AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** _____

School: SoET-CBCS **Branch:** ELECT. ENGG. **SEM:** IV

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- IV	EEC401		✓	02
2	Power System - I	EEC402		✓	02
3	Electrical Machines – II	EEC403		✓	02
4	Electromagnetic Field and wave Theory	EEC404		✓	02
5	Analog and Digital Integrated Circuits	EEC405		✓	02
6	Electrical Network	EEC406		✓	02

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

S.E - Sem-IV - Choice Based - Electrical.

Paper / Subject Code: 40601 / Applied Mathematics-IV

7/5/19

Time: 3 Hours **Marks:80**

N.B. 1. Question No. 1 is compulsory.
2. Attempt any THREE out of remaining FIVE questions.

Q. 1 *a)* Find the extremal of the functional $\int_{x1}^{x2}(y^2 + y'^2 - 2ysinx)\,dx$ (5)

b) Determine whether the set of vectors of the form (a,b,c) where b=a+c is subspace of R^3 under usual addition and scalar multiplication. (5)

c) Find the eigen values of $A^3 - 3A^2 + A$ where (5)

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$$

d) Find the value of k and mean if the function (5)

$$f(x) = \{kx^2(1-x^3) \quad if \quad 0 \le x \le 1$$
$$0 \qquad\qquad\quad otherwise\}$$

Q. 2 *a)* Evaluate $\int_c \frac{2z-1}{z(2z+1)(z+2)}dz$ where 'c' is the circle $|z| = 1$. (6)

b) Find the moment generating function of the following distribution (6)

x	-2	3	1
P(X=x)	1/3	1/2	1/6

Hence find the first four central moments.

c) Two regression lines are given by 3x +2 y=26 and 6x +y =31 i) Find the means of x and y ii) the correlation coefficient. And iii) σ_y *if* $\sigma_x = 3$. (8)

Q 3 *a)* Examine whether the set of real matrices of order 2×2 as defined by $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ with usual addition and scalar multiplication is a vector space. (6)

b) Evaluate $\int_c \frac{sin^6 z}{(z-\frac{\pi}{6})^3}dz$ $c: |z| = 1$. (6)

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c) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable. (8)
Find the transforming matrix and the diagonal matrix.

Q 4 a) Find the curve of given length 'l' which encloses a maximum area. (6)

b) The marks obtained by 1000 students in an examination are found to be normally distributed with mean 70 and standard deviation 5. Estimate the number of students whose marks will be i) between 60 and 75 ii) more than 75. (6)

c) Find all the possible Laurent's expansions of $\frac{z}{(z-1)(z-2)}$ about $z=-2$. (8)

Q 5 a) Show that the matrix $A = \begin{bmatrix} 2 & -3 & 3 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ is derogatory and find its minimal polynomial. (6)

b) Find an orthonormal basis for the subspaces of R^3 by applying Gram Schmidt Process where $S=\{(1,2,0),(0,3,1)\}$ (6)

c) Fit a binomial distribution to the following data. (8)

x	0	1	2	3	4	5	6
f	5	18	28	12	7	6	4

Q 6 a) Using Rayleigh Ritz method find an approximate solution for the extremal of the $\int_{x1}^{x2}(2xy + y^2 - y'^2)\,dx$ with $y(0)=0$ and $y(1)=0$. (6)

b) If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$. Show that for $n \geq 3, A^n = A^{n-2} + A^2 - I$. (6)

c) Using Residue theorem evaluate $\int_0^{2\pi} \frac{d\theta}{(2+\cos\theta)^2}$. (8)

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SE-sem-IV- Choice Based - Electrical

64

13/5/19

Paper / Subject Code: 40602 / Power System - I

Duration – 3 Hours **Total Marks - 80**

N.B.: - i) Question No.**1** is compulsory
ii) **Attempt** any **Three** questions from Q2. to Q6.
iii) Assume suitable data if necessary and justify the same.
iv) Figures to right indicate full marks

Q 1. Answer **all questions**.

A) Why long transmission lines are transposed? **05**

B) Why pin insulators are used for low voltage and suspension insulators are used for high voltages **05**

C) Discuss the imperfect behavior of cables. **05**

D) Discuss why the representation of line by lumped parameter gives inaccurate results for long lines **05**

Q 2 a) Derive the equation for economical choice of voltage **10**

Q 2 b) A 400 KV 3 phase bundle conductor line with two sub conductor per phase has a horizontal configuration. The horizontal distance between sub conductors is 45 cm. Radius of a sub conductor is 1.6 cm. Horizontal distance between the conductors is 12m. Find the inductance per phase per km of line. Compute the inductance of line with only one conductor per phase having the same cross sectional area of the conductor of each phase. **10**

Q 3 a) Derive an equation for inductance due to internal flux linkages **10**

Q 3 b) A 220 KV 50 HZ 200 Km long 3 phase line has its conductor on the corner of a triangle with the sides 6m,6m,12m the conductor radius is 1.1 cm. Find the capacitance per phase per km , capacitive reactance, charging current and total charging volt amperes. **10**

Q 4 a) Derive the equation for capacitance of three phase line equilateral spacing **10**

Q 4 b A line has a string of three suspended insulators, with a self-capacitance of C farads. The shunt capacitance of each insulator is 0.26C to earth and 0.15C to line. Find the string efficiency if a guard ring increases the shunt capacitance to line of metal work of the lowest insulator to 0.35C. **10**

Q 5 a)	Discuss the following terms with respect to transmission line propagation constant. Ferranti effect, and tuned power lines.	10
Q 5 b)	A 15 km long 3 phase overhead line delivers 5 MW at 11KV at a power factor of 0.8 lagging. Line loss is 12 % of power delivered. Line inductance is 1.1mH/Km. Calculate sending end voltage and regulation, power factor of load to make regulation zero.	10
Q 6 a)	Explain the per unit method of computation?	10
Q 6 b)	Discuss the measurement of earth resistance and soil resistivity	10

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SF - sem - IV - Choice Board - Electrical

(66)

Paper / Subject Code: 40603 / Electrical Machines -II

17/5/1

[Time: Three Hours] **[Marks: 80]**

N.B. 1. Question no. 1 is compulsory.
2. Attempt any THREE from the remaining questions.
3. Figure to right indicates full marks.

Q.1 Solve any four questions.

a) Explain the conditions for parallel operation of three phase transformer. [05]
b) Explain why secondary winding of CT always be shorted. [05]
c) Write short note on connection and phasor diagram of Dy1 transformer. [05]
d) Which necessary data get from O.C. and S.C. test on single phase transformer. [05]
e) Explain properties of magnetic materials required for electrical machine design. [05]

Q.2 a) Prove that the copper saved in auto transformer is (1-k) times that of two winding transformer. [10]
b) Explain Harmonics in transformer and state the causes of Harmonics. [10]

Q.3 a) Derive the output equation of single phase and three phase transformer. [10]
b) Two transformers A and B are joined in parallel to the same load. Determine the current delivered by each transformer, given: open circuit emf 6500 V for A and 6300 V for B. Equivalent leakage impedance in terms of the secondary = $(0.2+j2)\Omega$ for A and $(0.1+j1)\Omega$ for B. The load impedance is $(8+j6)\Omega$. [10]

Q.4 a) Derive the equation to obtain approximate voltage regulation in single phase transformer. Also draw the phasor diagram. [10]
b) Explain in detail the oscillating neutral in three phase transformer. [10]

Q.5 a) Draw a diagram showing main dimensions of single phase and three phase core type transformer and write the equation for the same. [10]
b) Explain the designing of cooling tubes and tank in transformer [10]

Q.6 a) Explain the designing of core of a three phase transformer [10]
b) A 500 KVA 6600/400 V, 50 Hz. Delta star, three phase core type transformer has the following data. [10]
Width of LV winding = 16 mm; Width of HV winding = 20 mm; height of coils=0.5m.
Length of mean turn = 0.8 m; HV winding turns = 900.
Width of duct between HV and LV winding=13mm.Calculate leakage reactance of transformer referred to HV side.

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SE - Sem-IV - Choice Based - Electrical

23/5/19

Paper / Subject Code: 40604 / Electromagnetic Field and Wave Theory

[3 Hours] **[Total Marks : 80]**

Please check whether you have got the right question paper.

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**.

1. a) Explain Coulomb's law in electrostatics and hence define Unit Charge. **(05)**
   b) Explain the following vector in Cartesian co-ordinate system : **(05)**
   $A = 2\cos\theta\, \hat{a}_r + 3r\, \hat{a}_\theta - 4\, \hat{a}_z$
   c) State and explain relationship between Electric Intensity and Potential. **(05)**
   d) What is Lorentz force equation for moving charge? Enlist two applications. **(05)**

2. a) Show that electric field due to infinite sheet of charge at a point is independent of distance at that point from the plane containing the charge. **(10)**

   b) Three equal point charges of 2μc are in free space at (0, 0, 0), (2, 0, 0), (0, 2, 0) respectively. Find net force on fourth charge of 5μC at (2, 2, 0). **(10)**

3. a) Derive Poisson's and Laplace equation. Two plates of a parallel capacitors are separated by a distance 'd' and maintained at potential 0 and V_1 respectively. Find potential at any point between plates. **(10)**

   b) Derive the set of Maxwell's equation for Static field and Time varying field. **(10)**

4. a) Explain Ampere circuital law and differentiate between condition current and displacement current. **(10)**

   b) Find the capacitance of a co-axial conductor of length L, where inner and outer radius are r_1 and r_2 respectively. **(10)**

5. a) A current sheet $\overline{K} = 10\, \hat{a}_z$ A/m lies in X = 4 m plane and a second sheet $\overline{K} = -8\, \hat{a}_z$ A/m is at X = –5 m plane. **(10)**
   Find $\overline{H}$ at points :
   i) (1, 1, 1)
   ii) (0, –3, 10)

   b) Derive magnetic field intensity due to finite and infinite wire carrying a current. **(10)**

6. a) Formulate the wave equation from Maxwell's equations for perfectly conducting medium. **(10)**

   b) Consider an interphase in Y - Z plane. The region X < 0 is medium 1 with $\mu_{r1} = 4.5$ and magnetic field, $H = 4\,\hat{a}x + 5\,\hat{a}y - 6\,\hat{a}z$ A/m. The region X > 0 is medium 2 with $\mu_{r2} = 6$. Find H_2 and B_2 in medium 2 and also calculate the angle made by H_2 with normal to interface. **(10)**

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SE-sem-IV - choice Based - Electrical 29/5/19

Paper / Subject Code: 40605 / Analog and Digital Integrated Circuits

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

N.B. (1) Question no.1 is **compulsory.**
(2) Attempt **any three** from the rest.
(3) Make any suitable assumption wherever required.

Q.1 Answer any FOUR of following

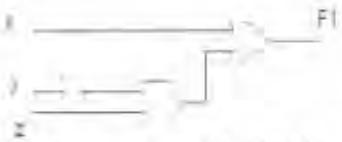
(a) Give the ideal and practical values of the following parameters 5M
a) CMRR b) Slew Rate c)) Input Resistance d) Output Resistance
e) PSRR

(b) For a inverting summing amplifier if R_f= 5KΩ, R_1=1KΩ, R_2=2KΩ and R_3=5KΩ with supply voltage of ±12V if following inputs are applied calculate the output voltage if 5M
I) V_1=3mV, V_2=4mV and V_3=6mV
II) V_1=3V, V_2=4V and V_3=6V

(c) I) Simplify the following 5M

$$\overline{AB} + \overline{ABC} + \overline{\bar{A}B + C}$$

(d) Write the output equation for following and prepare the truth table of F1 for possible values of X,Y and Z. 5M



(e) Convert i) $(C9.A2)_{16}$ to binary, octal and decimal 5M
ii) $(47.31)_{10}$ to hexadecimal

(f) Draw and explain V to I converter using Op-amp 5M

Q.2 (a) Draw and explain op-amp as Integrator, Also draw its input and output waveforms with its frequency response 10M

(b) Implement the following function using 3 data select input multiplexer 10M
f(A,B,C,D) = ∑m(0,2,3,5, 6,8,10,14)

Q.3 (a) Give the block diagram of IC-555 and explain the function of each pin 10M

(b) Convert i) JK Flip flop to T Flip flop 10M
ii) T to D Flip flop

Q.4 (a) Draw and explain First order Butterwoth Low Pass Filter with its practical frequency response. 10M

(b) Design 4 bit asynchronous counter using J-K flip flop 10M

Q.5 (a) How op-amp can be used as Inverting Schimitt Trigger. Explain it with neat diagram and waveforms. 10M

(b) Simplify the following using K-map implement using gates 10M
f(A,B,C,D) = Σ m (0,2,3,5,9,13,14) +d(4,7,10)

Q.6 Write short note on any **TWO** of the following. 20M

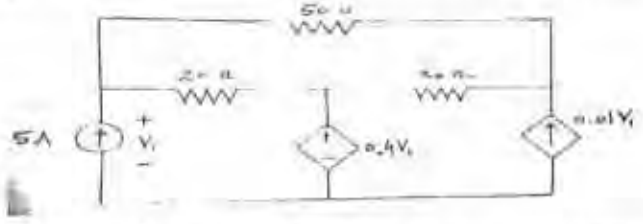
(a) Shift Register
(b) Sample and Hold Circuit using Op-Amp
(c) Binary to Gray Code converter

(3 Hours) Total Marks - 80

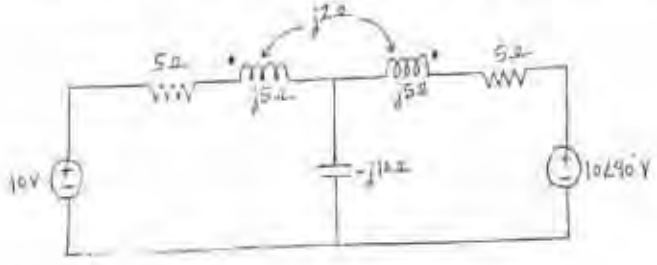
N.B.
i) Question No. 1 is compulsory.
ii) Attempt any three questions from remaining.
iii) Assume suitable data if necessary.
iv) Figures to the right indicate full marks.

Q.1 Attempt any **Four**
A) Express Z - parameters in terms of Y- parameters. [05]
B) Explain the principle of duality. [05]
C) State reciprocity theorem. [05]
D) Find Laplace transform of unit step & unit ramp function. [05]
E) State restrictions on pole & zero location for driving point function. [05]

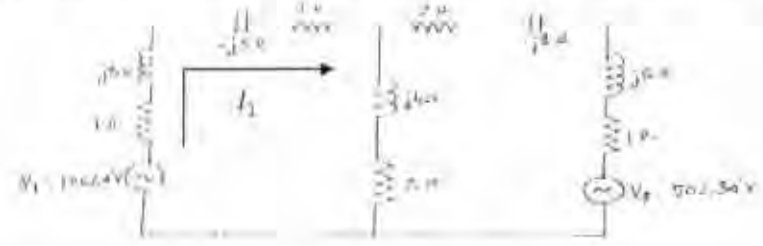
Q.2
A) Use Nodal analysis to determine voltage V_1 for the electrical circuit shown below. [10]



B) Find the current through 10Ω capacitive reactance by using mesh analysis. [10]



Q.3
A) Use Superposition theorem to find current I_1 for the electrical circuit shown below. [10]

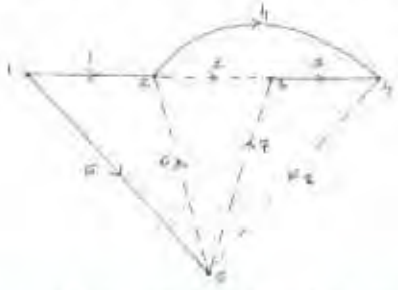


B) Define the following terms, [05]
i) Non-oriented & Oriented graph.
ii) Tree & Co-tree.

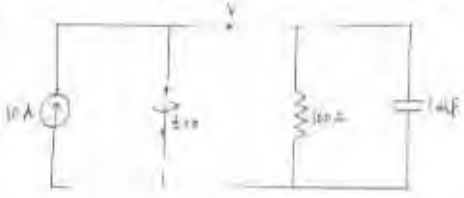
C) Define pole & zero of network function & draw p-z plot for $V(s) = \frac{5(S+5)}{S(S+10)(S+15)}$. [05]

Q.4

A) For a given tree of the linear graph, obtain incidence matrix, fundamental cut-set matrix & fundamental tie-set matrix. [10]

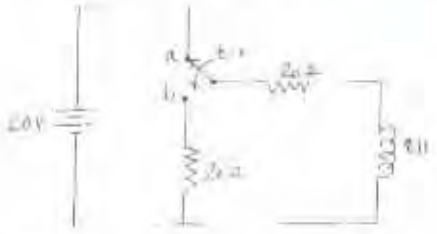


B) In the given circuit switch is opened at t = 0, find the value of $v, \frac{dv}{dt}$ & $\frac{d^2v}{dt^2}$ at time t = 0+. [10]

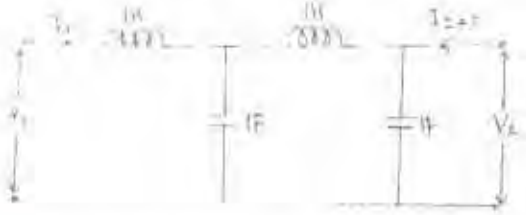


Q.5

A) The switch changes its position from "a" to "b" at time t = 0. Determine current i(t) for t>0 using Laplace transform. [10]

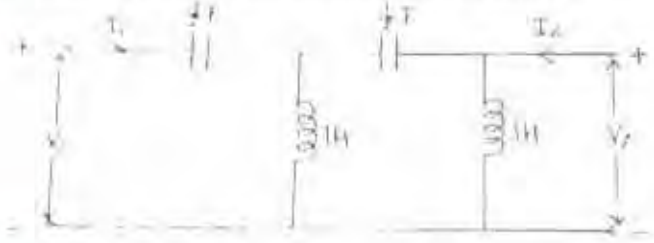


B) Find the network functions $\frac{V_1}{I_1}$, $\frac{V_2}{V_1}$ & $\frac{V_2}{I_1}$ for the network shown below. [10]



Q.6

A) Determine the Y- parameters for the two port network shown below. [10]



B) Define the Z - parameters of two port network. Derive the expression for reciprocity & symmetry condition. [10]

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