Q. P. Code: 37763

Duration – 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 any **FOUR** from **FIVE** following questions.

A) Explain typical AC system with single line diagram. **05**

B)Explain Skin effect and proximity effect. **05**

C) Define PU system. Write advantages and disadvantages of PU system. **05**

D) Explain suspension insulator. Write advantages over pin type insulator **05**

E) Explain transposition of power system **05**

Q 2 a) What is string efficiency. Describe different method to improve string efficiency. **10**

Q 2 b) Derive the expression for inductance of single phase two wire line. **10**

Q 3 a) A 3- phase double circuit line has vertical configuration as radius of each conductor is 1.1cm. The horizontal distance h is 5m and the vertical distance D is 3m. Find the inductance/ph/km of the line. **10**

Q 3 b) Explain effect on earth on single phase transmission line capacitance. **10**

Q 4 a) Find ABCD constant of medium transmission line represented by nominal π model. Also draw phasor diagram **10**

Q 4 b) If weight of conductor is 0.35 kg/m. maximum allowable strength is 800kg. Span length is 160m and safety factor is 2. Find the minimum point of sag if supports are at 70m and 65m **10**

Q 5 a) A string insulator has 5 units each rated for 11 kv. Find the maximum line voltage on which it can be operated safely. The mutual capacitance of unit is 10 times the capacitance between pin to earth **10**

Q 5 b) Find the approximate expression for sag in overhead lines, when **10**

I) Support are at equal level

II) Support are at unequal level

Q6) Short note on

a) Explain general construction of underground cable. **07**

b) Explain tuned power line **06**

c) Explain measurement of earth resistance and soil resistivity **07**

Q. P. Code: 24492

Duration: 3 Hours **Total Marks: 80**

N.B. : 1) Q.1. is compulsory.

2) Attempt any three from the remaining.

Q.1. a) Show that the set $\{e^x, xe^x, x^2e^x\}$ is linearly independent in $C^2(-\infty, \infty)$. (5)

b) Show that $\int_C \log z dz = 2\pi i$, where C is the unit circle in the z-plane. (5)

c) Find the projection of u=(3,1,3) along and perpendicular to v=(4,-2,2) (5)

d) Find the extremal of $\int_{x_1}^{x_2} \left(y^2 + y'^2 + 2ye^x\right) dx$ (5)

Q.2. a) If $A = \begin{bmatrix} 3/2 & 1/2 \\ 1/2 & 3/2 \end{bmatrix}$, find e^A (6)

b) Evaluate $\int_0^{\pi} \frac{d\theta}{3 + 2\cos\theta}$ (6)

c) Find the singular value decomposition of $\begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$ (8)

Q.3. a) Find the extremal of $\int_0^{\pi} \left(y'^2 - y^2\right) dx$ given $y(0) = 0, y(\pi) = 0$ (6)

b) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ and hence find A^{-1} & A^4 (6)

c) Expand $f(x) = \frac{1}{(z-1)(z-2)}$ in the regions (i) $1 < |z-1| < 2$ (ii) $|z| < 1$ (8)

Q.4. a) Construct an orthonormal basis of R^3 using Gram Schmidt process to
S = {(3,1),(2,3)} (6)

b) Find the extremum of $\int_{x_0}^{x_1} (2xy + y''^2) dx$. (6)

c) Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy + 4xz - 2zy$ to canonical form and hence, find its rank, index and signature and value class. (8)

Q.5. a) Using Residue theorem evaluate $\int_C \frac{z^2}{(z-1)^2(z+1)}dz$ where C is |z|=2. (6)

b) Find the linear transformation Y=AX which carries $X_1 = (1,0,1)', X_2 = (1,-1,1)', X_3 = (1,2,-1)'$ onto $Y_1 = (2,3,-1)', Y_2 = (3,0,-2)', Y_3 = (-2,7,1)'$ (6)

c) Check whether $V = \mathbb{R}^2$ is a vector space with respect to the operations

$(x_1,0)+(x_2,0) = (x_1+x_2,0); k(x_1,0) = (kx_1,0)$ (8)

Q.6.a) Obtain Taylor's series expansion for $f(x) = \frac{2z^3+1}{z(z+1)}$ about $z = i$ (6)

b) Let $W = span\left\{(0,1,0), \left(\frac{-4}{5},0,\frac{3}{5}\right)\right\}$, Express w =(1,2,3) in the form of $w = w_1 + w_2$ where

$w_1 \in W$ & $w_2 \in W^{\perp}$ (6)

c) Using Rayleigh- Ritz method, solve the boundary value problem $I = \int_0^1 \left(2xy - y^2 - y'^2\right)dx$;

given $y(0) = y(1) = 0$ (8)

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Q.P. Code : 16504

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

Please check whether you have got the right question paper.

N.B:
1. **Question.No.1 is compulsory.**
2. **Attempt any 3 from the remaining questions.**
3. **Assume suitable data if necessary.**
4. **Draw neat diagram, wherever necessary.**

Q. 1 Attempt any four questions.

a) Derive e.m.f equation of transformer. **(05)**

b) Explain the principle of energy conversion and develope the model of electromechanical energy conversion device. **(05)**

c) Explain the rherostanic braking of d.c. shunt motor. **(05)**

d) Explain the necessary the required to connect two transformer in parallel. **(05)**

e) List down the different application shunt, series and compound motor. **(05)**

Q. 2 **a)** Explain the different electrical braking methods for separately excited DC motor. **(10)**

b) Two single phase transformer with equal voltage ratio having impedance of (0.5+j3) ohm and (0.6+j10) ohm with respect to the secondary. If they operate in parallel determine how they will share a total load of 100kw at p.f 0.8 lagging. **(10)**

Q. 3 **a)** Explain the process of commutation and mention the method to improve the commutation **(10)**

b) Consider a 5 KVA 200/400 V, 50 Hz, single phase transformer gave following result. **(10)**
O.C test : 200 V, 0.74A, 60 W (L.V side)
S.C. test : 10 V, 5A, 22W (H. V. side)
Calculate (i) efficiency and voltage regulation at full load 0.8 pf lagging.
(ii) The efficiency at half load at unity power factor.

Q. 4 **a)** What is armature reaction? What are the effects of armature reaction and how the armature reaction is minimized? **(10)**

b) A 220 V, 6 pole shunt motor has wave winding with 720 conductor having armature resistance 0.2 ohm and field resistance is 120 ohm and flux per pole is 0.025 Wb, if motor draws 15A form mains then calculate speed and torque developed. **(10)**

Q. 5 **a)** Explain the necessities of starter in DC motor and hence explain 3 point starter. **(10)**

b) What do you mean by ideal transformer? Draw explain in detail transformer phasor diagram for lagging and leading P.F load. **(10)**

Q. 6 Write the Short Notes : **(10)**

a) Doubly exited magnetic field.

b) All day efficiency in transformer. **(10)**

Q.P. Code :24725

[Time: 03 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Q.1 is compulsory.
2. Attempt any three questions from remaining questions
3. Assume suitable data wherever required.

Q.1 a) If x[n] = {3, 2, 4} h[n] = {1, 2, 3} Find y[n] using circular convolution. **05**

b) Prove any two properties of Fourier Transform **05**

c) Find the Z transform of the given function $x(n) = (1/4)^n + u(n) + (1/5)^n u(-n-1)$ **05**

d) Check the linearity and Time variance property of the system $y[n] = x[n^2]$ **05**

Q.2 a) Find the even and odd components of x[n] = {-1, 7,-2, 3,-7, 6} **05**

b) Find the initial value and final value of **05**

$$X(z)=\frac{2z^{-1}}{1-1.8z^{-1}\ 0.08z^{-2}}$$

c) An LTI system is described by the difference equation **10**
$2y(n) + 3y(n-1) + y(n-2) = u(n) + u(n-1) - u(n-2)$
Find the response of the system when initial conditions are given
$y(-1) = 2$, $y(-2) = -1$ and unit step is applied at the input.

Q.3 a) Explain all basic filters and plot their magnitude responses |H(w)| **10**

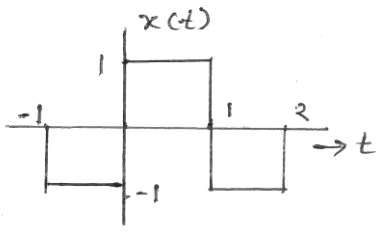
b) Identify the type of filter based on its pass band by analytical method. Draw pole-zero plot. **10**

$$H(Z)=\frac{1}{1+0.8z^{-1}}$$

Q.4 a) $$H(Z) = \frac{(1-0.5Z^{-1})(1-Z^{-1})}{(1+0.2Z^{-1})(1+0.8Z^{-1})(1-0.8Z^{-1})}$$ **10**

i) Give ROC condition
ii) Sketch pole Zero diagram
iii) Find the response of the system
iv) Comment on the stability

b) A continuous time signal x (t) is given below. Sketch the following Signals: **10**
a) $x_1(t) = 2x(t)$ b) $x_2(t) = x(t-3)$
c) $x_3(t) = x(t/2)$ d) $x_4(t) = x(2t)$



Q.P. Code :24725

Q.5	a)	State sampling theorem. How aliasing occurs? How it can be eliminated?	**10**
	b)	Derive and sketch the ROC of any three infinite duration signals. Also comment on stability.	**10**
Q.6	a)	An 8 point sequence is given by x(n)={2,4,6,8,2,4,5,8].Compute 8 point DFT of x(n) by radix -2 DIT - FFT method.	**10**
	b)	Prove any four DFT properties	**10**

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[Time: 3 Hours] [Marks:80]

Instructions:

1. Question no. 1 is **compulsory**.
2. Answer any **three** from remaining.
3. Figures to the **right** indicate **full marks.**

1. Answer any FOUR of the following **20**

i) Compare sequential and combinational logic circuits

ii) Draw circuit and derive expression for op-amp as as an adder and subtractor.

iii) Define the terms w.r.t op-amp i) Slew rate ii) input offset voltage

iv) Convert the following :
i) $(58)_{10}$ to Octal ii) $(275B)_{16}$ to binary

v) Explain interfacing between TTL and CMOS logic families.

2. a)Explain briefly the operation of TTL NAND gate in tristate output configuration **10**

b) Draw and explain operation of R-2R ladder DAC. Derive the expressions for its output voltage. State its advantages and disadvantages. **10**

3. a) Illustrate with neat circuit diagram, operation of Op-amp as an instrumentation amplifier. Derive the expression for output voltage **10**

b) Illustrate operation of Op-amp as basic integrator with circuit diagram. Draw input and output waveforms for input i) Triangular wave ii) square wave **10**

4. a) Implement the following SOP expression using i)Two 8:1 multiplexer ii) One 8:1 multiplexer **10**

$$f(A,B,C,D) = \Sigma m(0,2,3,4,6,9,10,12)$$ **10**

b) Design 3-bit synchronous counter using JK flip flops.

5. a) Minimize the expression using K-map and realize using gates. **10**

$$f(A,B,C,D) = \Sigma m(0,5,9,12,13,14,15) + d(1,2,3,4)$$

b) Design a 3-bit binary to gray code converter and implement using EX-OR gates. **10**

6. a) Design an astable multivibrator using IC 555 timer for 1 kHz frequency with 40% duty cycle. **10**

b) i) Simplify Y= $A\bar{B}\bar{C} + \bar{A}\bar{B}C + ABC + \bar{A}\bar{B}\bar{C}$ and implement using basic gates.
ii) Implement EX-OR using NOR gates. **10**

[3 Hours] **[Total Marks : 100]**

Please check whether you have got the right question paper.

N.B:
1. **Question No. 1** is **compulsory**.
2. Solve **any three** questions from **Questions No. 2** to **6**.
3. Assume necessary **data** where necessary.

Q1 Answer the following questions **20**

A) What do you mean by forward difference interpolation and backward difference interpolation? Enlist the various methods of interpolation.

B) What do you mean by equality and inequality constraints?

C) What do you mean by bracketing method? Discuss the methods with suitable example.

D) What do you mean by an error? Discuss types of errors and methods to minimize them.

Q2 a) Solve the equation $\frac{dy}{dx} = x^2 + y^2$, using 4^{Th} order RK method at x=0.2 and x =0.4, y(0) = 0. **10**

Q2 b) $Minimize\ Z = 2x_1^2 + x_2^2$

$subjected\ to\ x_1 + x_2 = 1$

$x_1, x_2 \geq 0$

Using Lagrange's multiplier method. **5**

Q2 c) What are the basic requirements of Linear programming? Discuss the various terms used in LPP. **5**

Q3 a) Write the algorithm for Newton's forward difference interpolation and calculate f(3.5) for the following data **10**

x	2	3	4	5	6	7	8	9
f (x)	19	48	99	178	291	444	643	894

Q3 b) Solve the equation $\frac{dy}{dx} = x - y^2$ using Milne's Predictor-Corrector method. **10**

Find y at x = 0.8 and x = 1 with step size of 0.2.

Given that y(0) = 0, y(0.2) = 0.0199, y(0.4) = 0.079, y(0.6) = 0.1762.

Q4 a) Use method of Regula Falsi to obtain root of equation $sins = x - 2$, near x = 2.5 for 5 iterations x is in radians. Write the algorithm for this method. **10**

Q4 b) Minimize cost $Z = 400x_1 + 800x_2$ **10**

subject to $6x_1 + 2x_2 \geq 12$

$2x_1 + 2x_2 \geq 8$

$4x_1 + 12x_2 \geq 24$

$x_1, x_2 \geq 0$ using graphical method.

Q5 a) Use LU Decomposition method to find solution of the following system of equations. **10**

$$2x + 2y + 3z = 4$$
$$4x - 2y + z = 9$$
$$x + 5y + 4z = 3$$

Q5 b) Solve the equation $dy/dx = 1 + xy^2$ with $y(0) = 0.2$ using Adam's Bashforth method. Determine y at x=0.5 with a step size of 0.1. **10**

Q6 a) Using Simplex method solve **10**

$$Max\ Z = 500x_1 + 600x_2$$
$$subjected\ to\ \ x_1 + 2x_2 \leq 15$$
$$3x_1 + 2x_2 \leq 18$$
$$x_1, x_2 \geq 0$$

Q6 b) Determine root of equation $f(x) = 0.51x - sinx$ using Newton Raphson method for three iterations. **10**
