SE-EE IV-CBSGS.
EM-I

29/5/14

QP Code : NP-19752

2013-14 (Reg.)

(3 Hours) **[Total Marks : 80**

N.B.:- (1) Question No.**1** is compulsory.
(2) **Attempt** any **three** questions out of remaining **five** questions.
(3) Assume suitable data if necessary and justify the same.

Q 1.	Answer the following questions.	20
	a) Explain eddy current loss and various factors affecting it.	
	b) Explain the principle of energy conversion and develop the model of an electromechanical energy conversion device.	
	c) Explain the Rheostatic Braking of D.C. separately excited motor with diagram.	
	d) Explain advantages and disadvantages of autotransformer over two winding transformer	
Q 2 a)	Explain with neat sketches, the armature reaction in dc machine and methods of decreasing effect of armature reaction.	10
Q 2 b)	Derive the expression for electromagnetic torque for doubly excited system in terms of angular rate of change of self and mutual inductances of stator and rotor winding.	10
Q 3 a)	Explain necessity of starter in D.C.motor and hence explain 3 point starter.	10
Q 3 b)	A 220V, 4 Pole, shunt motor has wave winding with 500 conductors. The armature circuit resistance is 0.25 ohm, field resistance is 125 ohm and the flux per pole is 0.02Wb. Armature reaction is neglected. If the motor draws 14 Ampere from the mains, then calculate:- 1) Speed 2) Internal torque developed 3) Shaft power 4) Shaft torque	10
Q 4 a)	Explain speed control methods of D.C.Shunt motor in detail.	10
Q 4 b)	A Field's test on two similar series machines gave the following data: Motor :- Armature current = 60A Voltage across armature = 500V Voltage across field = 40V Generator :- Terminal voltage = 450V Output current = 46A Voltage across field = 40V Armature resistance (including brushes) of each machine is 0.25Ω. Calculate efficiency of both the machines.	10
Q 5 a)	Explain the conditions for satisfactory parallel operation of transformer in detail.	10
Q 5 b)	A 10KVA, 200/400V, 50Hz single phase transformer gave the following test results O.C.Test:- 200 Volts, 1.3 Amp, 120 Watts, when L.V.winding connected to supply. S.C.Test:- 22 Volts, 30 Amp, 200 Watts, when L.V.winding short circuited. Calculate 1) Magnetizing current and core loss component 2) Magnetizing brance impedances 3) Approximate voltage drop when supplying full load at 0.8 power factor leading.	10
Q 6 a)	Explain saving of copper in auto transformer over two winding transformer.	10
Q 6 b)	Explain Faraday's laws. A conductor of 3m length moves under a magnetic field of flux density of 1.3 Wb/m^2 with a velocity of 1.3m/s. Calculate the magnitude of induced emf if conductor moves 1)At an angle of 60 degree to the direction of field and 1) At right angles to axis of field.	10

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SE-EE. IV-Rev

E.P.S

19.5.14

QP Code : **NP-19676**

(3 hours) **[Total Marks : 80**

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

1. Solve any **four** :– **20**
   (a) Why the transmission systems are operated at high voltages ?
   (b) The ac resistance of conductor for overhead line is greater than its dc resistance. Explain.
   (c) What is per unit system ? How are the base quantities selected ?
   (d) What is sag in overhead line ? Which factor affect sag in the overhead lines ?
   (e) Explain classification of cables based on voltage.

2. (a) Derive the expression for inductance of a composite conductor line. Explain the concept of self GMD and mutual GMD. **10**
   (b) A 3-ϕ double circuit line has the configuration shown in the **fig (1)** below. The radius of each conductor is 0·9 cm. Find the inductance per phase per km of line length. **10**

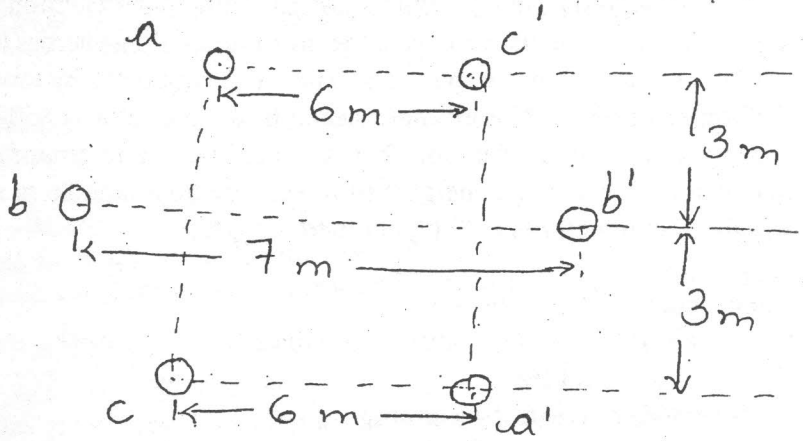

Fig. (1)

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3. (a) Derive the expression for capacitance of a double circuit line with conductors placed at the vertices of a hexagon. **10**
   (b) The fig.(2) below shows a generator feeding two motors through transformers and line. The ratings and reactances are as under, **10**
   Generator : 100 MVA, 11 KV, 3-ϕ, X = 20%
   Transformer T_1 : 3-ϕ, 100 MVA, 11 / 132 kV, X = 4% 3-phase
   Transformer T_2 : Bank of 3 single phase transformers each rated at 35 MVA, 66 / 11 KV, X = 4%.
   Motor M_1 : 40 MVA, 3-ϕ, 10 KV, X = 20%
   Motor M_2 : 60 MVA, 3-ϕ, 11 KV, X = 15%.

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The line reactance is 80 ohms.
Take generator rating as the base.
Draw the p.u. reactance diagram.

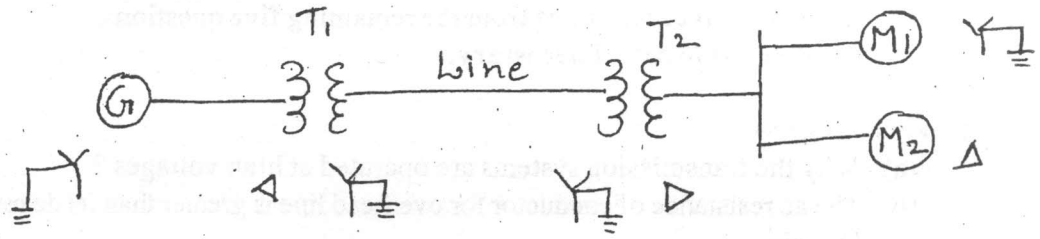

Fig. (2)

4. (a) Derive the A, B, C, D constants for Norminal π circuit of a transmission line. Also draw the phasor diagram. **10**

(b) An 80 km, 3-ϕ, line is supplying 24 MVA at 66 kV and 0·8 lagging p.f. Line resistance is 0·12 Ω | km | phase. Outside radius of conductors is 1·5 cm. Conductor spacing is 2·5 m and equilateral. Use Nominal π method to find the efficiency and regulation. **10**

5. (a) Define string η. Derive the expression for voltage distribution over the insulator string. Show which disc will have the maximum voltage across it. **10**

(b) A high voltage line has a span of 350 m and is supported by towers having a level difference of 35 m. The ultimate strength of conductor is 8500 kg and factor of safety is 3·5. Find the clearance between conductor and ground at a point midway between the towers. The heights of towers are 50 m and 85 m above ground and weight of conductor is 0·82 kg per meter length. **10**

6. Write short notes on any **two** :– **20**

(a) Power flow through transmission lines
(b) Grading of cables
(c) Methods of Neutral grounding.

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ADTC

QP Code :NP-19827

(3 Hours) **[Total Marks : 80**

N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **three** from remaining questions.
(3) Assume suitable data wherever **necessary.**

1. (a) Draw the block diagram of op-amp and explain function of each block. 4
(b) Define following terms w.r.t. op-amp 4
(i) CMRR
(ii) Slew rate.
(c) Explain terms line regulation, load regulation and dropout voltage for linear IC regulators. 4
(d) Convert 4
(i) $(8A9{\cdot}B4)_{16}$ to Binary
(ii) $(615{\cdot}25)_{8}$ to Hexadecimal.
(e) (i) List application of Flip-flops 4
(ii) What are basic types of shift registors in terms of data movement.

2. (a) Explain with waveform working of a positive clipper circuit. 4
(b) Explain working of Schmitt triger along with waveforms. Also derive the equations for trigger point voltages. 8
(c) (i) Draw circuit diagram for op-amp as inverting summing amplifier and derive equation for output voltage. 8
(ii) Draw and explain operation of half wave precision rectifier.

3. (a) Explain voltage to current converter with grounded load. 4
(b) Design a first order low pass filter for cut-off frequency of 2 KHz and pass band gain of 2. Draw circuit diagram and plot the frequency response. 8
(c) Explain IC 555 as monostable multivibrator. 8

4. (a) Op-amp is configured as integrator. Draw output waveforms when input to the circuit is– 4
(i) Square wave
(ii) Sine wave
(b) Give the specifications of digital IC. 4
(c) Explain dual slope analog to digital converter. 4
(d) Design two bit magnitude comparator and implimernt using logic gates. 8

5. (a) Simplify using Boolean laws– 4

$$AB + \overline{AC} + A\overline{B}C \quad (AB + C)$$

(b) Minimize the given function using k-maps and realize using universal gates. 8
$f(A, B, C, D) = \Sigma m(0, 1, 2, 3, 5, 7, 8, 9, 11, 14)$
(c) (i) Explain in short hazads in combinational circuits. 8
(ii) Implement using 8 : 1 multiplexer
$f(A, B, C, D) = 0, 2, 3, 6, 8, 9, 12, 14)$

6. (a) Write note on interfacing between TTL and CMOS logic families. 4
(b) Convert SR flipflop to JK flip-flop. 4
(c) State differences between synchronous and asynchronous counters. 4
(d) Design a mod-5 synchronous counter using JK flip-flop and implement it. Draw timing diagram. 8

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Course : S.E. (SEM-IV) (OLD) & (CBSGS)

Q.P Code : NP-19827

Correction :

Q5 (c) (ii) Implement using 8:1 Multiplexer
$f(A,B,C,D) = \sum m(0,2,3,6,8,9,12,14)$

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S.E. E.E Sem-IV - CBSGS. 16/08/2014

NMOT

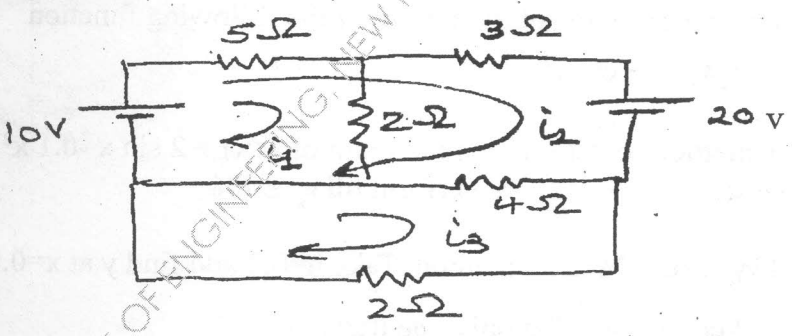
QP Code : NP-19865

(3Hours) [Total Marks :80

N.B.:—(1) Question no. 1 is **compulsory.**
(2) Solve any **four** questions from **remaining.** three
(3) Assume necessary data wherever necessary.

1. Each question carry 4 marks. 20
(a) Write a short note on propagation of error.
(b) Write an algorithm for golden section search method.
(c) Write a short note on curve fitting with sinusoidal function.
(d) Convert following LPP in to standard form.
max $Z = 3x_1+2x_2+5x_3$
Subjected to $2x_1+3x_2-2x_3 \leq 40$
$4x_1-2x_2+x_3 \leq 24$
$x1-5x_2-6x_3 \geq 2$
$x_1,x_2,x_3 \geq 0$
(e) Compare secant method with false position method.

2. (a) Use LU decomposition method to find the given currents i_1,i_2,i_3 in the following circuit. 10



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(b) Use method of bisection to find root of equation $f(x) = x^4+2x^3-x-1=0$ lying in interval [0,1] at the end of 5th iteration. 10

3. (a) For the following data find the polynomial f(x) which passes through all the points using Newton divided difference interpolation and find value at x=4. 6

x	-1	0	3	6	7
f (x)	3	-6	39	822	1611

(b) A firm produces an alloy having following specifications 4
(i) Specific gravity ≤ 0.98
(ii) Chromium $\geq 8\%$
Raw materials A, B & C having properties shown in table can be used to make alloy.

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Property	A	B	C
Specific gravity	0.92	0.97	1.04
Chromium	7%	13%	16%

Cost of various raw materials per ton are Rs 90 for A, Rs 280 for B, Rs 40 for C. Formulate LPP so that cost of raw materials is minimum.

(c) Solve the differential equation 10

$\frac{dy}{dx} = x^2 + 2yx$, $y(0) = 0$ by Picard's method upto 3rd approximation

4. (a) Solve the differential equation.

$\frac{dy}{dx} = 1 + xz$, $\frac{dz}{dx} = -xy$ for $x = 0.3$ using 4th order Runge kutta method . Given 10

$y(0) = 0$, $z(0) = 1$, $h = 0.3$

(b) With the given coordinates find x at y=2 using Lagrange's inverse interpolation of order 3. 5

x	0	1	2	3
y	0	1	7	25

(c) Find maximum or minimum solution point of the following function 5

$f(x) = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$

5. (a) Use Newton's method to determine maximum of $f(x) = 2 \sin x - 0.1 x^2$. Take initial approximation of $x_0 = 2.5$ & perform till $\varepsilon_s \leq 1\%$ 10

(b) Solve $\frac{dy}{dx} = 1 + y^2$ using Milne's method. Take h=0.2 and find y at x=0.8 with following initial conditions. Do only one iteration. 5

x	0	0.2	0.4	0.6
y	0	0.2027	0.4228	0.6841

(c) Maximize $Z = 4x_1 - x_1^2 + 8x_2 - x_2^2$ 5

Subjected to $x_1 + x_2 = 2$

$x_1, x_2 \geq 0$

using Lagrange's multiplier method.

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6. (a) Find maximum value using graphical method 10

maximize $Z=25x_1+30x_2$

subjected to $2x_1+3x_2 \leq 1500$

$3x_1+2x_2 \leq 1500$

$x_1 \leq 400, x_2 \leq 400$

$x_1, x_2 \geq 0$

(b) Solve using simplex method 10

Maximize $Z= 14x + 20y$

Subjected to $20x+6y \leq 1000$

$40x+8y \leq 500$

$x, y \geq 0.$

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SE - Electrical
Sem IV (CBSGS)
Sub : Signal Processing

04/06/2014

QP Code : **NP-19788**

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No. 1 is **compulsory.**
(2) Answer any **three** question out of remaining **five** questions.
(3) Assume **suitable data** wherever **required.**

1. Solve the following :— **20**
   (a) Determine the periodicity of the following continuous time signal :
   $x(t) = 5 \cos 4\pi t + 3 \sin 8 \pi t.$
   (b) Find the z-transform and ROC of the following infinite duration signal :
   $x(n) = a^n U(n) + b^n u(-n-1)$
   (c) Determine whetehr the following signal is energy or power signal or neither
   $x(n) = \left(\frac{1}{4}\right)^n u(n)$
   (d) State Sampling Theorem and explain how aliasing error occurs ?

2. (a) Classify the following system as linear, non-linear time-variant, time invariant, causal, non causal, static, dynamic. **10**
   $y(n) = nx(n)$ and $y(n) = x(n^2)$
   (b) An LTI system is described by the equation : **10**
   $y(n) = x(n) + 0{\cdot}8\, x(n-1) + 0{\cdot}8\, x(n-2) - 0{\cdot}49\, y(n-2)$
   Determine the transfer function of the system : sketch the poles and zeros on the z-plane.

3. (a) State and prove differentiation property of z-transform. **5**
   (b) Perform linear convolution using circular convolution. **5**

   $x_1(n) = \{\underset{\uparrow}{2}, 1, 2, 1\}$

   $x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$

   (c) Obtain the magnitude and phase response of the following system by Analitical and Geometric Method. **10**
   $h(n) = \{1, \frac{1}{2}\}$

4. (a) Determine the inverse z-transform of the function :— **10**

$$X(z) = \frac{1}{1 - 1{\cdot}5z^{-1} + 0{\cdot}5z^{-2}}$$

   (i) ROC $|z| > 1$
   (ii) ROC $|z| < 0{\cdot}5$
   (iii) ROC $0{\cdot}5 < |z| < 1$
   Sketch for all ROC.
   (b) Using radix 2 DIT FFT algorithm compute 8-point DFT for the given : **10**
   $x(n) = \{0, 1, 1, 1, 1, 1, 1, 1\}$

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5. (a) Determine the response of LTI system governed by the difference equation : 10

$$y(n) - 0{\cdot}5\, y(n-1) = x(n)$$

for input $x(n) = 5^n u(n)$ and initial condition $y(-1) = 2$

(b) Compute DFT of the 4 point sequence of the following :— 10

(i) $x(n) = \{ 0, 1, 2, 3 \}$

(ii) $x(n) = \{ 1, 2, 3, 1 \}$

6. Write short notes on the following :—

(a) Power Spectral Density. 5

(b) Properties of DFT. 5

(c) System classification as Minimum phase, maximum phase and mixed phase. 5

(d) Filter classification based on passband. 5

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SE - Electrical & EXTC.
Sem IV - Rev.
A.M. IV 23/5/14

2013-14
(ATKT)

QP Code : **NP-19713**

(3 Hours) **[Total Marks : 80**

N.B.: (1) Quesions No. **1** is **compulsory**.
(2) Solve any **three** from the **remaining**.

1. (a) Prove that Eigen values of a hermitian matrix are real. 5

(b) Evaluate $\oint_c \frac{e^{kz}}{z} dz$ over the circle $|z|=1$ and k is real. Hence prove that $\int_0^{\pi} e^{k\cos\theta} \cos(k\sin\theta)\, d\theta = 2\pi$. 5

(c) Find the extremal of $\int_{x_1}^{x_2} (16y^2 - (y'')^2 + x^2) dx$ 5

(d) Find a vector orthogonal to both u = (–6, 4, 2) and v = (3, 1, 5). 5

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2. (a) Find the curve y = f(x) for which $\int_{x_1}^{x_2} y\sqrt{1+(y')^2}\, dx$ is minimum subject to the constraint $\int_{x_1}^{x_2} \sqrt{1+(y')^2}\, dx = \ell$. 6

(b) Find eigen values and eigen vectors of the matrix $A = \begin{bmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{bmatrix}$ 6

(c) Obtain Taylor's series and two distinct Laurent's series expansion of $f(z) = \frac{z^2-1}{z^2+5z+6}$ about z = 0, indicating region of covergence. 8

3. (a) State Cayley-Hamilton Theroern, hence deduce that $A^8 = 625I$, where $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ 6

(b) Using calculus of Residues, prove that $\int_0^{2\pi} e^{\cos\theta} \cos(\sin\theta - n\theta)\, d\theta = \frac{2\pi}{n!}$. 6

(c) Find the plane curve of fixed perimeter and maximum area. 8

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4. (a) State Cauchy-Schwartz inequality and hence show that $\left(x^2+y^2+z^2\right)^{1/2} \geq \frac{1}{13}\left(3x+4y+12z\right)$, x, y, z are positive. 6

(b) Reduce the quadratic form $Q = x^2+y^2-2z^2-4xy-2yz+10xz$ to Canonical form using congruent transformation. 6

(c) (i) If $A = \begin{bmatrix} \pi/2 & 3\pi/2 \\ \pi & \pi \end{bmatrix}$, find Sin A. 4

(ii) Show that the matrix $A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$ is Derogatory. 4

5. (a) Using Rayleigh - Ritz method, find an appropriate solution for the extremal of the functional $I[y(x)] = \int_0^1 \left[xy + \frac{1}{2}\left(y^1\right)^2 \right] dx$ subject to $y(0) = y(1) = 0$. 6

(b) Find an orthonormal basis of the following subspace of R^3, $S = \{ [1,2,0]\ [0,3,1] \}$. 6

(c) Is the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ diagonalizable. If so find diagonal form and transforming matrix. 8

6. (a) Find f(3), f ' (1 + i), f " (1 – i), if $f(a) = \oint_c \frac{3z^2+11z+7}{z-a} dz$, $c: |z| = 2$. 6

(b) Evaluate $\int_0^\infty \frac{x^3 \sin x}{\left(x^2+a^2\right)^2}$ using contour integration. 6

(c) Find the singular value decomposition of the matrix $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ 1 & -1 \end{bmatrix}$. 8
