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**R-14**

**Code: 4G233**

II B.Tech. I Semester Supplementary Examinations November 2019

# 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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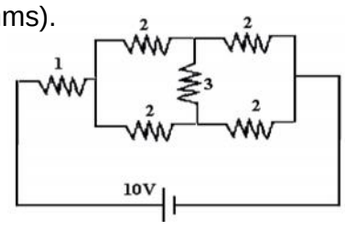
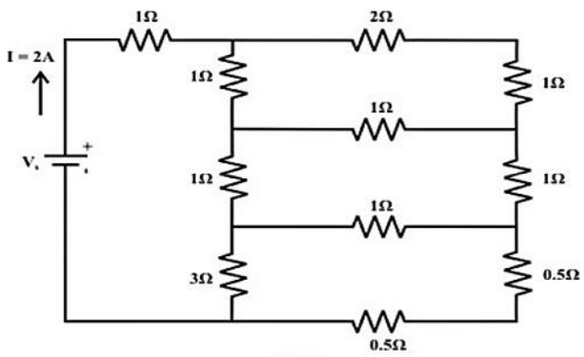
**UNIT–I**

1. a) Find the total power dissipated in the circuit shown in the figure. (All resistances are in ohms).




7M

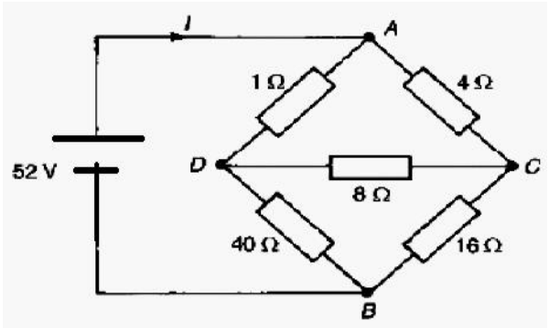
b) Find the value of the voltage source $V_s$ that delivers 2 Amps current through the circuit as shown in figure.




7M

**OR**

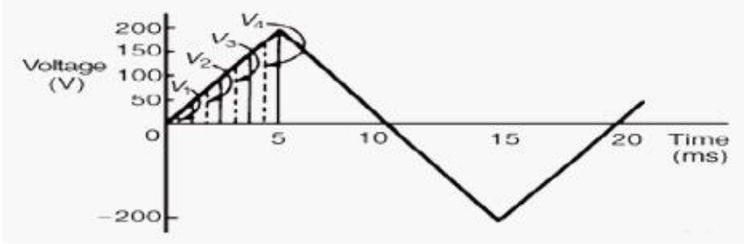
2. For the bridge network shown in figure below by using suitable delta – star transformations, Find The value of the single equivalent resistance that replaces the network between terminals A and B. (i) The current supplied by the 52 V source. (ii) The current flowing in the 8 Ω resistor.




14M

**UNIT–II**

3. For the periodic waveforms shown in figure below, determine: (i) Average value over half cycle. (ii) Frequency. (iii) RMS value. (iv) Form factor. (v) Peak factor




14M

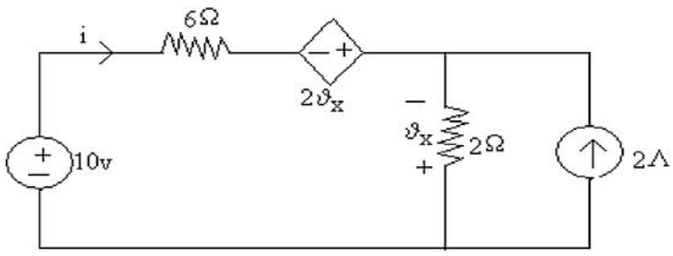
**OR**

4. a) Define the Q - factor and derive an expression showing the relation between Q -factor, Band width and selectivity of frequencies at resonance. 7M

b) Show that for a series RLC circuit $f_r = \sqrt{f_1 f_2}$ f = where $f_r$ resonant frequency and $f_1$ and $f_2$ are half power frequencies. 7M

**UNIT–III**

5. a) Find the current in the 6 ohm resistor shown in circuit diagram, using superposition theorem.

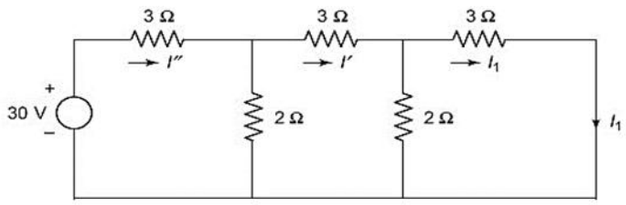



7M

b) State and explain Maximum power transfer theorem with an example. 7M

**OR**

6. a) Verify the reciprocity theorem for the given circuit shown below.

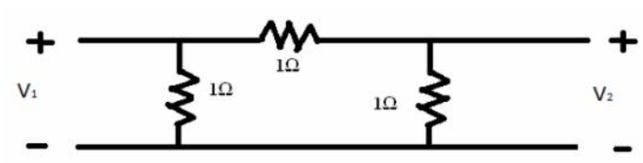



7M

b) Explain Millman's Theorem with a suitable example. 7M

**UNIT–IV**

7. a) Obtain the Y and Z parameters for the two port network shown in below figure.

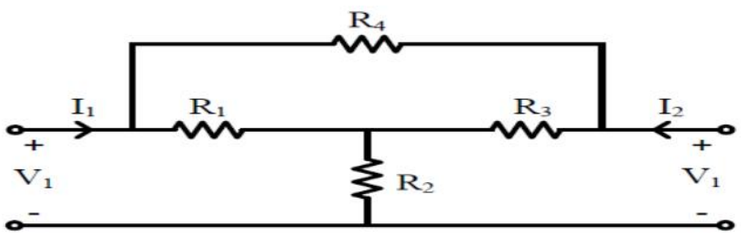



7M

a) Obtain the relation between Hybrid and ABCD parameters. 7M

**OR**

8. Determine the [Z] and [Y] parameters of the following two port network based on two-port interconnection technique.




14M

**UNIT–V**

9. a) Two coils connected in series-aiding fashion have a total inductance of 250mH. When connected in a series-opposing configuration, the coils have a total inductance of 150 mH. If the inductance of one coil is three times the other, find $L_1$, $L_2$ and M. What is the coupling coefficient? 7M

b) Distinguish between self-inductance and mutual inductance. 7M

**OR**

10. a) The two coils are connected in Parallel and they have self-inductance of 40mH and 10mH respectively. The total inductance of the circuit is found to be 50 mH. Determine: (i) The mutual inductance between the two coils. (ii) The coefficient of coupling. 7M

b) Develop an expression for equivalent inductance of two coupled coils connected in parallel with mutual inductance. 7M

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**R-14**

**Code: 4G234**

II B.Tech. I Semester Supplementary Examinations November 2019

# Electromagnetic 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 vector form of Coulombs law? 4M

   b) Derive the expression for Electric Field intensity and potential at a point P which is situated h meter away from the disc along its axis. The disc is charged uniformly with a charge density of $\rho_s$ C/m$^2$. 10M

**OR**

2. a) Prove that E=-▼V? 6M

   b) Derive Maxwell's First equation as applied to the electrostatics using Gauss's law? 8M

**UNIT–II**

3. a) Derive the expression for the energy stored in a parallel plate capacitor 8M

   b) Determine the capacitance of a capacitor consisting of two parallel metal plates of 30 cm X30 cm surface area, separated by 5 mm gap in air. What is the total energy stored by the capacitor if the capacitor if the capacitor is charged with 500 V? What is the energy density? 6M

**OR**

4. a) Derive the expression for torque on a dipole? 7M

   b) Derive Laplace Equation from fundamentals. 7M

**UNIT–III**

5. a) Derive an expression for magnetic field intensity at any point on the axis of a circular current carrying coil? 7M

   b) State and explain Biot-savart's law? 7M

**OR**

6. a) Derive an expression for magnetic field intensity at any point on the axis of a solenoid? 7M

   b) A solenoid has 3000 turns, a length of l=150 cm, a radius of a= 2 cm and carries a current of 100 mA. Find H at (0,0,20) cm and (0,0,150) cm. 7M

**UNIT–IV**

7. a) Derive the expression for Torque on a current loop placed in a magnetic field. 7M

   b) Derive the boundary conditions for magnetic field intensity and flux density. 7M

**OR**

8. a) Derive the expression for energy stored in a magnetic field. 7M

   b) Derive the self-inductance of a solenoid 7M

**UNIT–V**

9. a) State and explain Faradays laws of electromagnetic induction. 7M

   b) A circular loop of 10 cm radius is located in the x-y plane in a field given by $\overline{B}$ =0.5cos377t(3$a_y$+4$a_z$) Tesla. Find the emf induced in the loop. 7M

**OR**

10. a) Explain the modifications of Maxwell's equations for time varying electric and magnetic fields? 7M

    b) Find the displacement current within a parallel plate capacitor where $\varepsilon=100\varepsilon_o$, A=0.1m$^2$,d=0.05mm and the capacitor voltage is 100 sin2000π t volts. 7M

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

**Code: 5G539**

II B.Tech. I Semester Supplementary Examinations November 2019

# 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) Write briefly about different types of Pressure measuring devices 7M

   b) A fan delivers 4 $m^3$ of air per second at $20^0$C and 1.25 bar. Assuming molecular weight of air as 28.97, calculate the mass of air delivered. Also determine the density, specific volume and specific weight of the air being delivered. 7M

**OR**

2. a) What is the difference between U-tube differential manometer and inverted U-tube differential manometer? Where are they used? 7M

   b) Shaft 80 mm in diameter is being pushed through a bearing sleeve 80.20mm in diameter and 300 mm long, The clearance is filled with oil having a kinematic viscosity of 0.005 $m^2/s$ and specific gravity 0.90. If the shaft moves axially at 0.50m/s. find the resistance offered by the oil on the shaft. 7M

## UNIT–II

3. a) A venturimeter of 150 mm × 75 mm size is used to measure the flow rate of oil having specific gravity of 0.9. The reading shown by the U tube manometer connected to the venturimeter is 150 mm of mercury column. Calculate the coefficient of discharge for the venturimeter if the flow rate is 1.7 $m^3$/min. (Note : The size of venturimeter generally specified in terms of inlet and throat diameters) 7M

   b) Derive friction factor for the flow through the circular pipe by Darcy Weisbach equation? 7M

**OR**

4. a) Two pipes one of 10cm diameter, 200 m long and another 15cm diameter, 400 m long are connected in parallel. The friction factors are 0.0075 for the smaller pipe and 0.006 for the large pipe. The total discharge through the system is 50 lit/sec. Find the discharge and head loss in each pipe. Neglect minor losses. Calculate the equivalent length of a 20 cm diameter having f=0.005 7M

   b) State the momentum equation and mention some of its engineering applications 7M

## UNIT–III

5. a) A jet 200 mm diameter moving at a velocity of 20 metres per second impinges normally on a series of flat vanes mounted over a wheel. If the velocity of the vanes is 8 metres per second, find (i) the force exerted by the jet on the wheel,(ii) the work done by the jet on the wheel per second, and (iii) the hydraulic efficiency 7M

   b) Derive an expression for the force exerted by a jet striking the curved plate at one end tangentially when the plate is symmetrical. 7M

**OR**

6. a) Explain hydroelectric power plant working principle with neat sketch. 7M

   b) Discuss various type of Draft tubes with neat sketch. 7M

**UNIT–IV**

7. a) A Kaplan turbine works under a head of 60m at a speed of 145rpm utilizing 175 $m^3/s$ of water. Diameter of runner and hub are 5.60m & 3.20m. Turbine develops 82500 kW. Find i) flow ratio ii) speed ratio iii) overall efficiency iv) specific speed. 7M

   b) Explain what is meant by unit quantities in turbines. Derive expressions for unit speed, unit discharge and unit power of a turbine. 7M

**OR**

8. a) What is the importance of a draft tube in a Francis turbine? Discuss different types of draft tubes. 7M

   b) A turbine is to operate under a head of 25 meters at 200 rpm. The discharge is 9 $m^3/sec$. If the turbine efficiency is 90% determine: (i) specific speed of the turbine (ii) power generated (iii) performance under a head of 20 meters. Also state the type of the turbine. 7M

**UNIT–V**

9. a) List out necessary precautions against cavitation in centrifugal pumps. 7M

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

**OR**

10. a) Draw and discuss characteristic curves of a pump. 7M

    b) A double acting reciprocating pump having piston area 0.1m has a stroke of 0.30m long. The pump is discharging 2.4 $m^3$ of water per minute at 45 rpm through a height of 10 m. Find the slip of the pump and power required to drive the pump. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-14**

**Code: 4G231**

II B.Tech. I Semester Supplementary Examinations November 2019

# 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:
   i. $(4567)_8$ to base 10.
   ii. $(11001101.0101)_2$ to base 8 and base 4.
   iii. $(53.1575)_{10}$ to base 2. 8M

   b) i. Explain error detection codes. What is the drawback of error detection codes?
   ii. Construct even parity 7 bit hamming code for the message 0100. 6M

**OR**

2. a) State duality theorem. List Boolean laws and their duals. 6M

   b) Simplify the following Boolean functions to minimum number of literals.
   i. F = ABC + ABC' + A'B.
   ii. F = (A+B)' (A'+B'). 8M

## UNIT–II

3. a) Define prime implicant and essential prime implicant with example using K-map. 7M

   b) Find all the prime implicants for the following Boolean function using K-map and determine which are essential?
   F(A,B,C,D) = Σ(1,3,4,5,9,10,11,12,13,14,15) 7M

**OR**

4. a) Simplify the following Boolean expressions using K-map and implement them using NOR gates:
   i. F (A, B, C, D) = AB'C' + AC + A'CD'.
   ii. F (W, X, Y, Z) = W'X'Y'Z' + WXY'Z' + W'X'YZ + WXYZ. 8M

   b) Simplify the following Boolean function for minimal SOP form using K-map and implement using NAND gates.
   F(W,X,Y,Z) = Σ(1,3,7,11,15) + d(0,2,5). 6M

## UNIT–III

5. a) Implement full adder using decoder and OR gates. 7M

   b) Design a combinational circuit that accepts a three-bit binary number and generates an output binary number equal to the twice the input number 7M

**OR**

6. a) Explain the general combinational PLD configuration with suitable block diagram. 7M

   b) Give the logic implementation of a 32 x 4 bit & 8 x 4 bit ROM using suitable decoder 7M

**UNIT–IV**

7. a) Design a mod-6 synchronous counter using T-flip flop. 7M

   b) Draw the circuit of a negative edge triggered JK Flip-Flop with active high. Explain its operation with the help of truth table. 7M

**OR**

8. a) Design a sequential circuit with two D-Flip-Flops A and B and one input x. When x=0, the state of the circuit remains the same. When x=1, the circuit goes through the state transitions from 00 to 01 to 11 to 10 back to 00 and repeats. 6M

   b) Design Mod-12 synchronous counter using J-K flip –flops 8M

**UNIT–V**

9. a) Discuss mealy and Moore machine models of sequential machines. 7M

   b) Explain the minimization procedure for determining the set of equivalent state of a specified machine M. 7M

**OR**

10. a) Explain the salient features of the ASM chart. 10M

    b) Draw an ASM chart and state diagram for the synchronous circuit having the following description:" The circuit has a control input 'x', clock and outputs A and B. If x = 1, on every clock edge (rising of falling) the code on BA changes from 00 $\rightarrow$ 01 $\rightarrow$ 10 $\rightarrow$ 11 $\rightarrow$ 00 and repeats. If x = 0, the circuit holds the present state". 4M

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