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**R-15**

**Code: 5G232**

II B.Tech. I Semester Supplementary Examinations October 2020

# Electrical Machines-I

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. Elucidate the principle of operation and constructional details of a machine, which generates unidirectional voltage with the neat sketch? 14M

**OR**

2. a) Explain why equalizer connections are used in lap windings and dummy coils are sometimes used in wave winding? 7M

   b) Elucidate the principle of energy conversion of electromechanical system? 7M

## UNIT–II

3. a) Derive the expressions for demagnetizing and cross magnetizing ampere turns per pole. 8M

   b) What are different losses that occur in DC machines? Briefly explain. 6M

**OR**

4. a) Distinguish the methods to avoid sparking at the brushes in a DC machine? 7M

   b) A 4-pole motor has a wave connected armature with 888 conductors. The brushes are displaced backward through 5 mechanical degrees from the geometric neutral plane. If the total armature current is 90A. Calculate the cross and demagnetized ampere turns per pole. 7M

## UNIT–III

5. What is the experimental procedure to obtain the load characteristics of dc shunt generator? Explain. 14M

**OR**

6. a) State four reasons for operating dc generators in parallel? 6M

   b) Two D.C shunt generators with E.M.F's of 120 V and 115 V, armature resistance of 0.05ohms and 0.04 ohms and field resistances of 20 ohms and 25 ohms respectively are in parallel supplying a load of 25 kW. How do they share load. 8M

## UNIT–IV

7. a) Explain the significance of back emf in a DC motor. 7M

   b) Explain the working principle of a starter suitable for high speed control of a dc shunt motor with neat sketch. 7M

**OR**

8. a) From fundamentals derive the torque equation of a DC motor 7M

   b) Identify the DC motor with the highest starting torque. Assess the reason with relevant equation? 7M

## UNIT–V

9. a) Explain the fields test to determine the efficiency of a dc series machine. 7M

   b) Describe the Swinburne's test to determine the no-load losses of a dc machine. 7M

**OR**

10. a) Explain the procedure to find the stray losses of dc shunt machine. 7M

    b) List the advantages of Indirect test over Direct test. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G234**

II B.Tech. I Semester Supplementary Examinations October 2020

# Electro Magnetic Fields

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. a) State and explain coulombs law of force between two charges? 7M

   b) The concentrated charges of 0.2μC are located at the vertices of an equilateral triangle of 10m of side. Find the magnitude and direction of the force on one charge due to other two charges? 7M

**OR**

2. a) State and explain Gauss law in Integral form. 7M

   b) Derive the equation for potential at a point inside a solid sphere having uniform charge density? 7M

## UNIT–II

3. a) Define Dipole and Dipole moment? Derive the expression for potential due to dipole? 7M

   b) Explain Polarization of dielectric materials? 7M

**OR**

4. a) Deduce the boundary conditions for dielectric to dielectric with tangential and normal component? 7M

   b) Derive the equation for capacitance of two parallel transmission lines. 7M

## UNIT–III

5. a) Obtain an expression for Magnetic field intensity due to an infinitely long current carrying conductor? 7M

   b) Derive the expression for Vector Magnetic Potential. 7M

**OR**

6. Using Ampere's circuital law find H due to an infinite sheet of current. 14M

## UNIT–IV

7. a) What is a magnetic dipole? How does it differ from an electric dipole? 7M

   b) Derive the expression for inductance of a solenoid using Amperes circuital law. 7M

**OR**

8. Explain the magnetization and demagnetization by using B-H curve with neat diagram. 14M

## UNIT–V

9. a) Distinguish clearly the dynamically induced EMF and statically induced EMF explain with neat diagram. 7M

   b) Find the EMF developed around a circular path with radius r=0.5m in the plane z=0 at t=0 if(i) B=0.1 sin(377t)$a_{z,}$(ii) B=0.1sin(377t/r)$a_{r.}$ 7M

**OR**

10. a) Derive the expression of one of the Maxwell's equation Curl(E)=$\frac{-\partial B}{\partial t}$. 7M

    b) Derive the equation for modified Amperes circuital law for time varying fields. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G539**

II B.Tech. I Semester Supplementary Examinations October 2020

# Fluid Mechanics and Hydraulic Machines

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. a) State and explain the Newton's law of viscosity. 4M

   b) Calculate the capillary effect in millimetres in a glass tube of 4 mm diameter, when immersed in (**i**) water and (**ii**) mercury. The temperature of the liquid is $20^0$ C and the values of surface tension of water and mercury at $20^0$ C in contact with air are 0.0735 N/m and 051N/m respectively. The contact angle for water is $0^0$ and for mercury is $130^{0.}$ Take specific weight of glass tube at $20^0$ as equal to 9790 N/$m^3$. 10M

**OR**

2. a) Differentiate between (**i**) stream line and streak line (**ii**) Laminar flow and Turbulent flow 4M

   b) Explain the practical applications of following concepts in daily life
   (i) Vapour pressure (ii) surface tension (iii) vacuum pressure 10M

## UNIT–II

3. a) Explain Hydraulic Gradient Line and Total Energy Line 4M

   b) A pipe of 0.6m diameter is1.5km long. In order to augment the discharge, another pipe of the same dia is introduced parallel to the first in the second-half of the length. Neglecting minor losses, find increase in discharge if friction factor is 0.04. Assume a level difference of 30m at inlet & outlet of the pipe. 10M

**OR**

4. a) State the assumptions made in the derivation of Bernoulli's equation. State the momentum equation and explain its significance. 4M

   b) A 300 mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5 m/s. If the axis of the pipe turns through $45^0$, find the magnitude and direction of the resultant force at the bend. 10M

## UNIT–III

5. a) Derive an expression for the force exerted by a jet of water on a inclined fixed flat plate to the jet 7M

   b) A jet of water of 60 mm diameter strikes a curved vane at its centre with a velocity of 15 m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of $165^0$. Assuming the plate to be smooth, find (i) thrust on the plate in the direction of jet (ii) power of the jet and (iii) Efficiency of the jet. 7M

**OR**

6. a) What are the principal components of a hydro-electric scheme? Discuss their functions and design specifications 7M

   b) Define and differentiate between the following in connection with hydropower (**i**) firm and secondary power (**ii**) Load factor, utilisation factor and plant factor (**iii**) installed and dependable capacity of a power house 7M

**UNIT–IV**

7. a) Explain the Cavitations in Turbines. 4M

   b) A reaction turbine is 2m above the tail water level and works under a head of 25 m. The draft tube records a vacuum gauge reading of 5.3 m of water and its inlet diameter is 2.2 m. The efficiency of the draft tube is 80%. What is the power developed by the turbine with an efficiency of 90%. 10M

**OR**

8. a) Explain the different types of the Efficiencies of a turbine. 4M

   b) A Kaplan turbine working under a head of 25 m develops 16000 kW shaft power. The outer diameter of the runner is 4 m and hub diameter is 2 m. The guide blade angle is 35. The hydraulic and overall efficiency are 90% and 85% respectively. If the velocity of whirl is zero at outlet, determine: runner vane angles at inlet and outlet, and speed of turbine. 10M

**UNIT–V**

9. a) What is priming? Why is it necessary? 4M

   b) A centrifugal pump is to discharge 0.118 $m^3$/sat speed of 1200 rpm against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75 percent. Determine the vane angle at the outer periphery of the impeller. 10M

**OR**

10. a) Why is slip of a reciprocating pump? Why does it occur? Under what circumstances is the slip negative? 7M

    b) Explain working principle of reciprocating pump with neat sketch 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5GC32**

II B.Tech. I Semester Supplementary Examinations October 2020

# Mathematical Methods-III

( Common to EEE & ECE )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT–I**

1. a) Determine the rank of the matrix $\begin{bmatrix} 0 & 1 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$

   b) Find whether the following system of equations are consistent. If so, solve them
   x + 2y + 2z = 2 ; 3x - 2y - z = 5 ; 2x - 5y + 3z = - 4 ; x + 4y +6z = 0

**OR**

2. a) Solve the equations 3x + y + 2z = 3, 2x -3y - z = - 3 , x + 2y + z = 4 using Guass elimination method

   b) Prove that the Eigen values of a triangular matrix are just the diagonal elements of the matrix.

**UNIT–II**

3. a) Evaluate $\sqrt[3]{24}$ by Newton Raphson method

   b) Employ Taylor's method to obtain appropriate value of *y* at *x* = 0.2 for the differential equation $\frac{dx}{dy} = 2y + 3e^x,\ y(0) = 0$. Compare the numerical solution obtained with the exact solution.

**OR**

4. a) Find a real root of $x^3 - x^2 - 1 = 0$ by Bisection method

   b) Using Euler's method find an approximate value of y corresponding to $x = 1$, given $\frac{dx}{dy} = x + y$ and $y = 1$when $x = 0$

**UNIT–III**

5. a) Find the missing term in the table

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| f(x) | 1 | 3 | 9 | - | 81 |

   b) Find first and second derivatives of y at x=1.5 if

| x | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
|---|---|---|---|---|---|---|
| y | 3.375 | 7.000 | 13.625 | 24.000 | 38.875 | 59.000 |

**OR**

6. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at *x* =1.1 from the following table:

| *x* | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|---|
| *y* | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

**UNIT–IV**

7. a) Fit a straight line to the following data

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 5 |

b) Form the partial differential equation by eliminating a and b from $2z=(x-a)^{1/2}+(y-a)^{1/2}+b$.

**OR**

8. a) Fit a straight line by the method of least squares method to the following data

| *x* | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| *y* | 14 | 27 | 40 | 55 | 68 |

b) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from

$(i)\ z = a\,x + b\,y + a^2 + b^2$ and $(ii)\ z = f(x + a\,y) + g(x - a\,y)$

**UNIT–V**

9. a) Obtain a half range cosine series for $f(x) = (x-1)^2$ in interval $0 < x < 1$. Deduce the sum of series $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + - - - + \infty = \frac{®^2}{8}$

b) Find the Fourier sine transform of the function $f(x) = \frac{e^{ax}}{x}, a > 0$.

**OR**

10. a) Find the half range cosine series for $f(x) = x^2$ in the range $0 \le x \le ®$

b) Find the sine and cosine transform of $f(x) = \begin{cases} \sin x, 0 < x < a \\ 0, x \ge a \end{cases}$

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G231**

II B.Tech. I Semester Supplementary Examinations October 2020

# Switching Theory and Logic Design

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT–I**

1. a) Convert the following numbers as indicated:
   (i) Decimal 225.225 to binary, octal and hexadecimal.
   (ii) Binary 11010111.110 to decimal, octal and hexadecimal. 6M
   b) What is the Gray code? What are the rules to construct Gray code? Develop the 4 bit Gray code for the decimal 0 to 15. 8M

**OR**

2. a) State and prove De-Morgan's Laws. 4M
   b) Draw the symbols and truth tables of all logic gates and explain. 10M

**UNIT–II**

3. a) Prove that OR-AND network is equivalent to NOR-NOR network. 7M
   b) Express the Boolean function $F=A+B^1C$ as a sum of min-terms. 7M

**OR**

4. Realize the following expression using K-map $F=\Pi M(0,1,2,4,5,6,9,11,12,13,14,15)$ and implement the same using NOR logic. 14M

**UNIT–III**

5. Realize the following functions using PLA
   $f_1 (A, B, C) = \sum (0, 2, 4, 5)$ $f_2 (A, B, C) = \sum (1, 5, 6, 7)$ 14M

**OR**

6. For the given 3-input, 4-output truth table of a combinations circuit, tabulate the PAL programming table for the circuit.

| Inputs | | | Output | | | |
|---|---|---|---|---|---|---|
| x | y | z | A | B | C | D |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 |

14M

**UNIT–IV**

7. a) Convert SR flip-flop into JK-flip-flop. 8M
   b) Compare sequential and combinational circuits. 6M

**OR**

8. a) Design a mod-6 asynchronous counter using T-flip flop. 7M
   b) Compare synchronous and asynchronous sequential circuits. 7M

**UNIT–V**

9. a) Explain the capabilities and limitations of finite state machines. 6M
   b) Draw the portion of an ASM chart that specifies the conditional operation to increment register R during state T1 and transfer to state T2, if control inputs z and y are = 1 and 0 respectively. 8M

**OR**

10. a) What are the Moore and Melay machines? Compare them? 7M
    b) What are the salient features of the ASM? 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G233**

II B.Tech. I Semester Supplementary Examinations October 2020

# Electrical Circuits-I

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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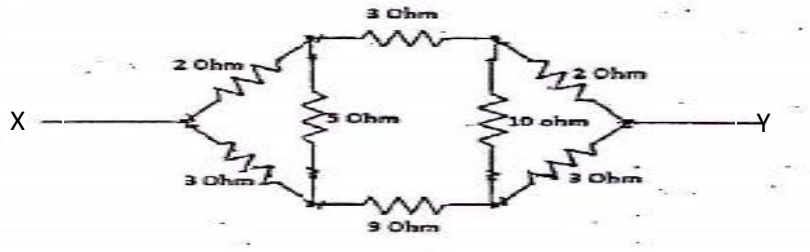
## UNIT–I

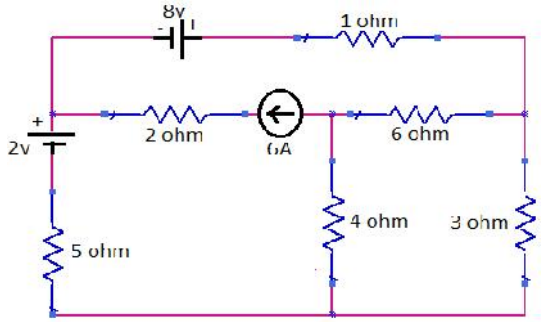
1. a) Discuss the V-I relationships for R,L and C parameters

   b) Determine the resistance between X-Y terminals for the network shown in fig.1

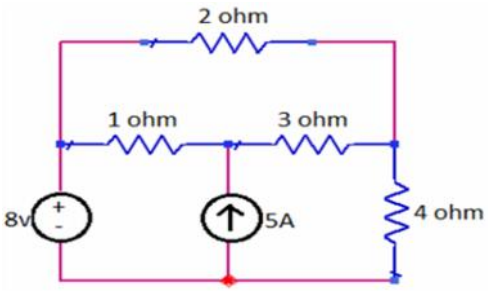



**OR**

2. a) Determine the mesh currents and determine the power delivered by 8V voltage source for the circuit shown in fig



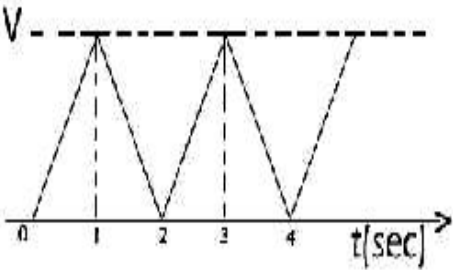

   b) Determine the node voltages and current through each resistor for the circuit shown in fig




## UNIT–II

3. a) Define the terms: i) Instantaneous value ii) Cycle iii)Time period iv) Frequency

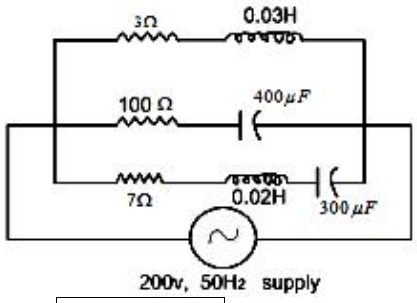
   b) Find R.M.S., Average value and the form factor for the wave shown in fig




**OR**

4. a) Define the terms: i) Resonance ii) Band Width
iii) Resonant Frequency iv) Q-factor

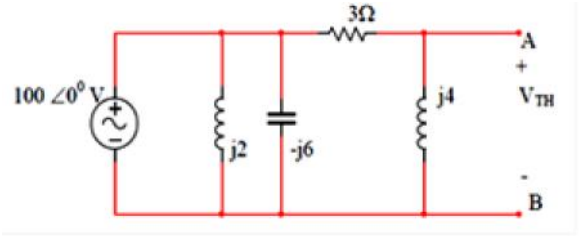
b) Find the current through each branch, total current and draw the vector diagram for the circuit shown in fig




**UNIT–III**

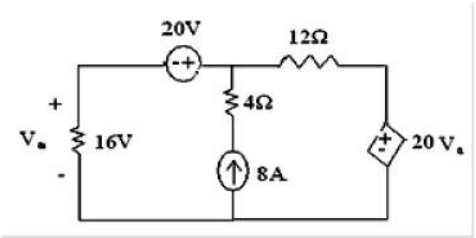
5. a) Derive the condition for maximum power transfer in DC circuits

b) Find the load impedance that draws maximum power and the amount of maximum power drawn for the circuit shown in figure.




**OR**

6. a) Find the voltage drop across16Ω resistor using super position theorem for the circuit shown in figure

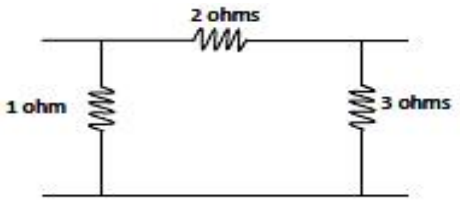



b) State and Explain compensation theorem

**UNIT–IV**

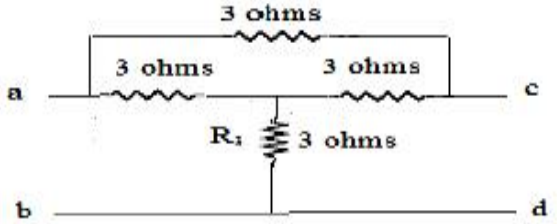
7. a) Obtain the relationship between Z and ABCD parameters.

b) Find the ABCD parameters of the network shown in fig




**OR**

8. a) Obtain the condition for symmetry and reciprocity for h-parameters
b) Find the Y-parameters for the network as shown in fig



**UNIT–V**

9. a) Define the terms:

i) Self inductance ii) Mutual inductance

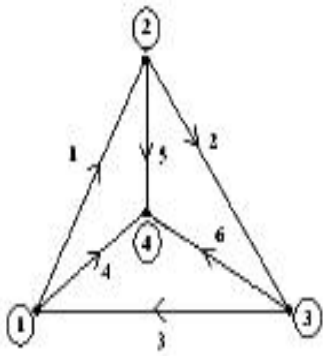
iii) Reluctance iv) Magneto Motive Force

b) Two coupled coils with $L_1$=0.02H, $L_2$=0.01H and k=0.5 are connected in four ways Series Aiding, Series Opposing, Parallel Aiding and Parallel Opposing. What are the four equivalent inductances?

**OR**

10. a) Define the terms: i) Graph ii) Tree iii) Link iv) Twig

b) Determine the Tieset and Cutset matrix for the graph shown in fig

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