is 17°C? 5
   (b) Explain with neat block diagram the Phase-shift method for suppression of unwanted sideband. 10
   (c) When a broadcast AM transmitter is 50% modulated, its antenna current is 12A. What will be the current when the modulation depth is increased to 0.9? 5

3. (a) Derive mathematical expression for FM wave and its modulation index: 10
   (b) State and prove Sampling theorem for low pass signal. 10

4. (a) Explain with neat block diagram and waveforms the demodulation of PWM signal. 10

(b) Explain the functioning of Phase Discriminator with the help of circuit diagram and phasor diagram. 10

5. (a) Explain disadvantages of Delta Modulation. 5

(b) Explain ISB transmission. 5

(c) Draw block diagram of super heterodyne receiver. Explain each block. 10

6. (a) Explain with neat block diagram and waveforms Grid modulated Class C amplifier used for AM generation . 10

(b) Draw block diagram of PCM technique and explain the functioning of each block. 10

7. Write short notes on any **Four**:– 20

(a) Adjacent – channel interference

(b) Co channel interference

(c) Super heterodyne tracking

(d) Double Spotting

(e) Intermediate Frequency.

13/6/2011

SE ~~ETRX~~ EXTC TV (Rev)
Electromagnetic Wave theory

Con. 3509-11. RK-1920

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.
(2) Out of remaining questions, attempt any **four**.
(3) Assume suitable **data** wherever **necessary**.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) State and explain Biot Savart's Law. 20
(b) Convert the point P (3, 45°, 60°) in :—
(i) Cartesian Co-ordinates
(ii) Cylindrical Co-ordinates.
(c) State and explain current continuity equation in point form and integral form.
(d) Derive an expression for capacitance of a parallel plate capacitor.
(e) State and explain Stoke's theorm.

2. (a) Evaluate work done in bringing a charge of 5μc from origin to P (2, –1, 4) through field. 20

$\bar{E} = 2xyz\ \bar{a}_x + x^2 z\ \bar{a}y + x^2 y\ \bar{a}_2$ v/m through the path.

(i) Straight line segments (0, 0, 0) to (2, 0, 0) to (2, –1, 0) to (2, –1, 4)
(ii) Straight line x = –2y, z = 2x.

(b) Derive an expression for electric field intensity due to infinite surface charge at any point P on z-axis, if surface is placed at z = 0 plane of ρs c/m².

3. (a) State and explain Maxwell's equation in point form and integral form for time varying field. 20
(b) A charge configuration is given as $\rho_v = 5\ r\ e^{-2r}$ c/m³. Find $\bar{D}$ using Gauss's law.

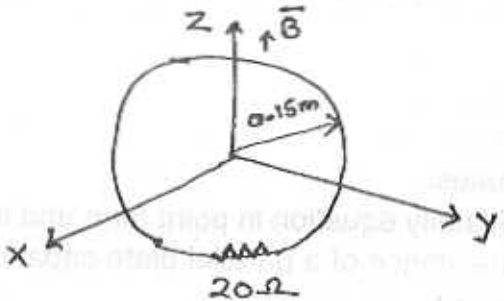
4. (a) Circular loop conductor carrying a current of IA is placed in x-y plane centred at origin. Find expression for $\bar{H}$ at any point P on Z-axis. 20
(b) Four like charges of 30 μc each are located at four corners of a square. The diagonal of which measures 8 m. FInd the force on 150 μc charge located 3 m above the center of a square.

5. (a) Evaluate both the sides of divergence theorem for the field $\bar{D} = 2xy\ \bar{a}_x + x^2\ \bar{a}_y$ C / m² and the rectangular parallel piped formed by the planes x = 0 and x = 1, y = 0 and y = 2, z = 0 and z = 3. 20
(b) Point charges + 3 μc and –3 μc are located at (0, 0, 1) mm and (0, 0, –1) mm respectively in free space.
(i) Find dipole moment $\bar{P}$
(ii) Find electric field intensity vector $\bar{E}$ in spherical co-ordinates at point P (2, 40°, 50°).

[TURN OVER

6. (a) Derive equations for uniform plane waves in time domain in free space in terms of $\overline{E}, \overline{D}, \overline{H}$ and $\overline{B}$. **20**

(b) The circular loop conductor having radius of 0·15 m is placed in x-y plane. This loop consists of a resistance of 20 Ω as shown in the **figure** below. If the magnetic flux density is $\overline{B} = 0 \cdot 5 \sin 10^3 \, t \, \overline{a}_2$ then find out current flowing through this loop.



7. Write short notes on any **two** :— **20**

(a) Boundary conditions for electrostatics between two different dielectric

(b) Poynting theorem

(c) (i) Laplace and Poisson's equation

(ii) Uniqueness theorem.

17/6/2011

SE - EXTC - SEM - IV
Applied maths IV

Con. 3804-11.

RK-1926

(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) Evaluate $\int_c (2x - 5y)\,dx - (2y - 3x)\,dy$ where c is parallelogram having vertices (0, 0), (2, 0), (4, 2) and (2, 2). 5

(b) Find the image of $|z - 1| = 1$ under the transformation $w = z^2$. 5

(c) Find $A^{20} - 2A^{19} + A$ where $A = \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$. 5

(d) Prove that $J_3(x) + 3J_0'(x) + 4J_0''(x) = 0$. 5

2. (a) Verify Green's theorem in the plane for $\int_c \frac{1}{y}\,dx + \frac{1}{x}\,dy$. Where c is the boundary of the region defined by $y = 1$, $x = 4$ and $y = \sqrt{x}$. 8

(b) Find Eigen values and Eigen vectors of A^3. Where $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. 6

(c) If ϕ and ψ are functions of x and y satisfying Laplace equation, then show that s+it is analytic function. Where $S = \frac{\partial \phi}{\partial y} - \frac{\partial \psi}{\partial x}$ and $t = \frac{\partial \psi}{\partial y} + \frac{\partial \phi}{\partial x}$. 6

3. (a) Verify Stoke's theorem for $\bar{F} = (2x - y + z)\,\hat{i} + (x + y - z^2)\,\hat{j} + (3x - 2y + 4z)\,\hat{k}$ over the surface of the cylinder $x^2 + y^2 = 4$ bounded by $z = 9$ and open at the end $z = 0$. 10

(b) Evaluate by using Cauchy's integral formula $\oint_c \frac{\cos \pi z}{z^2 - 1}\,dz$ where c is rectangle whose vertices are $2 \pm i$, $-2 \pm i$. 5

(c) Check wheather the matrix A is derogatory or non-derogatory ? Explain, where 5

$$A = \begin{bmatrix} 2 & -1 & 1 \\ 2 & 2 & -1 \\ 1 & 2 & -1 \end{bmatrix}$$

4. (a) By using Gauss divergence theorem evaluate $\iint_s (y^2 z^2 \hat{i} + z^2 x^2 \hat{j} + x^2 y^2 \hat{k}) \cdot d\bar{s}$ 8

where s is the upper part of the sphere $x^2 + y^2 + z^2 = 9$ above the xy plane.

(b) Obtain Taylor's and Laurent's expansion of f(z) : 6

$f(z) = \dfrac{z-1}{z^2 - 2z - 3}$ indicating the region of convergence.

(c) S.T. $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ satisfies Caley Hamilton theorem and hence find A^{-2}. 6

[TURN OVER

5. (a) If λ_i is root of $J_0(x) = 0$ then show that $x^2 = 2\sum_{i=0}^{\infty} \frac{\lambda_i^2 - 4}{\lambda_i^3 J_1(\lambda_i)} J_0^{(\lambda_i x)}$; $0 \le x \le 1$. 8

(b) Evaluate (By using Residue Theorem). $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$. 6

(c) Find bilinear transformation that maps 1, i, –1 of z plane onto 0, 1, ∞ of w plane. 6

6. (a) Reduce the following Quadratic form into cannonical form and hence find its rank, index, signature and value class by using congruent transformation :— 8

$x^2 - 2y^2 + 10z^2 - 10xy + 4xz - 2yz$.

(b) Evaluate $\int_c \frac{e^z}{z} dz$ where c is $|z| = 1$ and hence deduce that – 6

$\int_0^{2\pi} e^{\cos\theta} \cos(\sin\theta)\, d\theta = 2\pi$ and

$\int_0^{2\pi} e^{\cos\theta} \sin(\sin\theta)\, d\theta = 0$.

(c) Show that $\int J_5(x)\, dx = -J_4(x) - \frac{4}{x} J_3(x) - \frac{8}{x^2} J_2(x) + c$ 6

7. (a) Show that matrix $A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$ is similar to a diagonal matrix. Also find 8

transforming matrix and diagonal matrix.

(b) Show that – 6

$$\iint_S \frac{ds}{\sqrt{a^2x^2 + b^2y^2 + c^2z^2}} = \frac{4\pi}{\sqrt{abc}}$$

Where S is the surface of $ax^2 + by^2 + cz^2 = 1$.

(c) Show that 6

$3J_6(\sqrt{30}) + 5J_2(\sqrt{30}) = 0$.