3E1216

Roll No. _____ [Total No. of Pages : 2

3E1216

B.Tech. III sem. (Main) Examination, April/May - 2022
Electrical Engineering
3EE2-01 Advance Mathematics
EE, EX

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

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**. All **five** questions **Part B** and **three** questions out of **Five** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data 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 (As mentioned in form No.205)

PART - A

(word limit 25) **(10×2=20)**

1. What is Numerical integration formula in simpson's 3/8 rule? **(2)**
2. Write Gauss forward and backward interpolation formula. **(2)**
3. Write Trapezoidal formula's for integration. **(2)**
4. State convolution theorem for fourier transform. **(2)**
5. What are the existence condition for Laplace Transform? **(2)**
6. Find the Laplace transform of following $F(t) = te^t sint$. **(2)**
7. Find the inverse laplace transform following function $\frac{4s+5}{(s-1)^2(s+2)}$. **(2)**
8. State fundamental theorem of finite difference calculus. **(2)**
9. Define Lagrange's formulae. **(2)**
10. List the properties of mobius transformations. **(2)**

PART - B

(word limit 100) **(5×4=20)**

1. Use stialing formula to find f(1.22) from following table : **(4)**

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
$f(x)$	.84147	.89121	.93204	.96356	.98545	.99749	.99957	.97385	.97385

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2. Find inverse Laplace transform of the function. **(4)**

$$\frac{S}{S^4+S^2+1}.$$

3. Find the root of the following equation by Newton - Raphson method. **(4)**

$3x-\cos x+6=0$.

4. Find the Laplace transform of

a. $te^{-2t}\sin 3t$.

b. $Sinh3t\cos^2 t$ **(4)**

5. Given :

$\log_{10}654=2.8156$, $\log_{10}658=2.8182$, $\log_{10}659=2.8189$, $\log_{10}661=2.8202$ use Newton's divided difference formula to find value of $\log_{10}656$. **(4)**

PART - C

(Any three) **(3×10=30)**

1. Compute the value of following integral by Trapezoidal rule : - **(10)**

$$\int_{0.2}^{1.4}(\sin x-\log_e x+e^x)\,dx.$$

2. Show that the polar form of C-R equation's is. **(10)**

$$\frac{\partial u}{\partial r}=\frac{1}{r}\frac{\partial v}{\partial \theta},\frac{\partial v}{\partial r}=\frac{-1}{r}\frac{\partial u}{\partial \theta}$$

Using this result show that *log z* is analytic.

3. Find the bilinear transformation that map's the point 0, -i, -1 in z - plane onto the point's W = i, 1, 0. What are the invariant point's of this transformation? **(10)**

4. Find inverse Z transform of f(z) where R.O.C ; $|z|>2$. **(10)**

$$\frac{z^2}{(z+2)(z^2+4)}.$$

5. Prove that

$$L\left(\frac{\sin^2 t}{t}\right)=\frac{1}{4}\log\left(\frac{s^2+4}{s^2}\right)$$ and hence deduce the integral $\int_0^\infty \frac{\sin^2 t}{t^2}dt$. **(10)**

3E1221

Roll No. _____ [Total No. of Pages : 2

3E1221

B.Tech. III Sem. (Main) Examination, April/May - 2022

Electrical Engineering

3EE3-04 Power generation Process

EE, EX

Time : 2 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** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data 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)

PART - A

(word limit 25) **(10×2=20)**

1. What is nuclear fission and nuclear fusion? **(2)**
2. What is green house effect? Write the names of various types of renewable energy sources. **(2)**
3. Define demand factor and load factor. **(2)**
4. What are the advantages of power factor improvement? **(2)**
5. What do you mean by Co-generation? Also define spinning reserve. **(2)**
6. What is the difference between flat demand rate and straight meter rate? **(2)**
7. What do you mean by base load and peak load plants? **(2)**
8. What do you mean by closed cycle gas turbine plants? **(2)**
9. Define the term energy conservation. **(2)**
10. What do you mean by capacity factor and utilization factor? **(2)**

PART - B

(word limit 100) **(5×4=20)**

1. Explain the working of pumped storage hydro power plant with neat diagram. **(4)**
2. Explain the impact of thermal and nuclear power stations on environment. **(4)**
3. What are the various causes and effects of low power factor? Explain in short the power factor improvement using shunt capacitors. **(4)**

4. Explain about the calculation of most economic power factor when KW demand is constant. **(4)**

5. What are the various types of factors which are considered for the choice of plant location of steam power stations? **(4)**

PART - C

(Any three) **(3×10=30)**

1. Explain the basic principle and working of a thermal power station with neat schematic arrangement of modern steam power station. Also write the advantages and disadvantages of thermal power station. What is the efficiency of a steam power station? **(10)**

2. The load on a power plant on a typical day is as under : - **(10)**

Time	12-5am	5-9am	9-6 pm	6pm - 10pm	10pm-12am
Load (MW)	20	40	80	100	20

Plot the chronological load curve and load duration curve. Find the load factor of the plant and the energy supplied by the plant in 24 hours.

3. Write a short note on :

   i. Role of diversity in power sytem economics. **(4)**

   ii. Effect of load factor on unit energy cost. **(3)**

   iii. Operating cost of power plant. **(3)**

4. The monthly electricity consumption of a residence can be approximated as under:-

Light load	5 tube lights 40 watt each working for 3 Hrs daily.
Fan load	3 fans 100 watt each working for 5 Hrs daily.
Refrigerator load	1 KWh daily.
Misc. load	1 KW for one hour daily.

Find the monthly bill at the following tariff :

First 15 units	Rs. 2.74 per KWh
Next 25 units	Rs. 2.70 per KWh.
Remaining units	Rs. 2.36 per KWh.
Constant charge	Rs. 7.00 per month.

Discount for prompt payment 5%. **(10)**

5. With the help of suitable schematics, discuss the comparative study of hydro, nuclear and gas power plants. **(10)**

3E1218

Roll No. _____ [Total No. of Pages : 2

3E1218

B.Tech. III Sem. (Main) Examination, April/May - 2022
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**. All **five** questions from **Part B** and **three** questions out of **Five** questions from **Part C**.*

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

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

PART - A

(word limit 25) **(10×2=20)**

1. Explain application of Reciprocity theorem?
2. Explain one difference between Norton and Thevenin theorem?
3. What is a steady state response?
4. Explain uses of 2nd order differential equations?
5. What is RMS value?
6. Explain any one characteristics of Ideal Transformer?
7. What do you mean by poles and zeroes?
8. Explain Electrical Resonances?
9. What is two port network?
10. What is admittance parameters?

PART - B

(word limit 100) **(5×4=20)**

1. For a Sinusoidal waveform explain its
   1. Average power.
   2. Complex power.
2. Determine the average and RMS values of squar wave?

3. The inductance of a coil is 0.15 H. The coil has 100 turns. Find total magnetic flux through the coil when current is 4A; energy stored in magnetic field and voltage induced in coil, when current reduces to zero in 0.01 sec.

4. Explain the application of impedance and admittance parameters.

5. Find the inverse laplace transform $x(t)$,

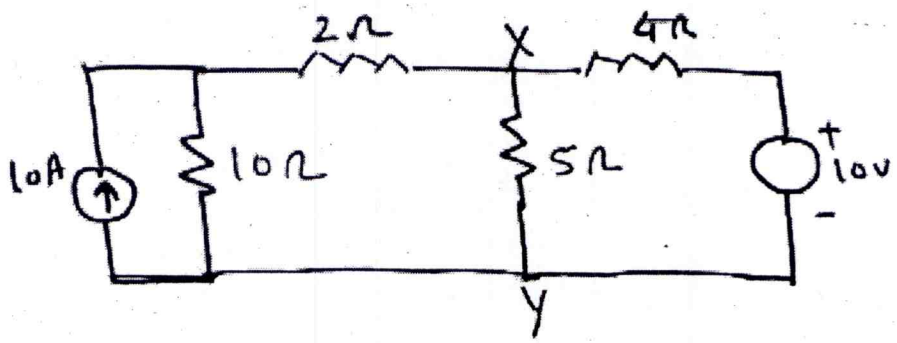
$$x(s) = \frac{s+8}{s^2+6s+13}.$$

PART - C

(Any three) **(3×10=30)**

1. The equation of a voltage wave is $V = 50+100\ sinwt\ volts$. find the average and RMS value of the voltage?

2. Determine the current threw 5Ω resistor using superposition theorem in fig.



3. a. Explain mutual coupled circuits with its applications.
   b. In a mutually coupled circuit, the primary current is reduced from 4A to zero in 10 μs. Avoltage of 40000 V is observed across the secondary. The mutual inductance between the coil will be.

4. Write short notes on any two :
   a. Ideal Transformer.
   b. Hybid parameters.
   c. Laplace transform.

5. Explain significance of forces & free response with the help of suitable example.

3E1217

Roll No. _____ [Total No. of Pages : 2

3E1217

B.Tech. III Sem. (Main) Examination, April/May - 2022
Electrical Engineering
3EE4-06 Analog Electronics
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** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data 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 (As mentioned in form No.205)

PART - A

(word limit 25)

(**All** questions are **compulsory**) **(10×2=20)**

1. What is an amplifier?
2. Define a Detector.
3. What are Oscillators?
4. Define Gain and give its unit.
5. What are Half wave rectifiers?
6. Explain slew rate.
7. What is a switch?
8. Define gain Bandwidth product.
9. What is working of Zener diode.
10. What is the function of the regulator.

PART - B

(word limit 100) **(5×4=20)**

(Attempt **all** questions)

1. Explain with a suitable diagram working of BJT as a switch. **(4)**
2. Explain the analog to Digital conversion. **(4)**

3. Sketch the circuit for a wein - bridge oscillator. What determines the frequency of oscillators? **(4)**

4. Explain how a MOSFET can be used as a SWITCH? **(4)**

5. Write short note on - "Zero - crossing Detector". **(4)**

PART - C

(Any three) **(3×10=30)**

1. For a BJT feedback amplifier in following fig (1.la) $h_{fc} = 100$, $h_{ic} = 1K$, neglect h_{re} and h_{oe}. Find with $R_e = 0\Omega$. **(10)**

   a) $R_{MF} = \frac{V_0}{I_s}$.

   b) $A_{vf} = \frac{V_0}{V_s}$.

   c) R_{if}.

   d) R_{of}.

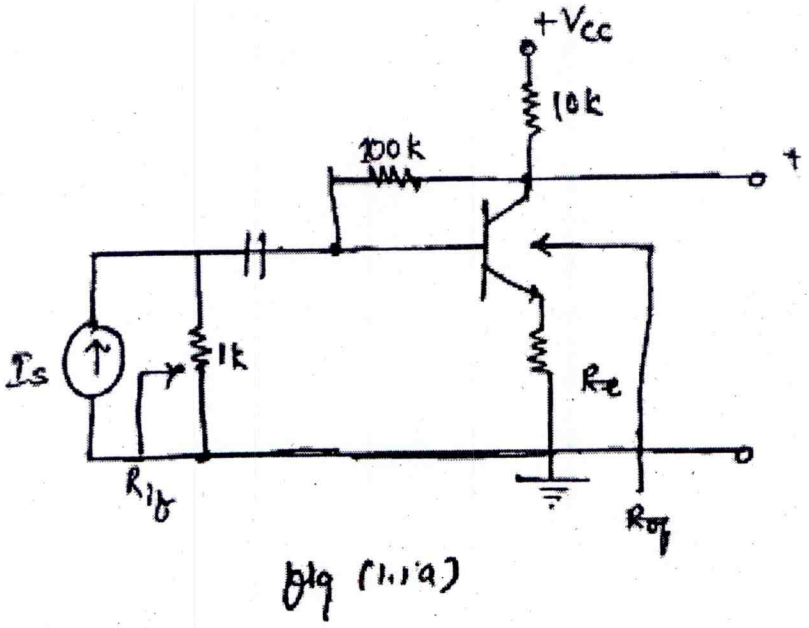


fig (1.1a)

2. Differentiate between CE, CB and CC amplifiers. **(10)**

3. Explain with suitable diagram operational amplifier (Op-amp). Explain different parameters related to op-amp. **(10)**

4. What are the characteristics of a MOSFET? With a suitable diagram explain MOSFET as an amplifier. **(10)**

5. Explain with suitable diagram.

   a) Clamping circuit. **(5)**

   b) Clipping circuit. **(5)**

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3E1219

Roll No. _____ [Total No. of Pages : 2

3E1219

B.Tech. III Sem. (Main) Examination, April/May - 2022
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**. All **five** questions from **Part B** and **three** questions out of **Five** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data 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 (As mentioned in form No. 205).

PART - A

(word limit 25) **(10×2=20)**

1. Define magnetic reluctance.
2. Draw the flux linkage v/s current characteristics of magnetic circuit.
3. What causes overheating of commutator is d.c. machines?
4. Write the function of compensating winding in d.c. machines?
5. While performing open circuit test of transformer, high voltage side is kept open, why?
6. What is the significance of back emf, in d.c machines?
7. State the Biot savart law?
8. What is armature reaction? Write the effects of armature reaction?
9. Why the stator core is laminated?
10. What is an auto transformer? Compare an auto transformer with two winding transformer?

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PART - B

(word limit 100) (5×4=20)

1. How highly permeable material influences the magnetic flux lines?
2. Draw and explain the B-H curves of magnetic material?
3. Explain the voltage build up in a shunt generator?
4. Derive the torque equation of d.c. machines?
5. What is meant by phase conversion of transformer? Explain the scott connection for the phase conversion of transformer?

PART - C

(Any three) (3×10=30)

1. Draw and explain the basic construction of d.c. machines. Name the different parts and state the function of each part.
2. Why the equivalent circuit of transformer is required? Draw and explain the equivalent circuit of single phase transformer?
3. Draw and explain the V-I characteristics and torque - speed characteristics of series and shunt motors?
4. A short shunt d.c. compound generator supplies 150 A at 100 V. The resistance of armature, series field and shunt field winding are 0.04 Ω, 0.03 Ω and 60 Ω respectively. Find the emf generated. Also find the emf. generated if same machine is connected as a long shunt machine.
5. A 10 KVA, 2500/250V, single phase transformer has following test results :

   O.C. Test : 250V, 0.8A, 50 W [LV side]

   S.C. Test : 60V, 3A 45 W [HV side]

   Find the core loss and full load copper losses respectively.

3E1220

Roll No. _____ [Total No. of Pages : 2

3E1220

B.Tech. III Sem. (Main) Examination, April/May - 2022
Electrical Engineering
3EE4-08 Electromagnetic Fields
EE, EX

Time : 2 Hours **Maximum Marks : 70**

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**. All **five** question from **Part B** and **three** 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)

PART - A

(word limit 25) **(10×2=20)**

1. How two vectors behave if their cross product is zero?
2. In case of co-axial cable, what is the value of the electric field at the core of the cable and outside the conductor?
3. What will be the work done in moving the charge around any closed loop?
4. What is the use of divergence and curl operations?
5. Give the relationship between potential gradient and electric field.
6. Write the expression for energy density in electrostatic field.
7. Define dielectric strength.
8. What is the effect of permeability on the force between two charges?
9. What is energy density in magnetic field?
10. Define Poynting vector.

PART - B

(word limit 100) **(5×4=20)**

1. Obtain the Capacitance of Parallel Plate Capacitor using Laplace's equation.
2. State and Prove the Stoke's Theorem.
3. Derive the expression for average Poynting vector.

4. Tabulate the similarities and dis - similarities of the electric and magnetic circuits.
5. A solenoid with length 10 cm. and radius 1 cm. has 450 turns. Calculate its Inductance.

PART - C

(Any three) **(3×10=30)**

1. Given the two points A (x=2, y = 3, z = -1) and B (r =4, $\theta = 25^{\circ}$, $\phi = 120^{\circ}$). Find the Spherical co-ordinates of A, Cartesian co-ordinates of B and distance AB.
2. Using Ampere's circuital Law, find Magnetic flux intensity due to infinite long straight conductor.
3. What is Magnetic torque? Derive the expression for magnetic moment of a planar coil.
4. State Maxwell's equation for static fields. Explain how they are modified for time varying electric field.
5. Derive different expressions for the energy density in the magneto static fields.

3E1141

Roll No. _____ [Total No. of Pages : 3

3E1141

B.Tech. III Sem. (Back) Examination, April/May - 2022
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** 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)

PART - A

(Answer should be given up to 25 words only)
All questions are **compulsory** **(10×2=20)**

1. Prove that $\Delta \log f(x) = \log\left[1+\frac{\Delta f(x)}{f(x)}\right]$
2. Prove that $E = e^{hD} = 1+\Delta$
3. If $f(x)=\frac{1}{x^2}$ find $\underset{b}{\triangle} f(a)$
4. Prove that $\mu^2 = I+\frac{\delta^2}{4}$
5. Find the Laplace transform of Sin5t Sin3t.
6. Prove that $L\left(\frac{\text{Sint}}{t}\right) = \tan^{-1}\left[\frac{1}{s}\right]$
7. Define Complex fourier Transform.
8. Using z-Transforms Prove that $z\left[\{a^n\}\right] = \frac{z}{z-a}$ if $n \geq 0$ *and* $z \neq a$
9. Define Analytic functions.
10. Define Mobius transformations.

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. **Prove that** $u_0 + \frac{xu_1}{\angle 1} + \frac{x^2u_2}{\angle 2} + \frac{x^3u_3}{\angle 3} + \ldots\ldots\ldots = e^x\left[u_0 + x\Delta u_0 + \frac{x^2}{\angle^2}\Delta^2 u_0 + \ldots\ldots\right]$

2. **Find the real root of the equation** $x^3 - 3x - 5 = 0$ **correct to four places of decimals by Newton Raphson (N-R) method.**

3. Using Simpson $\frac{1}{3}$ and $\frac{3}{8}$ rule to evaluate the following $\int_0^1 \frac{dx}{1+x^2}$ Hence obtain the value of π.

4. Find $L^{-1}\left[\frac{S}{S^4 + 4a^4}\right]$

5. Find the Fourier Sine transform of $\frac{e^{-ax}}{x}$

6. Find the inverse z-transform of $\frac{1}{(z-a)^2}$, when

   i) $|z| < a$ ii) $|z| > a$

7. Prove that the function $e^x(\cos y + i\sin y)$ is analytic and find its derivative.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Four** questions **(4×15=60)**

1. Given

θ	$=0^\circ$	5°	10°	15°	20°	25°	30°
$\tan\theta =$	0.000	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

   Use stirling formula to show that $\tan 16^\circ = 0.2867$

2. Use Regula falsi method to find a real root of the equation $x\log_{10} x - 1.2 = 0$ correct four places of decimal.

3. Find the Laplace transform of $\sin\sqrt{t}$. Hence show that $L\left[\frac{\cos\sqrt{t}}{\sqrt{t}}\right]=\sqrt{\frac{\pi}{S}}\ e^{-\frac{1}{4S}}$

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

Hence Prove that $\int_0^{\infty}\left(\frac{x\cos x-\sin x}{x^3}\right)\cos\frac{x}{2}dx=-\frac{3\pi}{16}$

5. Prove that the relation $W=\frac{iz+2}{4z+i}$ transforms the real axis in the Z-plane into a circle in the W-Plane. Find the centre and radius of the circle and the point in the Z-plane which is mapped on the centre of the circle.

3E1142

Roll No. _____ [Total No. of Pages : 2

3E1142

B.Tech. III Sem. (Back) Examination, April / May - 2022
ESC Electrical & Electronics Engineering
3EX3-04 Power Generation Process
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** questions 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 (As mentioned in form No. 205).

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(5×2=10)**

1. Why is the overall efficiency of a steam power station very low?
2. What is solar constant? What are its units?
3. What is the importance of power factor in the supply system?
4. Why is tariff for power load less than the lighting load?
5. What is non - spinning reserve?

PART - B

(Analytical/Problem solving questions)

Attempt any **four** questions **(4×10=40)**

1. Explain the important components of a steam power station. **(10)**
2. How can wind energy be converted into electrical energy? What prohibits large scale utilisation of wind power for electricity generation? **(10)**

3. The annual load duration curve of a small hydroplant shows 438×10^4 kwh of energy during the year. It is a peak load plant with 20% annual load factor. Find station capacity. If plant capacity factor is 15%, find reserve capacity of the plant. **(10)**

4. What consideration govern the selection of plant size? Discuss the advantages which accrue from large plant sizes? **(10)**

5. Describe the desirable characteristics of a tariff. Also, Describe some of the important types of tariff commonly used. **(10)**

6. Write short notes on the following. **(2×5=10)**

   i) Advantages of high load factor.

   ii) Sinking fund method of depreciation.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **two** questions **(2×15=30)**

1. Draw a neat schematic diagram of a hydro - electric plant and explain the functions of various components. **(15)**

2. A factory operates at 0.8 power factor lagging and has a monthly demand of 750 KVA. The monthly power rate is Rs. 8.50 per KVA. To improve the power factor, 250 KVAr capacitors are installed in which these is negligible power loss. The installed cost of equipment is Rs. 20,000 and fixed charges are estimated at 10% per year. Calculate the annual saving effected by the use of capacitors. **(15)**

3. Discuss the different classification of costs of electrical energy. What do you understand by the term 'load diversity' and what is its significance? **(15)**

3E1143

Roll No. _____ [Total No. of Pages : 4

3E1143

B.Tech. III Sem. (Back) Examination, April/May - 2022
3EX4-05 Electrical Circuit Analysis
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** from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data 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 (As mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)
All questions are **compulsory** **(10×2=20)**

1. What are the limitations of Thevenin's theorem?
2. Explain Reciprocity theorem with suitable example.
3. Explain DOT convention in magnetically coupled circuits.
4. Define initial value and final value theorem for network elements.
5. Explain transient response and steady state response of an element.
6. Derive ABCD parameters in terms of Z parameters.
7. Explain power triangle with its components.
8. State compensation theorem in an electrical network.
9. Define convolution theorem in reference to Laplace transform.
10. Explain
    i) Unit step function and
    ii) Ramp function.

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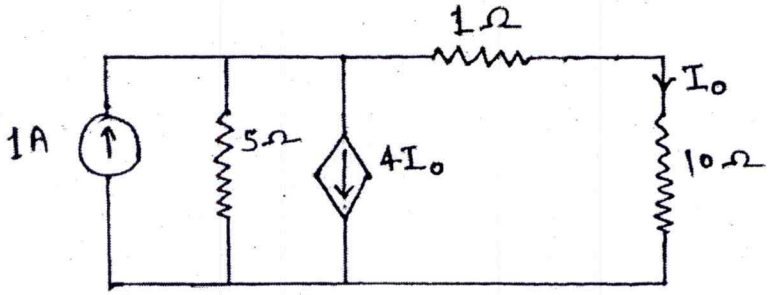
PART - B

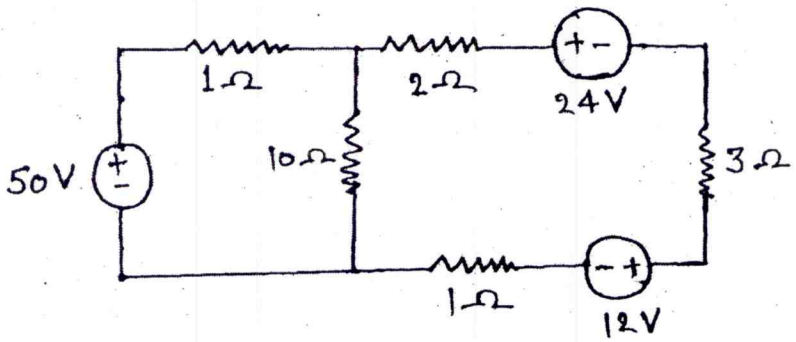
(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

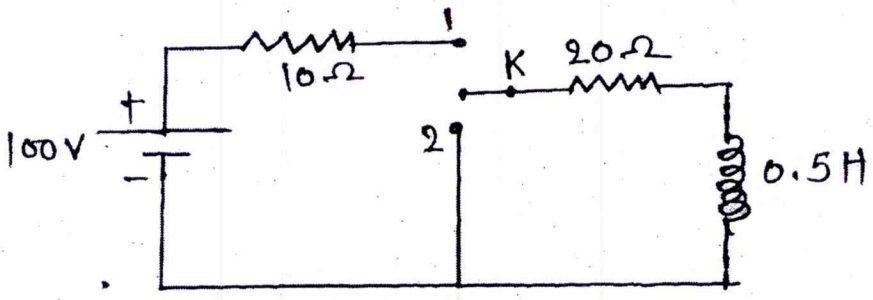
1. Find the power loss in the 10Ω resistor in the circuit of given Figure using Norton's theorem.



2. Find the current in the 10Ω resister in the circuit of given Figure using Thevenin's theorem. What is the power loss in that resister?



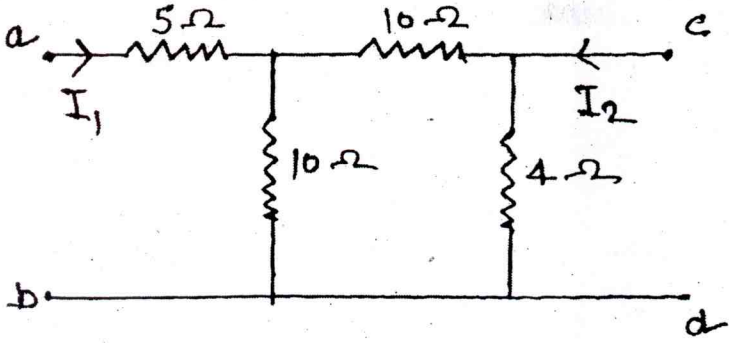
3. In given figure, the switch K is kept first at position 1 and steady state condition is reached. At t = 0, the switch is moved to position 2. Find the current in both cases.



4. Find the current in a series R L circuit having R = 2 Ω and L = 10 H while a DC voltage of 100 V is applied. What is the value of this current after 5 second of switching on?

5. Following data refers to two coupled coils 1 and 2. $\Phi_{11} = 0.5mWb$; $\Phi_{12} = 0.3mWb$; N_1 = 100 turns; N_2 = 500 turns ; i_1 = 1 A. Find following
   i) Coefficient of coupling.
   ii) Inductances L_1 and L_2.
   iii) Mutual inductance.

6. Find the Z parameter of the network given in figure.



7. Find the Laplace inverse of $I(s)=\dfrac{S+1}{S(S^2+4S+4)}$.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Four** questions **(4×15=60)**

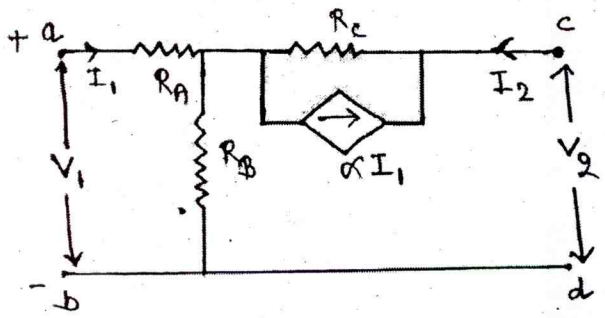
1. Derive expressions for transient response of series RL circuit with sinusoidal excitation.

2. Find the inverse Laplace transform of following

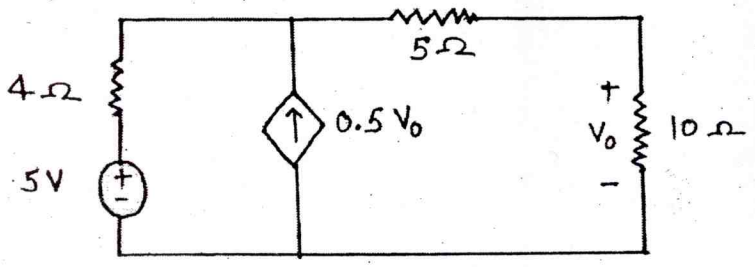
   i) $M(s)=\dfrac{s^2+10s+15}{(s+1)(s+2)(s+3)}$.

   ii) $F(S)=\dfrac{1}{s^2(s+\alpha)^3}$.

3. Find the hybrid parameter of the following circuit.



4. What is the power loss in 10Ω resistor of the circuit in figure.



5. i) A R-L series circuit has resistance of 20 Ω and inductance of 0.02 H. If they net impedance of the given circuit be $40\angle\phi^0$, find the ϕ and frequency of the circuit.

ii) A series RLC circuit has R = 10 Ω, L = 1 H, C = 20 μF. A 100 V, 50 Hz supply is applied across the circuit. Find the input current and voltage across the elements.

3E1144

Roll No. _____ [Total No. of Pages : 3

3E1144

B.Tech. III Sem. (Back) Examination, April/May - 2022
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** 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)

PART - A

(Answer should be given up to 25 words only)

All questions are **compulsory** **(10×2=20)**

1. What are general characteristics of Diode clipper circuits. **(2)**
2. Draw the circuit of transistor in CE configuration and sketch the O/P characteristics. **(2)**
3. Distinguish between JFET and BJT. **(2)**
4. What are advantages of push - pull amplifier over that of a single transistor amplifier. **(2)**
5. Explain the construction and working of MOSFET. **(2)**
6. List six characteristics of an ideal OP-AMP. **(2)**
7. Define slew rate. What causes the slew rate. **(2)**
8. List the different types of comparators. **(2)**
9. State the two conditions of Oscillations. **(2)**
10. Distinguish between oscillators and generators. **(2)**

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. A full wave rectifier ckt is required to give a DC O/P voltage of 80 V. Neglect resistance of diode. Find **(8)**

   i. DC load current if $R_L = 5k\Omega$.

   ii. Efficiency of a rectifier.

   iii. Peak current through diode.

2. Differentiate CB,CE and CC amplifiers. **(8)**

3. Show the classification of power amplifiers using O/P characteristics, load line and operating point. **(8)**

4. Describe the Ebers - Moll model of a bipolar junction transistor and explain the working of the transistor. **(8)**

5. Design an inverting amplifier with a gain of - 5 and an I/P resistance of 10 KΩ. **(8)**

6. Draw and explain the operation of a triangular wave generator. **(8)**

7. Design a first order low pass filter for a high cut - off frequency of 2KHZ and pass band gain of 2. **(8)**

8. Explain the important specifications of D/A and A/D converters. **(8)**

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Four** questions **(4×15=60)**

1. a. In intrinsic SC, how can find the concentration of electron, derive the expression. **(7)**

   b. Draw the characteristics of p-n junction diode with proper labels of forward and reverse bias. **(8)**

2. a. What are different configurations of BJT. Describe with proper biasing. **(7)**

   b. Distinguish b/w enhancement and depletion type MOSFET. Also explain the construction and characteristics of n - channel depletion and enhancement type MOSFET. **(8)**

3. Define the following parameters - **(15)**

   a. I/P offset voltage.

   b. I/P Bias current.

   c. O/P offset voltage.

   d. CMRR.

   e. Slew Rate.

4. Draw the ckt using OP-AMP to get a **(2×7½=15)**

   i. Phase - shift Oscillator.

   ii. Precision Rectifier.

5. a. Design band pass filter with $f_c = 5KHZ$ and $f_m = 20\ KHZ$. **(8)**

   b. Design a square wave oscillator for f = 1KHZ. The Op-Amp is a 741 with supply voltage $\pm 15V$. **(7)**

3E1145

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3E1145

B.Tech. III Sem. (Back) Examination, April/May - 2022

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** 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 (As mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are **compulsory** **(10×2=20)**

1. Explain Ampere Law and Biot Savart Law.
2. Define
   i. Reluctance.
   ii. Magneto motive force.
   iii. Flux.
3. What is coupling coefficient between coils?
4. Explain singly excited magnetic field systems.
5. What is self - excitation mode of DC machine? Explain with suitable example.
6. Why it is not advisable to fully load a DC shunt generator until its voltage builds up the rated values?
7. What is the importance of back emf in DC machines?
8. How does a DC motor differ from a DC generator in construction?
9. Define voltage regulation in transformer.
10. What is the difference between ideal and practical transformer?

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. Draw and explain B-H curve. What is meant by saturation, coercive force and residual magnetism?

1140

2. Explain armature reaction in DC motors.
3. A 20 kVA, 440/220 V transformer with an equivalent impedane of 0.01 Ω is to operate in parallel with a 15 kVA, 440/220 V transformer with an equivalent impedance of 0.015 Ω. The two transformers are connected in parallel and made to carry a load of 25 kVA. Assume both the impedances to have the same angle.
   i. Find the individual load currents.
   ii. What percent of the rated capacity is used in each transformer?
4. Explain following operating characteristics of DC shunt motors/
   i. Speed - armature current characteristics.
   ii. Torque - armature current characteristics.
   iii. Speed - torque characteristics.
5. Explain different types of power losses in transformers. How can they be minimized?
6. What are the methods to control the speed of DC shunt motor? Explain any method in detail.
7. A 250 V dc shunt motor has an armature resistance of 0.5 Ω and field resistance of 250 Ω. When driving a constant torque load at 600 rpm the motor draws 21 A. What will be the new speed of the motor if an additional 250 Ω resistance is inserted in the field circuit?

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

(Attempt any **Four** questions) **(4×15=60)**

1. Explain core and shell type transformer with their applications. Explain important factors that affect the selection of transformer core construction.
2. Discuss the necessary condition for parallel operation of single phase transformer. Explain the division of load between transformers in parallel.
3. A shunt generator gives full load output of 30 kW at a terminal voltage of 200 V. The armature and field resistance are 0.05 Ω and 50 Ω respectively. The iron and friction losses are 1000 W. Calculate
   a. generated emf.
   b. copper losses.
   c. efficiency.
4. Explain regenerative braking for DC shunt and DC series motors.
5. a. Explain energy stored in magnetic field with required expressions.
   b. A coil of 100 turns is wound on a torroidal magnetic core having a reluctance of 10^4 AT per Wb. When the coil current is 5 A and is increasing at the rate of 200 A/s, determine (i) energy stored in the magnetic circuit (ii) voltage applied across the coil. Assume coil resistance as zero.

3E1146

Roll No. _____ [Total No. of Pages : 3

3E1146

B.Tech. III Sem. (Back) Examination, April/May - 2022

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 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)

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(5×2=10)**

1. State and explain Biot - Savart's law. **(2)**

2. State and explain Gauss's law. **(2)**

3. What is skin effect? **(2)**

4. Explain Poynting theorem. **(2)**

5. Express the following points in spherical co-ordinates :

i. A (2,3,-1).

ii. B(2, 90°,1). **(1+1=2)**

PART - B

(Analytical/Problem solving questions)

Attempt any **four** questions **(4×10=40)**

1. a. Determine the divergence of the given vector fields :

i. $P = x^2yz\ \hat{a}_x + xz\ \hat{a}_z$.

ii. $Q = \rho \sin\phi\ \hat{a}_\rho + \rho^2 z \hat{a}_\phi + z\cos\phi\ \hat{a}_z$.

iii. $T = \frac{1}{r^2}\cos\theta \hat{a}_r + r\sin\theta\cos\phi \hat{a}_\theta + \cos\theta \hat{a}_\phi$. **(5)**

b. Assuming potential V as :

$$V = \frac{10}{r^2}\sin\theta\cos\phi$$

i. Find the electric flux density D at $(2, \pi/2, 0)$.

ii. Calculate the work done in moving a 10 μc charge from point A(1,30°,120°) to point B (4,90°,60°). **(5)**

2. a. If $A = \rho\cos\phi\hat{a}_\rho + \sin\phi\hat{a}_\phi$, evaluate the integral $\int A.dl$ around the path shown in figure 1 given below.
confirm this using stokes's theorem. **(6)**

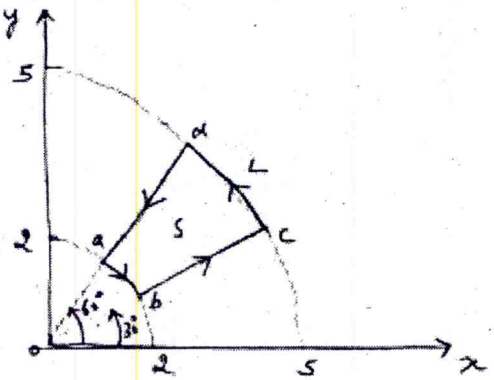

Figure 1

b. Write short note on Poisson's theorem. **(4)**

3. a. Determine the magnetic moment of an electric circuit formed by the triangular loop as shown in figure 2 given below. **(5)**

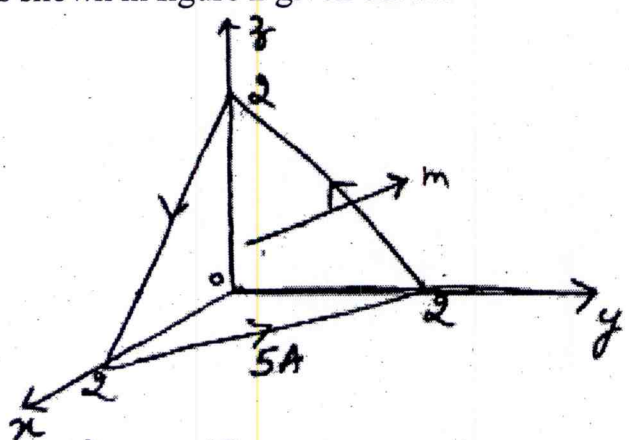

Figure 2

b. Prove that : $\nabla \times H = J + \frac{\partial D}{\partial t}$. **(5)**

4. a. Write short note on wave propagation in lossy dielectric medium. **(5)**

b. A parallel plate capacitor with plate area of 5 cm^2 and plate separation of 3 mm has a voltage of 50 sin10^{3}t applied to its plates. Calculate the displacement current assuming $\epsilon = 2\epsilon_0$. **(5)**

5. a. Show that in a good conductor

$$\alpha = \beta = \sqrt{\frac{w\mu\sigma}{2}}$$

where α is the attenuation factor and β is the phase shift constant. **(5)**

b. Compare electric circuits and magnetic circuits. **(5)**

6. Write short notes on :

a. Cylindrical co-ordinate system.

b. Spherical co-ordinate system. **(5+5=10)**

PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any **two** questions **(2×15=30)**

1. a. Express vector $B = \frac{10}{r}\hat{a}_r + r\cos\theta\hat{a}_\theta$ in cartesian and cylindrical co-ordinates.

Find B(-3,4,0) and $B(5,\pi/2,-2)$. **(7.5)**

b. Derive an expression for electric field internalty E due to charge uniformly distributed over an infinite plane with surface charge density ρ_s. **(7.5)**

2. a. The electric field and magnetic field in free space are given by :

$$E = \left(\frac{50}{\rho}\right)\cos(10^6 t + \beta z)\hat{a}_\phi \text{ V/m}$$

$$H = \left(\frac{H_0}{\rho}\right)\cos(10^6 t + \beta z)\hat{a}_\rho \text{ A/m}$$

Determine the constants H_0 and β such that the fields satisfy Maxwell's equations. **(10)**

b. Prove that : $\nabla \times E = \frac{-\partial B}{\partial t}$. **(5)**

3. a. A uniform plane wave propagating in a medium has

$E = 2e^{-\alpha z}\sin(10^8 t - \beta z)\hat{a}_y$ V/m If the medium is characterized by $E_r = 1$, $\mu_r = 20$ and $\sigma = 3\,{}^{S}/_{m}$; find α, β and H. **(7.5)**

b. Using Biot - Savart's law, determine the magnetic field intensity due to an infinitely long steady straight line current. Also show that $\vec{\nabla}.\vec{B} = 0$. **(7.5)**

3E1645

Roll No. _____ [Total No. of Pages : 2

3E1645

B.Tech. III Sem. (Old back) Examination, April/May - 2022
Electrical Engineering
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)

Unit - I

1. a) Discuss the analogy between electric and magnetic - circuit. **(8)**

   b) Define magneto motive force and magnetic field strength. Write few applications of permanent magnet. **(8)**

(OR)

1. a) Discuss about the energy started in the magnetic field. **(8)**

   b) Discuss about the conservation of energy and the phenomenon involved in the conversion process. **(8)**

Unit - II

2. a) Derive the EMF equation of a DC - generator. **(8)**

   b) What is armature reaction in a DC - generator? What are the remedies to the armature reaction effect? **(8)**

(OR)

2. a) What are the various types of DC - generators? Explain about the separately excited DC generator. **(8)**

   b) Draw and explain the different types of characteristics of a DC series generator. **(8)**

Unit - III

3. a) Explain the basic construction and operating principle of a DC motor. What are the various types of DC motors? (8)

   b) Explain the speed control methods of a DC - motor in brief. (8)

(OR)

3. a) What is starting of DC motors? Explain the three - point starter method for the starting of DC motor. (8)

   b) Explain the swinburne's test (no - load test) of DC motor with merits and demerits. (8)

Unit - IV

4. a) What is an electrical transformer? Explain the construction, working nad basic principle of a transformer. (8)

   b) Derive the EMF equation of a transformer and voltage transformation ratio. (8)

(OR)

4. a) What is parallel operation of a transformer? Why parallel operation is required? What are the conditions for parallel operation? (8)

   b) Explain the sumpner's test (back - to - back) on transformer. (8)

Unit - V

5. a) Explain the scott - T connection of a transformer. Also write the applications of scott - T connection. (8)

   b) What is Open - delta connection of transformers? How it works? Write the applications of open - delta connection. (8)

(OR)

5. a) Explain the three - phase to six - phase conversion of the transformer. (8)

   b) What is a three - winding transformer? What are the uses of the tertiary winding of the three - phase transformer? (8)

3E1646

Roll No. _____ [Total No. of Pages : 3

3E1646

B.Tech. III Sem. (Old Back) Examination, April / May - 2022
Electrical and Electronics Engg.
3EX6A Electrical & Electronics Engg.
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. Schematics 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)

UNIT - I

1. a) Prove that $L\left\{\frac{\cos(ax)-\cos(bx)}{x}\right\}=\frac{1}{2}\log\left(\frac{s^2+b^2}{s^2+a^2}\right)$. **(8)**

b) Using convolution theorem evaluate $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$. **(8)**

(OR)

1. a) Find the Laplace transform of the following periodic function : **(8)**

$$f(x)=\begin{cases}k, & 0<x<a,\\ -k, & a<x<2a\end{cases}.$$

b) Using Laplace transform solve the differential equation. **(8)**

$(D+2)^2 y=4e^{-2x}$ with y(0) = -1, $y'(0)=4$.

UNIT - II

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

$$\int_0^\infty\left(\frac{x\cos x-\sin x}{x^3}\right)\cos\frac{x}{2}\,dx.$$ **(8)**

b) State and prove convolution theorem for Fourier transform. **(8)**

(OR)

17

2. a) Find the function, if Fourier sine transform is $\frac{s}{1+s^2}$. (8)

b) Solve the following partial differential equation using Fourier sine transform technique :

$\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$, if $u(0,t) = 0$, $u(x,0) = e^{-x}$, $u(x,t)$ is bounded. (8)

UNIT - III

3. a) Find the Fourier series to represent $f(x) = x - x^2$ in the interval (-1,1). (8)

b) State and prove Euler - Lagrange's equation. (8)

(OR)

3. a) Obtain the expansion for y from the following table up to the second harmonic: (8)

x	0	1	2	3	4	5
y	9	18	24	28	26	20

b) On which curve the functional

$\int_0^{\pi/2} \left(y'^2 - y^2 + 2xy\right) dy$; $y(0) = 0$, $y\left(\frac{\pi}{2}\right) = 0$ be extremized? (8)

UNIT - IV

4. a) Prove that the function $u = x^3 - 3xy^2$ satisfies Laplace's equation and find the corresponding analytic function $f(z) = u + iv$. (8)

b) Define analytic function and find the values of a,b,c and d such that the function $f(z) = x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$ is analytic. (8)

(OR)

4. a) Show that the function $f(z) = |\sqrt{xy}|$ satisfied the Cauchy - Riemann equations at origin, but is not analytic at the point. (8)

b) Find the value of $\int_C \frac{\sin^6 z}{(z - \pi/6)^3}\, dz$, where $C : |z| = 1$. (8)

UNIT - V

5. a) Find different expansions of $\frac{1}{(z-1)(z-3)}$ in powers of z which are valid for regions :

   i. $|z|<1$

   ii. $1<|z|<3$

   iii. $|z|>3$ **(8)**

   b) Use method of contour integration to evaluate

   $$\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos\theta}\, d\theta .$$ **(8)**

(OR)

5. a) Find the residue of

   $f(z)=\frac{z^2-2z}{(z+1)^2(z^2+4)}$, at all its poles in the finite plane. **(8)**

   b) Use method of contour integration to prove that

   $$\int_0^{2\pi} \frac{d\theta}{1+a^2-2a\cos\theta} = \frac{2\pi}{1-a^2} \quad (0<a<1) .$$ **(8)**
