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3E1216

Roll No. _____ Total No. of Pages: 4

3E1216

B. Tech. III - Sem. (Main / Back) Exam., February - 2023

Electrical Engineering

3EE2-01 Advance Mathematics

EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. Use of non-programmable scientific calculator is allowed in this paper 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Show that $2\mu\delta \equiv (E - E^{-1})$.

Q.2 Define divided difference.

Q.3 Write Newton- Raphson iteration formula.

Q.4 Write Simpson's trapezoidal rule.

Q.5 Define Fourier sine transform.

Q.6 State convolution theorem for Laplace transform.

Q.7 Define Z- transform.

Q.8 Prove that function u = cosx.coshy is harmonic function.

Q.9 Define Mobius transformation.

Q.10 Write Cauchy-Riemann equations.

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt any five questions

Q.1 Prove that $\left(\frac{\Delta^2}{E}\right)\left(\frac{e^x E e^x}{\Delta^2 e^x}\right) = e^x, h = 1.$

Q.2 Find f(3.5) and f(4) from given data –

x	3	5	7	9	11
f(x)	6	24	58	108	174

Q.3 Find real root of equation $x^3 - 3x - 5 = 0$ corrected upto 4 decimal place using Newton-Raphson method.

Q.4 Find inverse Fourier cosine transform of $\frac{1}{1+p^2}$

Q.5 If f(t) is a periodic function with period T >0, then prove that -

$$L[f(t); p] = \frac{1}{1-e^{-pT}} \int_0^T e^{-pt} f(t) dt$$

Q.6 Find Z-transform of $u_n = a^n \cos bn, n \geq 0.$

Q.7 Show that function $f(z) = u + iv$ where $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, (z \neq 0), f(0) = 0$ is continuous at origin and satisfies Cauchy–Riemann equations at origin but f '(z) does not exists at origin.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 (a) Find value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 5 from given data.

x	0	2	3	4	7	9
y=f(x)	4	26	58	112	466	922

(b) Find value of integral $\int_0^1 \frac{dx}{1+x^2}$ using Simpsons $\frac{1}{3}$ and $\frac{3}{8}$ rule by dividing range into 6 equal parts.

Q.2 (a) Find a polynomial in powers of (x–3) from following data.

x	5	11	27	34	42
f(x)	23	899	17315	35606	68510

(b) Use Stirling's interpolation formula to find f(128) from given data.

x	120	125	130	135	140
f(x)	49225	48316	47236	45926	44306

Q.3 (a) Find Laplace transform of the function $\sin\sqrt{t}$ and hence obtain Laplace transform of $\frac{\cos\sqrt{t}}{\sqrt{t}}$.

(b) Find inverse Laplace transform of $\frac{p^2-4}{(p^2+1)(p^2+4)^2}$.

Q.4 (a) Find the Fourier transform of $f(t) = \begin{cases} 1-t^2, & |t| < 1 \\ 0, & |t| > 1 \end{cases}$ and hence evaluate

$\int_0^\infty \left(\frac{t\cos t - \sin t}{t^3}\right)\cos\frac{t}{2}\,dt$.

(b) Find inverse Z-transform of $f(z) = \frac{z^2}{\left(z-\frac{1}{4}\right)\left(z-\frac{1}{5}\right)}$ if region of convergence is

(i) $|z| < \frac{1}{5}$

(ii) $\frac{1}{5} < |z| < \frac{1}{4}$

Q.5 (a) If $u + v = \frac{2\sin 2x}{(e^{2y}+e^{-2y}-2\cos 2x)}$ and $f(z) = u + iv$ is an analytic function then find $f(z)$ in terms of z.

(b) Show that transformation $w = \frac{2z+3}{z-4}$ transfers circle $x^2 + y^2 - 4x = 0$ into straight line.

3E1141

Roll No. _____ Total No. of Pages: 3

3E1141

B. Tech. III - Sem. (Back) Exam., February - 2023

Electrical & Electronics Engineering

3EX2 – 01 Advance Mathematics

EE, EX

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Find the value of $\Delta \tan^{-1}x$.

Q.2 Write the formula of Regula-Falsi method.

Q.3 Find L $[t^3 e^{-3t}]$.

Q.4 Find $L^{-1}\left[\frac{1}{s^2-6s+10}\right]$.

Q.5 Find Fourier sine transform of e^{-x}.

Q.6 State the convolution theorem for Fourier transform.

Q.7 Find the value of u_1, if $\bar{u}(z) = \frac{2z^2+5z+14}{(z-1)^4}$.

Q.8 Write the change of scale property of Fourier transform.

Q.9 Prove that $u = x^3-3xy^2+3x^2-3y^2+1$ is a harmonic function.

Q.10 For the conformal transformation $\omega=z^2$, find the coefficient of magnification at $z=1+i$.

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 By using the Newton's divided difference formula, find the value of f(8) from the following table -

x	:	4	5	7	10	11	13
f(x)	:	48	100	294	900	1210	2028

Q.2 Find dy/dx at x = 1.5 from the following table -

x	:	1.5	2.0	2.5	3.0	3.5	4.0
y	:	3.375	7	13.625	24	38.875	59

Q.3 Evaluate the Laplace transform of Dirac-Delta function.

Q.4 Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$.

Q.5 Find inverse Z-transform of $\bar{u}(z) = \frac{z}{(2-z)(2z-1)}$ by partial fraction method.

Q.6 If $f(z) = u+iv$ is an analytic function of $z = x+iy$ and $u-v = e^x(\cos y - \sin y)$, find f(z) in terms of z.

Q.7 Prove that the relation $\omega = \frac{iz+2}{4z+i}$ transforms the real axis in the z plane into a circle in the ω-plane. Find the centre and radius of circle.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 (A) By using Gauss Backward Formula, find y (1936) –

(B)

x	:	1901	1911	1921	1931	1941	1951
y	:	12	15	20	27	39	52

Show that Z-transform of $\{\cos n\,\theta\}$ is $\frac{z(z-\cos\theta)}{z^2-2z\cos\theta+1}$; and hence show that Z-transform of $\{a^n \cos n\,\theta\}$ is $\frac{z(z-a\cos\theta)}{z^2-2az\cos\theta+a^2}$.

Q.2 (A) Use Convolution Theorem, find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$.

(B) Find the bilinear transformation which maps the points $z = \infty$, i, o into the points ω = o, i, ∞ respectively.

Q.3 (A) Show that the Fourier transform of $f(x) = e^{-x^2/2}$ is $e^{-s^2/2}$.

(B) By using Newton-Raphson's method, find the root of e^x-sin x=0, correct to four places of decimal, given $x_0 = 0.6$.

Q.4 (A) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{"1"}{3}$ and $\frac{"1"}{8}$ rule.

(B) Prove that the function $f(z) = \frac{x^2y^5(x+iy)}{x^4+y^{10}}, z \neq 0\ f(z) = 0;\ z = 0$ satisfies the Cauchy-Riemann equation at origin but f '(0) does not exist at origin.

Q.5 (A) Prove that -

$$L^{-1}\left[\frac{s}{(s^2-2s+2)(s^2+2s+2)}\right] = \frac{1}{2}\sin t \sin ht.$$

(B) Use Lagrange's formula for unequal interval to find y when x = 6, given that -

x	:	1	2	7	8
y	:	4	5	5	4

3E1646

Roll No. _____ Total No. of Pages: 3

3E1646

B. Tech. III - Sem. (Back) Exam., February - 2023
Electrical & Electronics Engineering
3EX6A Advanced Engineering Mathematics-I
EE, EX

Time: 3 Hours **Maximum Marks: 80**
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Find inverse Laplace transform of $F(s) = \frac{1}{s}\log\frac{s+2}{s+1}$. [8]

(b) State Convolution Theorem for Laplace transforms. Hence, using Convolution Theorem, find inverse Laplace transform of the function $\frac{1}{(s^2+a^2)^2}$. [8]

OR

Q.1 (a) Evaluate $L\left\{\int_0^x \frac{\sin u}{u}du\right\}$. [8]

(b) Using Laplace transform solve the differential equation $(D^2 + 25)\, y = 10\cos 5x$ with $y(0) = 2$, $y'(0) = 4$. [8]

UNIT- II

Q.2 (a) Find the Fourier transform of the function - [8]

$$f(x) = \begin{cases} -(1+x), & -1 \le x \le 0, \\ x-1, & 0 < x \le 1, \\ 0, & |x| > 1. \end{cases}$$

(b) Find the function, if Fourier transform is $e^{-|p|}$. [8]

OR

Q.2 Solve the following partial differential equation with Fourier transform - [16]

$\frac{\partial V}{\partial t} = \frac{\partial^2 V}{\partial x^2}, x > 0, t > 0$, subject to conditions -

(i) $V = 0$ when $x = 0, t > 0$

(ii) $V = f(x) = \begin{cases} 1, & 0 < x < 1 \text{ when } t = 0 \\ 0, & x \ge 1 \end{cases}$

(iii) $V(x, t)$ is bounded $x > 0, t > 0$.

UNIT- III

Q.3 (a) Find the Fourier series of a function $f(x) = e^x$ in $-\pi \le x \le \pi$. [8]

(b) Find the Fourier series expansion of the following periodic function of period 4 - [8]

$$f(x) = \begin{cases} 2+x, & -2 \le x \le 0, \\ 2-x, & 0 < x \le 2, \end{cases} \quad f(x+4) = f(x).$$

OR

Q.3 Find the Fourier series expansion of $f(x) = 2x - x^2$ in $(0, 3)$ interval and hence deduce that - [16]

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots - \infty = \frac{\pi}{12}.$$

UNIT- IV

Q.4 (a) Show that the function u = cosx coshy is harmonic and find its harmonic conjugate. Also, find the corresponding analytic function f(z) = u + iv. [8]

(b) Find a bilinear transformation that maps the point z = ∞, i, 0 into the points w = 0, i, ∞. [8]

OR

Q.4 (a) Find the residue of $\frac{z^2}{(z-1)(z-2)(z-3)}$ at z = 1, 2, 3 and infinity. Also, show that their sum is zero. [8]

(b) Evaluate the integral - [8]

$\int_C \frac{e^z}{z(z+1)} dz, \qquad C : |z| = 2$

UNIT- V

Q.5 (a) Expand $f(z) = \frac{1}{(z-1)(z-3)}$ in the power of z which are valid for the regions - [8]

(i) $|z| < 1$

(ii) $1 < |z| < 3$

(iii) $|z| > 3$.

(b) Use the Method of Contour Integration prove that - [8]

$\int_0^{2\pi} \frac{d\theta}{1 + a^2 - 2a\cos\theta} = \frac{2\pi}{1 - a^2}$; $0 < a < 1$.

OR

Q.5 (a) Find Taylor's expression of $f(z) = \frac{1}{(z+1)^2}$ about the point z = –i. [8]

(b) Use the Method of Contour Integration evaluate - [8]

$\int_0^{\infty} \frac{\cos mx}{a^2 + x^2} dx$.

3E1200

Roll No. _____ Total No. of Pages: 4

3E1200

B. Tech. III - Sem. (Main / Back) Exam., February - 2023
Artificial Intelligence & Data Science
Managerial Economics and Financial Accounting
Common to all Branches

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Define Managerial Economics.

Q.2 Define National Income.

Q.3 What do you mean by Law of Demand?

Q.4 Define price elasticity of demand.

Q.5 Define Production Function.

Q.6 What is opportunity cost?

Q.7 What do you mean by Monopoly?

Q.8 Define Financial Statement Analysis.

Q.9 What is Pay Back Period?

Q.10 Explain Debtors Turnover Ratio.

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt any five questions

Q.1 Distinguish between deductive and inductive methods in Economics.

Q.2 Discuss the various concepts of national income – Gross National Products, Net National Products, Personal Income and Disposable Income.

Q.3 Explain the various methods of demand forecasting.

Q.4 Distinguish between monopolistic competition and perfect competition.

Q.5 Explain the degrees of price elasticity of demand.

Q.6 The following table gives the total cost schedule of the firm. It is also given that the Average Fixed Cost (AFC) at 4 units of output is ₹ 5.

Quantity (Q)	Total Cost (TC)
1	50
2	65
3	75
4	95
5	130
6	185

Find the Total Variable Cost (TVC) and Total Fixed Cost (TFC) schedules of the firm for the corresponding values of output.

Q.7 Define Balance Sheet. Give two characteristics of balance sheet.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 The following is the Balance Sheet of Riddhima Motors -

Balance Sheet as on 31st March, 2022

Liabilities	₹	Assets	₹
Equity Share Capital	2,00,000	Fixed Assets	4,60,000
Preference Share Capital	1,00,000	Investments (Long Term)	15,000
General Reserve	50,000	Stock	50,000
Profit & Loss Account	70,000	Debtors	20,000
Debentures	1,00,000	Cash	15,000
Creditors	30,000		
Bank Overdraft	10,000		
	5,60,000		**5,60,000**

Calculate the following ratios :

(a) Current Ratio (b) Liquid Ratio/Quick Ratio (c) Debt Equity Ratio (d) Proprietary Ratio

(e) Solvency Ratio

Q.2 Discuss the nature and scope of Managerial Economics.

Q.3 Explain the Law of Variable Proportions. Explain various stages of this law with the help of diagram.

Q.4 How the price and output is determined under perfect competition during short period?

Q.5 A company has to select one of the two alternative projects whose particulars are given below -

	Project A (₹)	Project B (₹)
Initial Investment/Initial Outlay	1,18,720	1,00,670
Net cash inflow at the end of the year :		
1	1,00,000	10,000
2	20,000	10,000
3	10,000	20,000
4	10,000	1,00,000

The company can arrange necessary fund at 10%. Compute Net Present Value (NPV) of each project and comment on the result.

The PV factor of ₹ 1 received at the end of each year at 10% discount rate are as follows -

Year	1	2	3	4
10%	0.909	0.826	0.751	0.683

3E1103

Roll No. _____ Total No. of Pages: 2

3E1103

B. Tech. III - Sem. (Back) Exam., February - 2023

HSMC Aeronautical Engineering

3AN1-03 Managerial Economics & Financial Accounting

All branches

Time: 2 Hours **Maximum Marks: 80**

Min. Passing Marks: 28

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 What do you mean by Economic?

Q.2 Define Law of Supply.

Q.3 Define production function.

Q.4 What you mean by perfect competition?

Q.5 What is capital budgeting?

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Discuss the scope of Managerial Economics.

Q.2 Explain Law of Demand.

Q.3 Explain the relationship between Average Cost (AC) and Marginal Cost (MC).

Q.4 Distinguish between monopoly and perfect competition.

Q.5 Write five merits and demerits of inductive and deductive methods.

Q.6 Explain the significance of ratio analysis.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 Explain the methods of measuring National Income.

Q.2 How the price and output is determined under monopoly during short period?

Q.3 A Ltd. is considering investing in a project requiring a capital outlay of ₹ 1,00,000.

Forecast of annual income after depreciation but before tax is as follows -

Year	1	2	3	4	5
Amount	50,000	50,000	40,000	40,000	20,000

Depreciation may be taken at 20% on original cost and income tax at 50% of net income.

Evaluate the project using pay-back method and Average Rate of Return (ARR).

3E1642

Roll No. _____ Total No. of Pages: 4

3E1642

B. Tech. III - Sem. (Back) Exam., February - 2023

Electrical Engineering

3EE2A Circuit Analysis - I

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

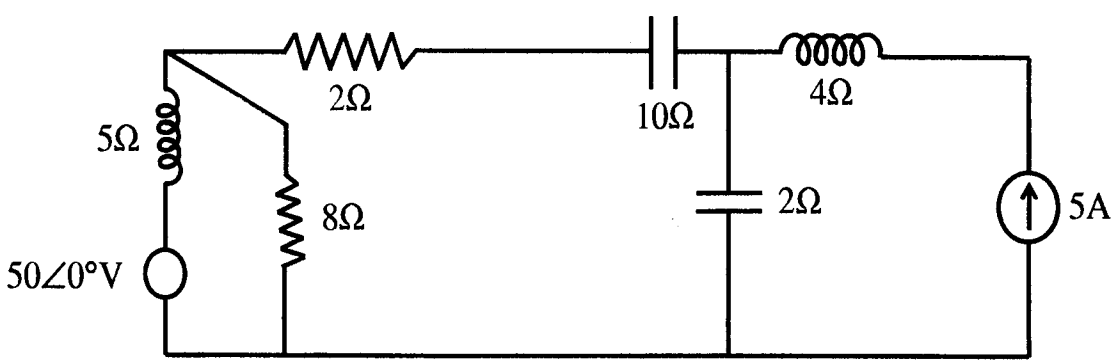
1. NIL 2. NIL

UNIT- I

Q.1 (a) Define Q-factor in an AC-circuit. Deduce the relation between resonant frequency and Q-factor. [8]

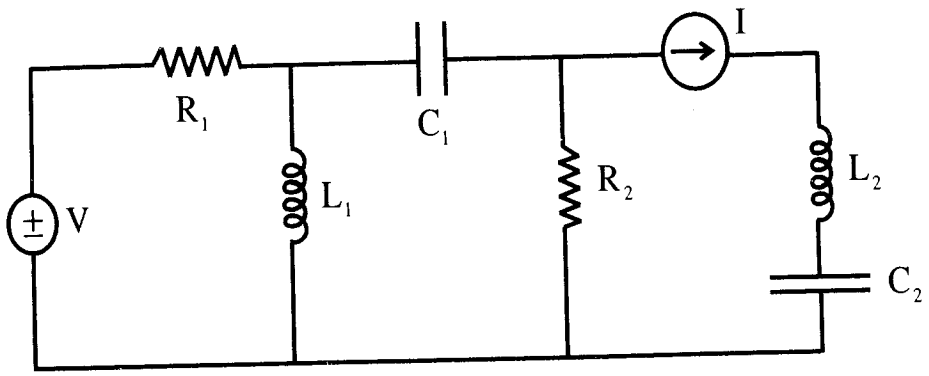
(b) Develop the graph of the network shown in figure given below. Select the tree and write the - [8]

(i) Cut-Set matrix (ii) Tie-set matrix



OR

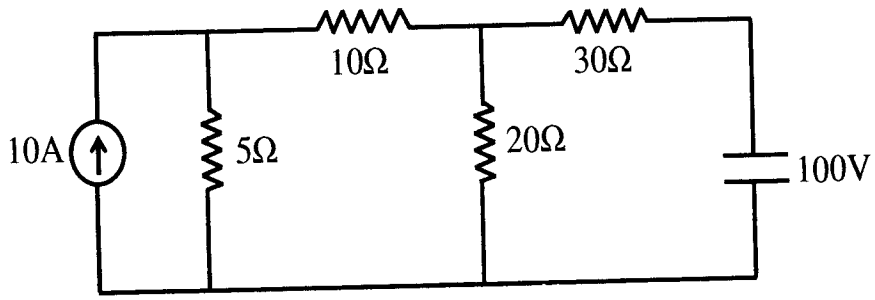
Q.1 (a) Draw the dual of the network as shown in figure. [8]



(b) Explain the variation of resistance, inductance and capacitive reactance with frequency. [8]

UNIT- II

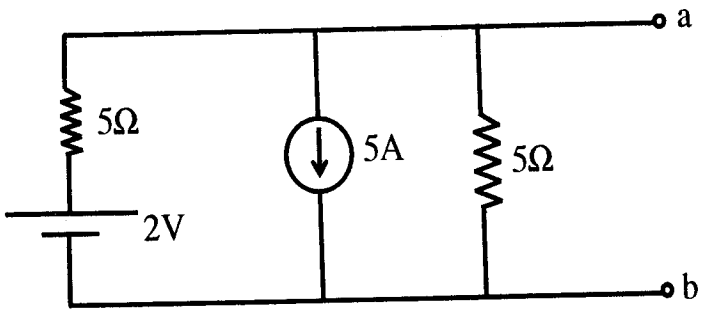
Q.2 (a) Using Thevenin's theorem, find the current through the 10Ω resistance. [8]



(b) State and explain the maximum power transfer theorem. [8]

OR

Q.2 (a) Find the Norton's equivalent circuit across a-b for the network - [8]



(b) State and explain the superposition theorem. [8]

UNIT- III

Q.3 (a) A balanced three-phase load connected in delta draws a power of 10.4kW at 200V at a power factor of 0.5 load. Find the values of the circuit elements and the reactive volt amperes drawn. [8]

(b) Explain the neat circuit phasor diagram, how the power and power factor of three-phase system can be measured by means of two wattmeter method? [8]

OR

Q.3 (a) What do you mean by power triangle? Explain active, reactive and apparent power with example. [8]

(b) A voltage $V(t) = 150 \sin 10^3 t$ is applied a series circuit, where $R = 40\Omega$, $L = 0.13H$, $C = 10\mu F$. Find – [8]

(i) The power supplied by the source

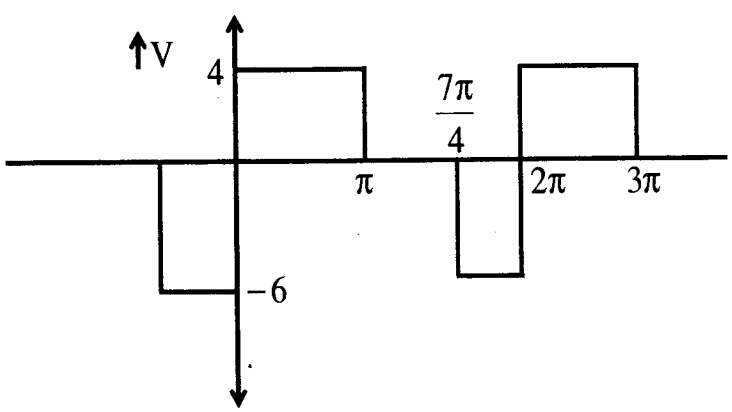
(ii) The reactive power supplied by the source

(iii) The reactive power of the capacitor

(iv) The reactive power of the inductor

UNIT- IV

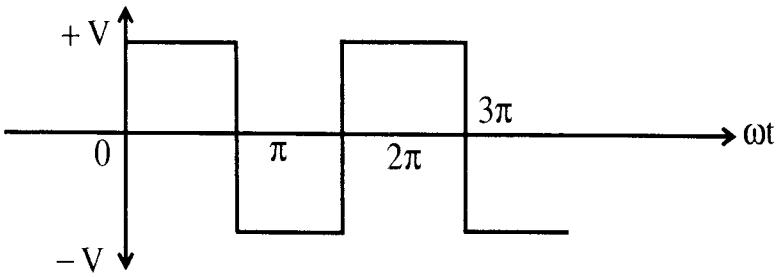
Q.4 Find a and b coefficient of Fourier series of the given waveform. [16]



OR

Q.4 (a) Explain the different kind of symmetry in non-sinusoidal waves. [8]

(b) Obtain the experimental Fourier series of the waveform. [8]



UNIT- V

Q.5 (a) State and deduce initial value and final value theorem. [8]

(b) Explain the impulse response of series RC network. [8]

OR

Q.5 (a) A function in Laplace domain is given by –

$$F(S)= \frac{2}{S} - \frac{1}{(S+3)}$$

Obtain its value by final value theorem in 't' domain. [8]

(b) Define and explain shifting theorem. Describe the time domain and frequency domain analysis of circuits. [8]

3E1221

Roll No. _____ Total No. of Pages: 2

3E1221

B. Tech. III - Sem. (Main / Back) Exam., February - 2023
Electrical Engineering
3EE3 – 04 Power Generation Process
EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, all five questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Define greenhouse effect.

Q.2 Define diversity factor.

Q.3 Compare open cycle and closed cycle gas turbine plants.

Q.4 Explain flat demand rate.

Q.5 Why the overall efficiency of thermal plant is very low?

Q.6 What is the need of moderator in a reactor?

Q.7 Compare wind and solar energy generation.

Q.8 Explain the renewable energy source.

Q.9 Define the role of load curve.

Q.10 Compare utilization factor and capacity factor.

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt all five questions

Q.1 Explain in brief main parts of a nuclear reactor and their function.

Q.2 Explain the sustainable energy system with its application.

Q.3 Explain the effect of load factor on unit energy cost.

Q.4 Compare peak load and base load plants.

Q.5 Draw and explain the scheme of wind power generation.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 How pumped storage plant is advantageous during peak loads? Describe the factor which are considered for selection of site for thermal power station.

Q.2 A 1000 MW powers station delivers 1000 MW for 2 hours, 500 MW for 6 hours and is shut down for rest of each day. It is also shut down for maintenance for 60 days annually. Calculate its annual load factor. Also explain, how power factor can be improved using synchronous condensers?

Q.3 Discuss the impact of nuclear and gas power plant an environment. Draw and explain the scheme of solar energy generation also discuss the current energy scenario of India.

Q.4 What is depreciation curve? Define the method to calculate the depreciation charges. How power factor affects when kW demand is constant and in other case kVA demands is constant.

Q.5 An Industrial consumer has single phase 230V supply. His monthly energy consumption is 2020 kWh. A maximum demand indicator installed at his premises indicates 40A which is charged at unity power factor for 2 hours daily at ₹ 3.50 per kWh. The remaining units are charged at 1.80 per kWh. Find his monthly bill (for 30 days) and average tariff per kWh.

3E1218

Roll No. _____ Total No. of Pages: 4

3E1218

B. Tech. III - Sem. (Main / Back) Exam., February - 2023

Electrical Engineering

3EE4-05 Electrical Circuit Analysis

EE,EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define the concept of duality and dual networks.

Q.2 Define effective or RMS value of AC Circuit.

Q.3 Explain the DOT convention in coupled circuit with suitable example.

Q.4 Explain initial and final condition in network elements.

Q.5 Write the condition of symmetry and reciprocal for ABCD parameters.

Q.6 Write down the necessary condition of stability of a network function.

Q.7 Explain Power triangle with diagram.

Q.8 State and explain maximum power transfer theorem.

Q.9 Write a short note on a series RLC circuit resonance.

Q.10 Write down the definition of Laplace Transform.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Apply superposition theorem to the given circuit (figure 1), to find the voltage drop V across the 5 ohm resistor.

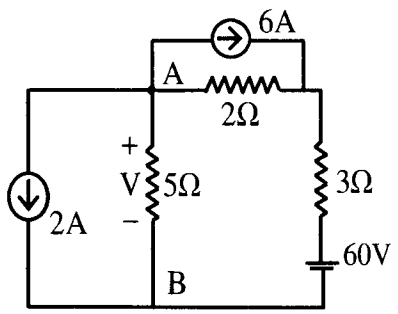


Figure – 1

Q.2 State and explain Reciprocity Theorem. Also, write the steps for solving a network using Reciprocity Theorem.

Q.3 What is the relationship between line and phase voltages and currents in a star connection? Also, explain power factor, apparent power and reactive power.

Q.4 In the figure 2, switch is closed at position A at t=0, the switch is moved to position B. Find the current in both the cases.

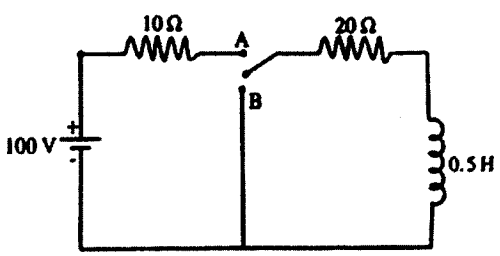


Figure 2.

Q.5 Find the resonant frequency for the parallel circuit shown in figure 3.

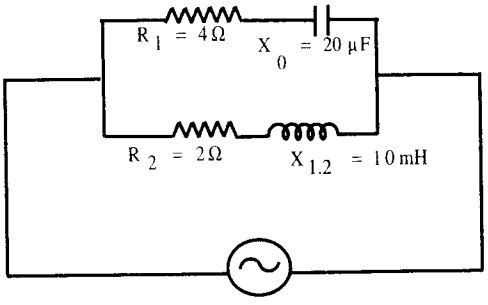


Figure 3

Q.6 The Z-parameters of a two port network are Z_{11}=10 ohms, Z_{22}=20 ohms, Z_{12}=Z_{21}=5 ohms.

(a) Find ABCD parameters

(b) Find hybrid parameters of this two port network

Q.7 State and explain the restriction on the location of poles and zeros for driving point function. What is the physical significance of this? Explain.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Find Thevenin's equivalent circuit for network shown in figure 4 at the left of terminals n-y.

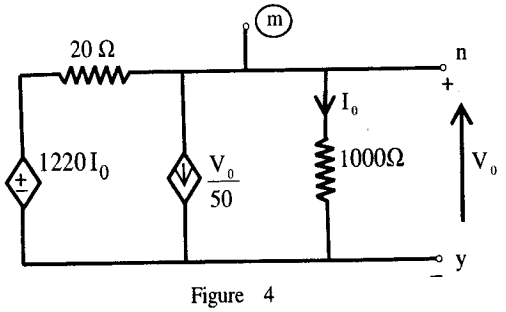


Figure 4

Q.2 Find the transient responses of series RL and RC circuit having sinusoidal excitation.

Q.3 Find the Laplace transform of the function $x(t) = \mu(t) - \mu(t - \theta)$. Also a function is given by $X(S) = \frac{2(S+2)}{(S+1)(S+3)}$. Find its value using the initial and final value theorem.

Q.4 Explain and establish all different types of interconnections of 2 two port networks.

Q.5 A 3 phase load has a resistance of 10 ohms in each phase and is connected in (a) Star and (b) Delta against a 400 Volts three phase supply. Compare the power consumed in both the cases.

3E1143

Total No. of Questions: Total No. of Pages: 4

Roll No. _____

B.Tech. III-Sem (Back) Jan. Feb. 2023
Electrical & Electronics Engineering
3EX4-05 Electrical Circuit Analysis
3E1143
EE,EX

Time: 3 Hours **Maximum Marks: 120**
Min. Passing Marks: 42

Attempt all ten questions from Part A, five question out of seven from Part B and four questions out of five from Part C.
Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.
Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. ___Nil___ 2. ____Nil_____

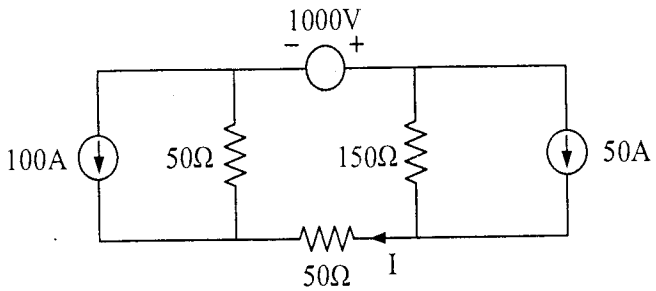
Part A (Answer should be given up to 25 words only)
All questions are compulsory

Q.1. State the maximum power transfer theorem.
Q.2. What is the major difference between the Mesh and Loop?
Q.3. A capacitor reaches at its steady state with a voltage applied across it. How it behaves?
Q.4. What do you mean by steady state and transient state response.
Q.5. Relate the active power, reactive power and apparent power.
Q.6. Two coils L_1 and L_2 are connected in series and mutually coupled with additive fluxes. What is the equivalent inductance in terms of their mutual inductance M.
Q.7. What is the Laplace Transform of te^{-2t}?
Q.8. What is the relation between the line voltage and phase voltage in 3-phase star connection.
Q.9. What are the relations in transmission parameters of a two-port network?
Q.10. What are the various types of connections of two-port networks?

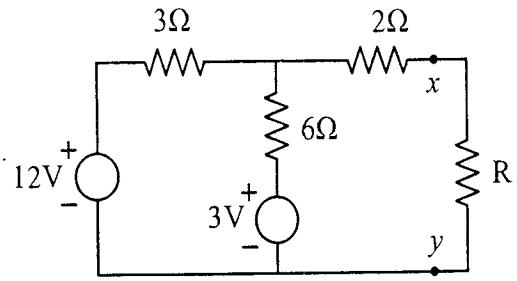
[10 x 2 = 20]

Part B (Analytical/Problem solving questions)
Attempt any Five questions

Q.1. Find the current I in the circuit shown in Figure below using superposition theorem.

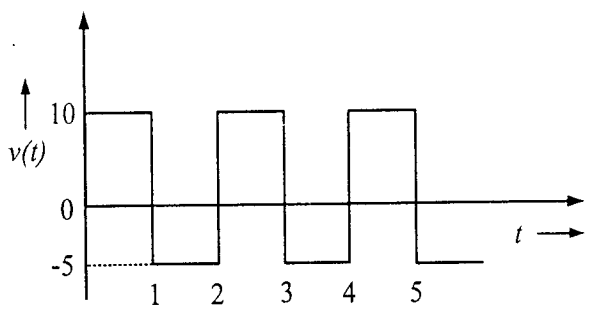


Q.2. What should be the value of R in the circuit shown below for the maximum power transfer into it.



Q.3. Find the transient response of a series R-L circuit supplied by step input.

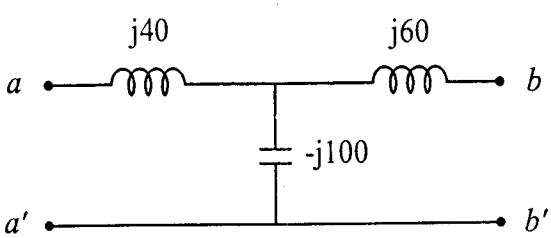
Q.4. Find the RMS value of voltage, $v(t)$ represented by the waveform shown in the figure below.



Q.5. Find the initial and final value of the function given as follows-

$$X(s) = \frac{5(s+1)}{(s+2)(s+3)}$$

Q.6. Calculate the hybrid parameters of the two-port network shown in figure below.

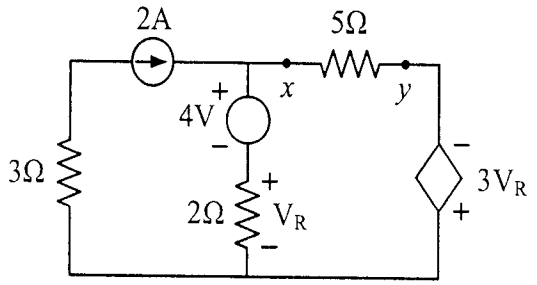


Q.7. Find the relation between the transmission parameters of two 2-port networks connected in cascade.

[5 x 8 =40]

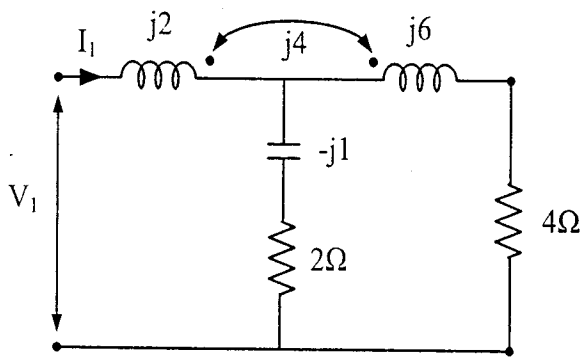
Part C (Descriptive/Analytical/Problem Solving/Design questions)
Attempt any four questions

Q.1. State the Thevenin's theorem. Obtain the current in 5Ω resistor connected between terminals x and y by Thevenin's theorem in the circuit shown in the Figure below.



[15]

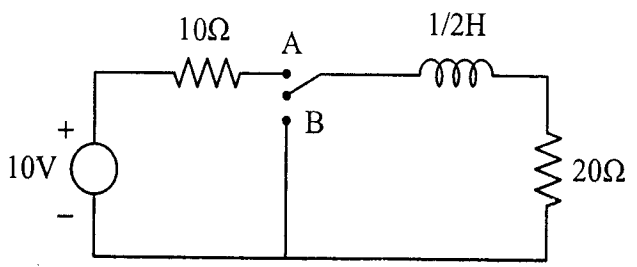
Q.2. a) Obtain the input impedance of the conductively coupled circuit shown in figure below.



[10]

b) What is the concept of duality. [5]

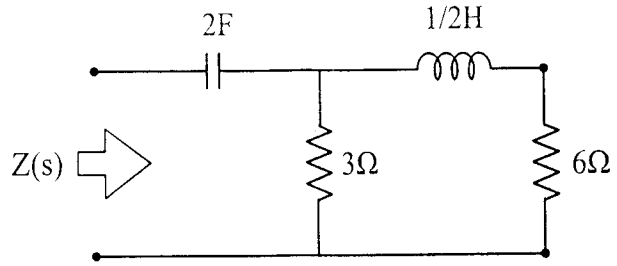
Q.3. a) In the circuit shown in figure below, switch S is closed at position A at $t = 0$ and remain closed till steady state is reached. Now, it is moved to position B. Find the transient current in both the case.



[10]

b) Explain the stability of a function considering the position of the ploes. [5]

Q.4. a) Obtain the pole-zero diagram of the impedance function of the circuit shown in figure below. [$7\frac{1}{2}$]



b) What are the properties of an Ideal Transformer? $[7\frac{1}{2}]$

Q.5. a) Find the Laplace transform of the following function- $[7\frac{1}{2}]$

$$f(t) = te^{-at} + \delta(t)e^{-bt}$$

b) State and explain the compensation theorem. $[7\frac{1}{2}]$

[15 x 4 =60]

---------- END ----------

3E1645

Roll No. _____ Total No. of Pages: 3

3E1645

B. Tech. III - Sem. (Back) Exam., February - 2023

Electrical Engg.

3EE5A Electrical Machines-I

EE,EX

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Derive the expression of torque developed in closely excited magnetic system. Write also the assumptions made. [8]

(b) Two coils with self-inductances 4 H and 1 H have 1 H as mutual inductance. The RMS value of current flowing through the coils is 1 A and 4 A respectively, find – [4+4=8]

(i) the coupling factor

(ii) the energy stored in the magnetic system

OR

Q.1 Explain the Principle of Electro-Mechanical System and give its general representation. [16]

UNIT- II

Q.2 Write a short note on commutation in DC machine and discuss the methods of its improvement. [16]

OR

Q.2 Draw the load characteristics of DC compound generator (differential and cumulative type) and explain. [16]

UNIT- III

Q.3 Explain the Hopkinson's method of testing DC machines. Differentiate this method with Swinburne's testing approach. Can Swinburne's testing approach be applied on DC series type motor? [16]

OR

Q.3 A 10 kW, 240 V, DC shunt motor draw a line current 5.2 A while running at a no-load of 1200 rpm from a 240 V DC supply. It has an armature current of 0.25 ohm and a field resistance of 160 ohm. Estimate the efficiency of the motor when it delivers the rated load current. [16]

UNIT- IV

Q.4 (a) Explain the Principle and construction of a single phase transformer. Derive an expression for the induced e.m.f. of the transformer. [8]

(b) Develop the exact equivalent of single phase transformer. Also, write the assumptions. [8]

OR

Q.4 (a) State and prove the condition of maximum efficiency of the transformer. [8]

(b) Enumerate the comparison of autotransformer with two-winding transformer. [8]

UNIT- V

Q.5 (a) Write the short note on inrush magnetizing current of poly phase transformer. [8]

(b) Write short note on open connection of transformer. [8]

OR

Q.5 (a) Explain in detail the double star connection for obtaining 6-phase supply from 3-phase power supply. [8]

(b) Explain magnetizing harmonic currents and their effects. [8]

3E1217

Roll No. _____ Total No. of Pages: 3

3E1217

B. Tech. III - Sem. (Main / Back) Exam., February - 2023

Electrical Engineering

3EE4 – 06 Analog Electronics

EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 What is clipper and clamper circuits? Explain briefly.

Q.2 Differentiate BJT with FET?

Q.3 What are the two mechanism of breakdown in P-N Junction diode?

Q.4 What are the characteristics of an ideal OP-AMP?

Q.5 Differentiate voltage amplifier with power amplifier?

Q.6 A Ge transistor with $\alpha = 0.98$ gives a reverse saturation current $I_{CO} = 10\mu A$ in CB configuration. When transistor used in CE configuration with a base current of 0.22mA, calculate the collector current?

Q.7 What is Bias stabilization?

Q.8 What are the types of analog to digital converter? Which analog to digital converter is best for conversion?

Q.9 What is the difference between enhancement and depletion MOSFET?

Q.10 Why is Zener diode used as a voltage regulator?

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt any five questions

Q.1 Draw the V-I characteristic of P- N Junction diode and show how temperature change affect the characteristics?

Q.2 Define the following with respect to performance characteristic of ADC –

(a) Resolution

(b) Accuracy

Q.3 A class A power amplifier uses a transformer as a coupling device, the transformer has a turn ratio of 10 and the secondary load is 10 ohm. If the zero signal collector current is 100mA, find the maximum output power.

Q.4 Draw the high frequency equivalent circuit of an emitter follower and derive the expression of voltage gain for the same.

Q.5 Explain current mirror, its basic topology and its variants.

Q.6 Explain low frequency analysis of multi stage amplifiers.

Q.7 What are the different analog to digital conversion techniques? Explain any one of them in detail.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 (a) Draw the circuit of OP-AMP integrator and derive the output expression.

(b) A 10mV, 2kHz sinusoidal signal is applied to the input of OP-AMP integrator for which $R_I = 100k\Omega$ and $C = 1\mu F$. Find the output voltage.

Q.2 (a) Describe concept of stability and gain margin.

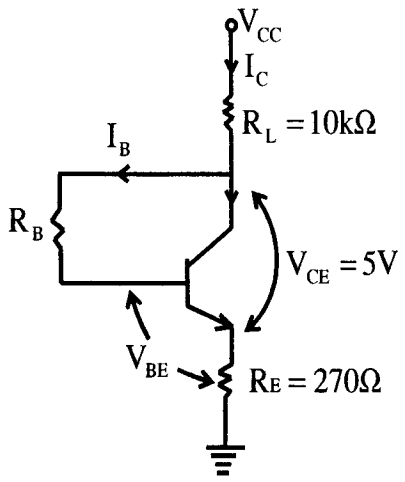
(b) What is meant by cross-over distortion in class B amplifier? Explain, how it is over come in class AB operation?

Q.3 (a) Explain, how OP-AMP can be used as a zero crossing detector.

(b) A JFET has $V_P = -4.5$volt, $I_{DSS} = 10$mA and $I_{DS} = 2.5$mA. Determine the transconductance.

Q.4 (a) Define filter. What is the difference between active and passive filters?

(b) A transistor with $\beta = 45$ is used with collector to base resistor R_B biasing with quiescent value of 5 volt for V_{CE}. If $V_{CC} = 24$ volt $R_L = 10k\Omega$, $R_E = 270\Omega$, find the value of R_B =?



Q.5 Write short notes on any two –

(a) Triangular – wave generators

(b) Differential amplifiers

(c) Instrumentation amplifiers

3E1144

Roll No. _____ Total No. of Pages: 3

3E1144

B. Tech. III - Sem. (Back) Exam., February - 2023

Electrical & Electronics Engineering

3EX4 – 06 Analog Electronics

EE, EX

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Define diffusion and drift currents in semiconductors.

Q.2 Describe Zener diode characteristics with equivalent model for each region.

Q.3 Define the parameters of a transistor which depend on temperature.

Q.4 How can the Field Effect Transistor be considered as Voltage Variable Resistor?

Q.5 Explain base width modulation in context to a Bipolar Junction Transistor.

Q.6 Give three differences between voltage and power amplifiers.

Q.7 Draw a well labelled internal structure of an operational amplifier.

Q.8 Differentiate between Input–Bias and Input–Offset current of an operational amplifier.

Q.9 Define three electrical characteristics of an ideal operational amplifier.

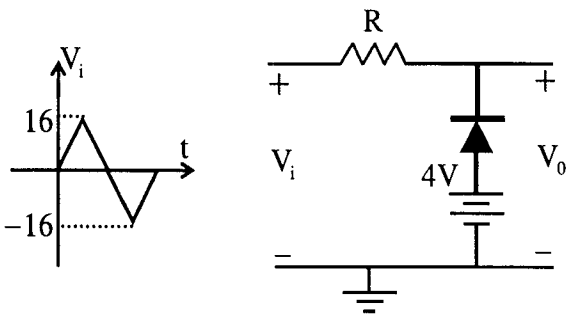
Q.10 Differentiate between negative and regenerative feedback in amplifiers.

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 Sketch the output for the circuit given below -



Q.2 Define the term biasing in context to a BJT. Define the various types of biasing with well labelled circuit diagram.

Q.3 Draw an instrumentation amplifier using operational amplifier. List the various applications for this instrumentation amplifier.

Q.4 Draw block diagram and explain the working of voltage regulators. Also, list the specifications of positive and negative voltage regulators.

Q.5 Design a Wien bridge oscillator circuit using operational amplifier for $f_0 = 965$ Hz.

Q.6 Explain the application of operational amplifier as comparator and voltage follower.

Q.7 Design a RC–phase shift oscillator circuit using operational amplifier for $f_0 = 200$ Hz.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 Draw the h–parameter model for a BJT in common emitter configuration at low frequency. Compare it with hybrid–Pi model at high frequencies.

Q.2 Draw the schematic diagram for an inverting mode voltage shunt feedback amplifier and derive the expression for closed loop voltage gain and input resistance with feedback.

Q.3 Derive the expression for cutoff frequency for low–pass Butterworth filter using operational amplifier. Design this filter for a cutoff frequency of 1kHz and passband gain of 2.

Q.4 Draw and explain the working of operational amplifier as integrator. Explain, how this circuit can be used to design a triangular wave generator.

Q.5 Draw and explain the working of n–channel Depletion type MOSFET. Using suitable diagram compare its working with that of an n–channel Enhancement type MOSFET.

3E1219

Roll No. _____ Total No. of Pages: 3

3E1219

B. Tech. III - Sem. (Main / Back) February - 2023

Electrical Engineering

3EE4 – 07 Electrical Machine-I

EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Explain, what does fingers and thumb represents in Fleming right hand rule?

Q.2 Give application of Biot Savart Law.

Q.3 Give name of sources that store energy in magnetic circuits.

Q.4 Give example of linear and non-linear magnetic circuits.

Q.5 What is an air gap flux?

Q.6 Give similarity between lap and wave winding.

Q.7 Give name of losses related to DC motors.

Q.8 What are output of back to back test of DC machines?

Q.9 What do you understand by the term 'Flux per pole'?

Q.10 What are the basic units of a 3-phase transformer?

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt any five questions

Q.1 Explain, why all electrical machines, when operating develops torque and generates voltage at the same time?

Q.2 Explain, how B-H curves are determine for magnetic materials? Also, explain its application.

Q.3 Explain, how derivation of back EMF equation is determined?

Q.4 A series motor has a resistance of 0.5 ohm between the terminals. It runs at a speed of 1500 r.p.m. when taking 10 A from 200 V supply. Find the speed, at which it will run when taking 20 A from the same supply? Assume no saturation.

Q.5 By the help of suitable diagram, explain the method of speed control through armature voltage.

Q.6 Explain the phenomena of back EMF with armature reaction.

Q.7 By the help of neat diagram, explain the working of an Auto transformer.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 By the help of a neat diagram design and explain a DC machine with (a) separately excitation system (b) series exaction system.

Q.2 (a) A 230 V DC shunt motor runs at 1000 rpm when the armature current is 35 A. The resistance of the armature circuit is 0.3 ohm. Calculate the addition resistance required in the armature circuit to reduce the speed of the motor to 750 rpm assuming the armature current is then 25 A.

(b) A shunt motor supplied at 250 V runs at 900 rpm when the armature current is 30 A. The resistance of the armature circuit is 0.4 ohm. Calculate the resistance required in series with the armature to reduce the speed to 600 rpm. Assuming current is then 20 A.

Q.3 Explain the working principle, construction and operation of a single phase transformer. Also, draw and explain its equivalent circuit with phase diagram.

Q.4 Give basic construction mechanism of DC machine, also explain its magnetic structure and air gap flux density distribution.

Q.5 Write Short note on -

(a) Ampere Law

(b) Biot Savart Law

3E1145

Roll No. _____ Total No. of Pages: 4

3E1145

B. Tech. III - Sem. (Back) Exam., February - 2023
Electrical & Electronics Engineering
3EX4 – 07 Electrical Machine - I
EE, EX

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Give the analogy between magnetic and electric circuits.

Q.2 State the Biot–Savart Law.

Q.3 Draw the B–H Curve of a (a) magnetic and (b) non–magnetic material, on the same plot.

Q.4 What do you mean by 'speed control' of a dc machine?

Q.5 Enumerate the various parts of a dc machine.

Q.6 What is the role of an interpole in a dc machine?

Q.7 Why is the e.m.f. generated in the armature of a dc motor called 'back e.m.f.'?

Q.8 Enumerate the various losses in a dc machine.

Q.9 What is the need for parallel operation of transformers?

Q.10 What is the difference between no-load and on-load tap changers?

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 (a) A 50kVA, single-phase transformer has 500 turns on the primary and 100 turns on the secondary. The primary is connected to 2500V, 50Hz supply. Calculate the following –

(i) The secondary voltage on open circuit

(ii) The current flowing through the windings on full load

(iii) The maximum value of flux

(b) A mild steel ring has a mean diameter of 20cm and a cross-section area of 50cm^2. For a relative permeability of 800, calculate (a) reluctance of the ring, and (b) current required in 200-turn coil to produce a flux of 1mWb in the ring.

Q.2 A 12kVA, 1200/400V, single-phase, 50Hz transformer has the following test results -

OC test (HV side): 1200V, 1.2A, 70W

SC test (LV side): 30V, 22A, 80W

Calculate the equivalent circuit parameters referred to the h.v. side and its efficiency at half full-load of unity power factor. Also, calculate the regulation of the transformer at full load and 0.8 power factor lagging.

Q.3 The terminal voltage of an eight-pole DC shunt generator with 780 wave-connected armature conductors and running at 500 rpm at terminal voltage is 240V. The armature resistance is 0.24Ω and the field resistance is 240Ω. Find the armature current, the induced e.m.f. and the flux per pole, if the load resistance is 12Ω.

Q.4 Using suitable diagrams, show how the effect of armature mmf on the main field is entirely cross-magnetizing.

Q.5 Two single-phase transformers A and B of equal voltage ratio are running in parallel and supply a load of 800A at 0.8 power factor lagging having equivalent impedances of $(1.5 + j\ 3)\Omega$ and $(2 + j\ 4.5)\Omega$ respectively. Find the current supplied by each transformer and the ratio of the kW output of the two transformers.

Q.6 In an auto-transformer, the power transfer from primary circuit to the secondary circuit is partly by transformer action and partly by direct conduction. Justify this statement.

Q.7 A d.c. shunt motor is running at 1500 rpm at rated load torque. Discuss what would happen to the motor operation, if the following changes are made -

(a) Field terminal are reversed

(b) Supply wires are reversed

(c) Brushes are shifted against the direction of rotation

(d) Brushes are shifted in the direction of rotation

(e) The armature is rewound with a fewer number of turns of thick wire

(f) Some of the field-turns are short-circuited

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 Derive the expression for force as a partial derivative of stored energy with respect to position of a moving element. Also, explain the working of a relay contact using the above expression.

Q.2 Explain the voltage build-up process in d.c. shunt generators. It is found that the voltage of a d.c. shunt generator does not build up. Explain the various possible causes of this failure.

Q.3 Describe the process of commutation in dc machines through the reversal of current in a coil. Differentiate between good commutation and bad commutation. Enumerate the mechanical and electrical conditions leading to poor commutation in dc machines.

Q.4 Explain with the help of connection and phasor diagrams, how Scott-connections are used to obtain two-phase supply from three-phase supply mains.

Q.5 Explain how three-phase to six-phase conversion takes place in a three-phase transformer.

3E1220

Roll No. _____ Total No. of Pages: 3

3E1220

B. Tech. III - Sem. (Main / Back) Exam., February - 2023

Electrical Engineering

3EE4-08 Electromagnetic Fields

EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What do you mean by scalar and vector quantities?

Q.2 Write the divergence theorem.

Q.3 Write the Coulomb's law.

Q.4 What do you understand by dielectric constant and dielectric strength?

Q.5 Write the uniqueness theorem.

Q.6 Write the Biot–Savart's law.

Q.7 Discuss magnetic flux density.

Q.8 What do you mean by magnetic scalar potential?

Q.9 What is the difference between transformer and motional electromotive forces?

Q.10 What do you mean by skin depth & skin resistance?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Given point P(-2, 6, 3) in rectangular coordinates. Express this point P in cylindrical & spherical coordinates.

Q.2 Write the Maxwell's equations for static fields in point and integral form. Also, discuss the laws associated with these equations.

Q.3 What is the current density which produces a magnetic field of $H = 28 \sin x\, a_y$?

Q.4 If a wave with a frequency of 100 MHz propagates in free space, find the propagation constant.

Q.5 Planes z = 0 and z = 4 carry current $K = -10a_x$ A/m and $10a_x$ A/m respectively, determine H at (1, 1, 1).

Q.6 Derive the expression for energy stored in parallel plate capacitor.

Q.7 A magnetic material has $\mu_r = 10/\pi$ and is in a magnetic field of strength $H = 5\rho^3 a_\Phi$ A/m. Find the magnetization.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What is Gauss's Law? Consider a uniformly charged sphere of radius 'a' with uniform charge density ρ_v C/m^3, find 'D' everywhere using Gauss's law.

Q.2 Describe the analogy between electric and magnetic fields.

Q.3 Discuss the magnetic boundary conditions.

Q.4 Explain the following -

(a) Displacement current

(b) Poynting theorem

(c) Electric potential

Q.5 Conducting spherical shells with radii a = 5 cm & b = 30 cm are maintained at a potential difference of 100 V such that V(r = b) = 0 V and V(r = a) = 100 V. Determine V and E in the region between the shells.

3E1146

Roll No. _____ Total No. of Pages: 3

3E1146

B. Tech. III - Sem. (Back) Exam., February - 2023
PCC Electrical & Electronics Engineering
3EX4 – 08 Electromagnetic Field
EE, EX

Time: 2 Hours **Maximum Marks: 80**
Min. Passing Marks: 28

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Why the curl of DC Electric field is zero? If field is time varying, find the expression for its curl.

Q.2 What is meant by displacement current? Give its importance with respect to the time varying fields.

Q.3 What is continuity equation?

Q.4 What is meant by motional electromotive force? Also derive an expression for transformer's emf.

Q.5 Give mathematical expression for gradient in spherical co-ordinate system.

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 A vector field is given by the expression $\mathbf{A} = (x/R)\ \mathbf{u}_x + (y/R)\ \mathbf{u}_y + (z/R)\ \mathbf{u}_z$, where $R = \sqrt{(x^2 + y^2 + z^2)}$. Transform the vector into cylindrical co-ordinate system.

Q.2 Calculate the circulation of $\mathbf{A} = \rho cos\phi \boldsymbol{a}_\rho + z sin\phi \boldsymbol{a}_z$ around the edge L of wedge defined by $0 \le \rho \le 2$, $0 \le \phi \le 2$, $z = 0$ and shown in fig.1.

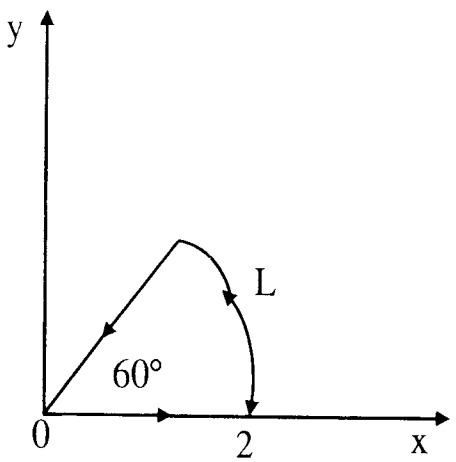


Fig.1.

Q.3 Electric flux density $\mathbf{D} = 6xy\ z^2\mathbf{a}_x + 3\ x^2z^2\ \mathbf{a}_y + 6\ x^2yz\ \mathbf{a}_z$ C/m2. Find the total charge lying within the region bounded by $1 \le x \le 3$m, $0 \le y \le 1$, $-1 \le z \le 1$.

Q.4 Define coefficient coupling. Show that mutual inductance between two coupled coils is the geometric mean of their self-inductances.

Q.5 A circular ring radius 'a' carries a uniform change ρ_L C/m and is placed on x-y plane with axis the same as z-axis. Show that:

(a) $\mathbf{E}\ (0, 0, h) = \dfrac{\rho L^{ah}}{2\varepsilon_0[h^2 + a^2]^{\frac{3}{2}}}\ \mathbf{a}_z$

(b) Find value of h for E_{max}.

Q.6 Explain the Poynting vector and Poynting theorem. Find the average power density.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 What are the various types of magnetic materials? Discuss the nature of magnetic materials on the basis of magnetization and permeability in detail.

Q.2 What do you understand by boundary condition? Explain considering the case of boundary between two different dielectrics. Also derive relation for Law of Refraction.

Q.3 Define Biot-Savart's Law. Using this law, derive a relation to find out magnetic field intensity at point P, due to straight carrying filament conductor of:

(a) Semi-infinite length

(b) Infinite length

6

3E1653

Roll No. _____ Total No. of Pages: 2

3E1653

B. Tech. III - Sem. (Back) Exam., February - 2023

Computer Science & Engineering

3CS3A Digital Electronics

EE, EX, EC, EI, CS, IT, AI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 Find the 11's complement of following number - [16]

(a) $(935)_{12}$

(b) $(267)_{12}$

OR

Q.1 Simplify the expression using Boolean Algebra - [16]

(a) $\overline{\overline{AB} + ABC + A(B + \overline{AB})}$

(b) Find the radix value if -

$(23)_r + (12)_r = (101)_r$

UNIT- II

Q.2 Explain Duality Theorem and De-Morgan's Law with proof. [16]

OR

Q.2 Implement the XOR gate using minimal number of NAND gates. Show that the circuit drawn realizes the XOR gate. [16]

UNIT- III

Q.3 Compare K-map technique and quine–Mc–Klusky minimization technique. [16]

OR

Q.3 Simplify the following function using tabulation method and verify the result using K-map, $F = \sum(0, 6, 9, 10, 13) + d(1, 3, 8)$ [16]

UNIT- IV

Q.4 Explain the Binary Serial and Parallel Address with proper example. [16]

OR

Q.4 Explain diode switching matrix with proper examples. [16]

UNIT- V

Q.5 Explain following in details - [16]

(a) Flip-flops

(b) Counter

OR

Q.5 Explain following in details - [16]

(a) Registers

(b) Sequential system

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(3)

3E1641

Roll No. _____ Total No. of Pages: 3

3E1641

B. Tech. III - Sem. (Back) Exam., February - 2023
Applied Electronics & Instrumentation Engineering
3AI2 Electronic Devices & Circuits
EC, EIC, EE, EX, AI, BM

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) What do you mean by Hall Effect? Explain it with suitable diagram. Also derive an expression for Hall Coefficient. [12]

(b) Explain the Mass Action Law. [4]

OR

Q.1 (a) With the help of neat diagram derive expression for continuity equation. [10]

(b) In an N-type semi-conduction, the Fermi level is 0.2eV below the conduction band at the room temperature of 300°k. If the temperature is increased to 350°k, determine the new position of Fermi level? [6]

UNIT- II

Q.2 (a) What do you mean by Voltage Multiplier circuits? With the help of neat diagram explain full wave voltage doubler and voltage tripler. [8]

(b) What do you mean by clamper circuits? With suitable diagram explain the Negative clamper circuit. [8]

OR

Q.2 (a) What do you mean by clipper circuits? With the help of suitable example explain series clipper. [8]

(b) What do you mean by UJT (Unit-Junction Transistor)? With the help of suitable diagram explain working and construction of UJT. [8]

UNIT- III

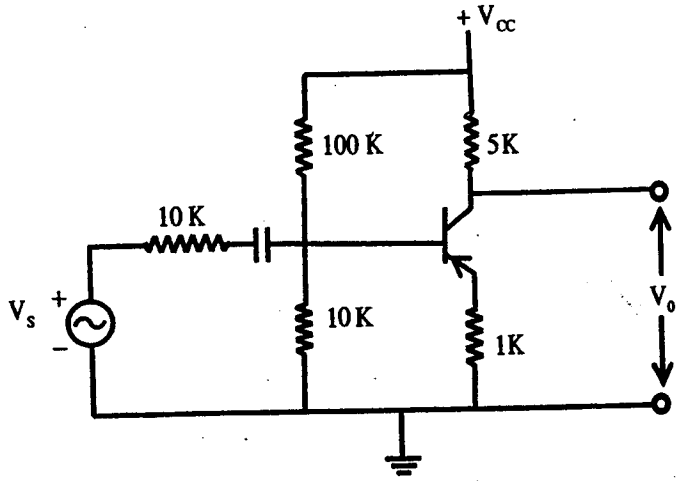
Q.3 (a) Write short note on Early Effect. [8]

(b) With the help of neat diagram explain the working of BJT (Bipolar Junction Transistor). [8]

OR

Q.3 (a) Explain Ebers Moll Model of transistor. [8]

(b) For the figure shown below find A_i, A_v and R_i? Given $h_{ie} = 1.1k\Omega$, $h_{re} = 2.5\times10^{-4}$, $h_{fe} = 50$ and $h_{oe} = 24\,\mu A/V$. [8]



UNIT- IV

Q.4 (a) Explain construction and working of JFET with suitable diagram. Also draw its characteristics and explain it. [8]

(b) Explain the types of MOSFETs and draw symbols for each of them. [4]

(c) Write the differences between BJT and FET. [4]

OR

Q.4 (a) Explain construction and working of n-channel enhancement type MOSFET with suitable diagrams. [8]

(b) Explain FET as a voltage variable resistor. [4]

(c) Write difference between enhancement type MOSFET and depletion type MOSFET. [4]

UNIT- V

Q.5 (a) Write short note on Millar Theorem. [8]

(b) Explain the analysis of mid frequency of RC coupled amplifier. [8]

OR

Q.5 (a) What do you mean by Darlington Emitter Follower? Derive expression for overall current gain for it. [10]

(b) The mid frequency gain of RC coupled amplifier is 100. If lower and upper half power frequencies are 50 Hz and 200 kHz respectively, find out the frequencies at which gain is reduced to 80. [6]
