Hall Ticket Number :										

R-15

Code: 5G233

II B.Tech. I Semester Supplementary Examinations May 2018

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. Simplify the circuit of fig 1 into one voltage source in series with a resistor and find the current in 10 ohms resistor using source transformation technique.

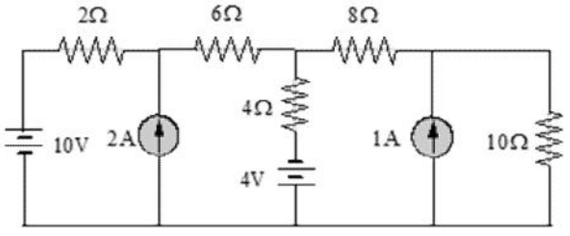

Fig 1

14M

OR

2. Determine the current through 3 ohms resistor in fig 2 using node voltage analysis.

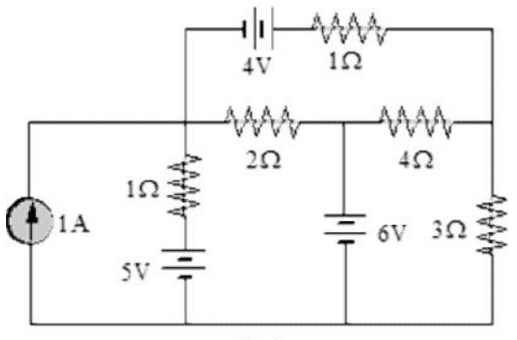

Fig 2

14M

UNIT–II

3. a) Explain the advantages of AC supply 7M

b) A series circuit consisting of a resistor of 10 ohms and an inductance of 100mH is connected across a 200V, 50Hz, single phase ac supply. Determine the current drawn, real power and reactive power. 7M

OR

4. a) A resistance of 15 ohms is connected in series with an inductance of 200mH and a capacitance of 100μF. Determine the resonant frequency and bandwidth. 7M

b) Define bandwidth and Q factor of a resonant circuit. Derive the expressions for bandwidth and Q factor for a series resonant circuit. 7M

UNIT–III

5. State and explain Superposition theorem with an example 14M

OR

6. In the circuit of fig 3, find the power consumed by 5 ohms resistor using Thevenin's theorem.

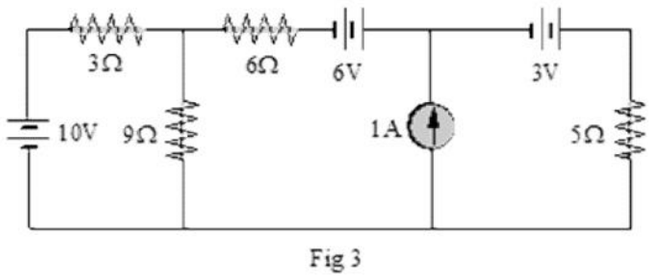

Fig 3

14M

UNIT–IV

7. a) Define ABCD parameters of a 2 port network 7M

b) Derive the relations between Z and hybrid parameters 7M

OR

8. Two, 2 port networks are connected in cascade. The Z parameters of the networks are defined by:

Network 1: $V_1 = 8\ I_1 + 3\ I_2$ and $V_2 = 4\ I_1 + 7\ I_2$

Network 2: $V_1 = 2\ I_1 + I_2$ and $V_2 = I_1 + 2\ I_2$

Determine the ABCD parameters of the overall network 14M

UNIT–V

9. A magnetic ring comprises of 3 parts:

Part 1: 20 cm length, 30cm^2 cross sectional area, relative permeability = 1000

Part 2: 40 cm length, square cross section of 4 cm side, relative permeability = 1200

Part 3: Air gap of 2 mm length, 23 cm^2 cross sectional area

A coil of 800 turns is wound uniformly on the ring. Determine the current required to produce a flux of 2 mWb in the airgap. 14M

OR

10. a) Define cut-set. Explain the procedure of obtaining the cut-set matrix 7M

b) Construct the dual network of the circuit shown in fig 4

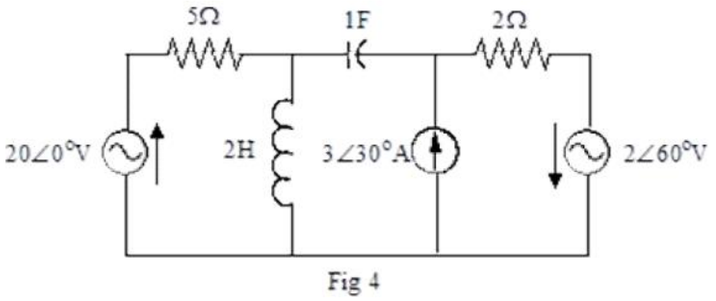

Fig 4 7M

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Hall Ticket Number :										

R-15

Code: 5G234

II B.Tech. I Semester Supplementary Examinations May 2018

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) Define electric flux density? Derive the relation between electric flux density and electric field intensity? 7M

   b) Calculate the electric field intensity in rectangular coordinates at point P(2,-3,6) produced by (i) point charge of 55nC at Q(-2,3,-6) (ii) uniform line charge of 20mC/m^2 on x-axis 7M

OR

2. State and explain procedure for applying Gauss law. 5M

   Deduce the expressions for electric field intensity due to point charge, line charge and surface charges applying Gauss law. 9M

UNIT–II

3. a) Prove that when a dipole is placed in a uniform electric field it tends to align to the direction of field. 7M

   d) Two dipoles with dipole moments $-5\hat{k}$ nCm and $9\hat{k}$ nCm are located at points (0,0,-2) and (0,0,3) respectively. Find the potential at origin. $\hat{k}$ is the unit vector along z-axis. 7M

OR

4. a) Find the capacitance of a spherical capacitor 7M

   b) Find the potential at P(1,2,3) for the field of two radial conducting planes v=50V at $\phi=10^0$ and v=20V at $\phi=30^0$. 7M

UNIT–III

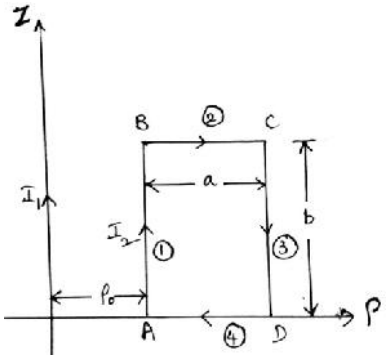
5. Deduce the expression for magnetic field intensity at a point due to a square shaped current carrying wire. 14M

OR

6. Apply Ampere's law to find magnetic field intensity at different possible regions due to an infinite current carrying co-axial transmission line. 14M

UNIT–IV

7. A rectangular loop carrying current I_2 is placed parallel to an infinitely long filamentary wire carrying current I_1 as shown in figure. Show that force experienced by the loop is $\vec{F} = \frac{-\mu_0 I_1 I_2 b}{2\pi}\left[\frac{1}{\rho_0} - \frac{1}{\rho_0+a}\right]\vec{u}_\rho$, u_ρ is the unit vector along ρ-axis.



14M

OR

8. a) Derive the expression for self inductance of a toroid. 5M

   b) A very long solenoid with 2x2 cm^2 cross section has an iron core (μ_r=1000) and 4000 turns/meter. If it carries a current of 500mA, find (i) its self inductance per meter (ii) the energy per meter stored in its field. 9M

UNIT–V

9. a) Briefly describe dynamically induced emf with necessary expressions 6M

   b) State the laws from which Maxwell's I, II, III and IV laws are derived and express them in both differential and integral form. 8M

OR

10. a) A stationary 10 turn square coil of 1m side is situated with its lower left corner coincident with the origin and with sides x_1 and y_1 along x and y axes respectively. If magnetic field B is normal to the plane of the coil and has its amplitude given by $B_o = \sin\left(\frac{\pi x}{x1}\right)\sin\left(\frac{\pi y}{y1}\right)$ tesla, determine the rms value of emf induced in the coil if B varies harmonically at a frequency of 1kHz. 14M

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Hall Ticket Number :										

R-15

Code: 5G232

II B.Tech. I Semester Supplementary Examinations May 2018

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. a) Explain why equalizer connections are used in lap windings and dummy coils are sometimes used in wave winding? 6M

   b) Define pole pitch, front pitch, back pitch, resultant pitch, commutator pitch and illustrate them with the help of neat sketches? 8M

OR

2. a) Elucidate the principle of energy conversion of electromechanical system? 7M

   b) Write energy balance equation in electromechanical energy conversion devices? 7M

UNIT–II

3. a) Derive an equation for EMF in a DC machine? 7M

   b) An 8-pole dc shunt generator which has 778 wave-connected armature conductors runs at 500rpm, supplies a load of 12.5Ω resistance at a terminal voltage of 250V. The armature resistance is 0.24Ω and field resistance is 250Ω. Calculate the Armature current, Induced EMF and the flux per pole. 7M

OR

4. a) Explain the reactance voltage in case of a DC machine? 6M

   b) A 4-pole wave wound dc machine has an armature of 25cm diameter and runs at 1200 rpm. If armature current is 160A, thickness of brush is 12mm and the self-inductance of each armature coil is 0.14mH, calculate the average emf induced in each coil during commutation. 8M

UNIT–III

5. a) "External characteristics are more drooping in nature for a shunt machine compared to DC separately excited machine" Justify 8M

   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? 6M

OR

6. a) State four reasons for operating dc generators in parallel? 5M

   b) Explain the working principle of equalizer bar in parallel operation of dc series generators? 9M

UNIT–IV

7. a) Explain the significance of back emf in a DC motor? 6M

   b) Explain the working principle of a starter suitable for high speed control of a dc shunt motor with neat sketch 8M

OR

8. a) Sketch the torque vs current characteristics of dc shunt and dc series motor with relevant torque equation? 8M

   b) List the applications of dc shunt, dc series and dc compound motors? 6M

UNIT–V

9. a) Examine the back to back test in detail with advantages and disadvantages? 8M

   b) Hopkinson's test on two shunt machines gave the following results for full loads line voltage 250V, line current excluding field currents 50A, motor armature current 380A, field currents of generator and motor are 5A and 4.2A. Calculate the efficiency of each machine. Armature resistance of each machine is 0.02 ohm 6M

OR

10. a) Explain the procedure to find the stray losses of dc shunt machine. 8M

    b) List the advantages of Indirect test over Direct test? 6M

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Hall Ticket Number :										

R-15

Code: 5G539

II B.Tech. I Semester Supplementary Examinations May 2018

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) Explain the properties of fluids? 3 liter petrol weighs 21N. calculate (i) specific weight (ii) density (iii) specific volume and (iv) specific gravity. 7M

   b) A U-tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having a specific gravity 1.594 under a pressure of 11.772 N/ cm^2 and Pipe B contains oil of specific gravity 0.9 under a pressure of 12 N/cm^2. The pipe a lies 2.5m above pipe B. Find the difference of pressure measured by mercury as fluid filling U-tube. 7M

OR

2. a) Will you state pascal's law in your own words? What is the pressure, in meters of oil (Sp.gr. 0.8), equivalent to 80 m of water? 4M

   b) A blower delivers 8 m^3 air per sec at 27^0 C and one atmospheric pressure (1 bar). Find mass of the air delivered if molecular weight of the air is 30. Also find (i) density (ii) specific volume and (iii) specific weight of the air being supplied. 10M

UNIT–II

3. a) Develop the Euler's equation of motion and then derive Bernoulli's equation. List all some practical applications 7M

   b) Water flows in a circular pipe. At one section, the diameter is 0.3 m, the static pressure is 260 Kpa gauge, the velocity is 3m/s and the elevation is 10 m above ground level. The elevation at a section downstream is 0 m, and the pipe diameter is 0.15 m. Find the gauge pressure at the downstream section. Frictional effects may be neglected. Assume density of water to be 999 kg/m^3 7M

OR

4. a) Can you illustrate hydraulic gradient and total energy line? 4M

   b) Derive Darcy-Weisbach formula for calculating loss of head due to friction in a pipe. Water flows through a pipe of diameter 300mm with a velocity of 5m/s. If the co-efficient of friction is given by $f = 0.015 + \frac{0.08}{\mathrm{Re}^{0.3}}$ where Re is the Reynolds number, estimate the head lost due to friction for a length of 10m. Take kinematic viscosity of water as 0.01 stoke. 10M

UNIT–III

5. a) Show that the efficiency of a free jet striking normally as series of flat plates mounted on the periphery of a wheel never exceeds 50% 7M

   b) A jet of water of diameter 60 mm moving with a velocity of 40 m/s, strikes a curved fixed plate tangentially at one end at an angle of 30^0 to horizontal. The jet leaves the plate at an angle of 20^0 to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical directions. 7M

OR

6. a) Explain pumped storage plants and storage requirements? 7M

   b) How do you estimate power developed from a given catchment area? 7M

UNIT–IV

7. a) An inward flow reaction turbine operating under 30 m head, develops 4000 KW while running at 300 rpm. The overall efficiency of the turbine is 0.85; the hydraulic efficiency is 0.9; and the radial velocity of flow at inlet is 7 m/s; the inlet guide vane angle at full gate opening is 30^0. Calculate the diameter and width of the runner at inlet. Blade thickness coefficient is 5 %. 10M

   b) How do you classify hydraulic turbines? 4M

OR

8. a) Explain cavitation, surge tank and water hammer? 7M

   b) Performance characteristics of different turbines? Show that when runner blade angle at inlet of a Francis turbine is 90^0 and the velocity of flow is constant, the hydraulic efficiency is given by $2/(2+\tan^2 \alpha)$, Where α is the vane angle. 7M

UNIT–V

9. a) Derive an expression for the work done by the impeller of a centrifugal pump on liquid per second per unit weight of lquid. Explain briefly manometric and volumetric efficiencies of a centrifugal pump 7M

   b) Explain the working principle of a single stage centrifugal pump with a neat sketch. 7M

OR

10. a) Explain briefly manometric and volumetric efficiencies of a centrifugal pump 7M

    b) Describe working principle of reciprocating pump and enumerate its applications? 7M

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Hall Ticket Number :										

R-15

Code: 5GC32

II B.Tech. I Semester Supplementary Examinations May 2018

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) Find the rank of a matrix A by reducing it into Echelon form where

$$A=\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$ 7M

b) Solve $x+y+z=9,\quad 2x-3y+4z=13,\quad 3x+4y+5z=40$ by Gauss elimination method. 7M

OR

2. a) Find the Eigen values and the corresponding Eigen vectors of the matrix

$$A=\begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}.$$ 7M

b) Verify Caley-Hamilton theorem for the matrix $A=\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$ and find its inverse. 7M

UNIT–II

3. a) Find the real root of the equation $x\log_{10} x=1.2$ by Regula-falsi method correct to four decimal places. 7M

b) Apply Runge-Kutta method to find an approximate value of y for $x=0.2$ in steps of 0.1 if $\frac{dy}{dx}=x+y^2$, given that $y=1$, where $x=0$. 7M

OR

4. a) Find the positive root of the equation $x^4-x=10$ by Newton-Raphson method correct to four decimal places. 7M

b) Using Euler's method, find an approximate value of $y(1)$ when $\frac{dy}{dx}=x^2+y^2$ and $y(0)=1$ in five steps (i.e. $h=0.2$). 7M

UNIT–III

5. a) Find the cubic polynomial which takes the following values:

x	0	1	2	3
$f(x)$	1	2	1	10

Hence evaluate $f(4)$. 7M

b) Use Trapezoidal rule and Simpson's $(1/3)rd$ to estimate $\int_0^6 \frac{dx}{(1+x^2)}$. 7M

OR

6. a) Estimate the value of $f(x)$ for $x = 2.5$ from the following table:

x	1	2	3	4
$f(x)$	1	8	27	64

Using Lagrange's interpolation formula. 7M

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

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

7M

UNIT–IV

7. a) Fit a second degree parabola to the following data by the method of least squares:

x	10	12	15	23	20
y	14	17	23	25	21

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

$(i) z = ax + by + a^2 + b^2$ and $(ii) z = f(x + ay) + g(x - ay)$ 7M

OR

8. a) Fit a curve $y = ae^{bx}$ to the following data by the method of least squares:

x	0	1	2	3
y	1.05	2.10	3.85	8.30

7M

b) Solve $z^2 = pqxy$ by the Charpit's method.

UNIT–V

9. a) Obtain Fourier series for the function $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$. Hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots\cdots = \frac{\pi^2}{8}$ 7M

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

Hence evaluate $\int_0^\infty \left(\frac{\sin x - x\cos x}{x^3} \right) dx$. 7M

OR

10. a) Obtain the half-range Cosine series for the function $f(x) = \begin{cases} kx, & 0 \le x \le l/2 \\ k(l-x), & l/2 \le x \le l \end{cases}$. 7M

b) Solve the integral equation $\int_0^\infty f(\lambda)\cos(\alpha\lambda)\,d\lambda = \begin{cases} 1-\alpha, & 0 \le \alpha \le 1 \\ 0, & \alpha > 1 \end{cases}$. Hence evaluate $\int_0^\infty \left(\frac{\sin^2 t}{t^2} \right) dt$. 7M

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Hall Ticket Number :										

Code: 5G231

R-15

II B.Tech. I Semester Supplementary Examinations May 2018

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)

*****

UNIT-I

1. a) i. Find the value of x in the number $(786.983)_{10} = (x)_8$.
   ii. Convert the binary number 11001.001011 to decimal.

   b) State
   i. Idempotent Law
   ii. Involution Law
   iii. Absorption Law

OR

2. a) i. Convert $(4057.06)_8$ to binary
   ii. Perform subtraction using 10's complements : 597-239.

   b) What is self complementary code ? Give Examples.

   c) What is the Hamming code? How is the Hamming code word tested and corrected?

UNIT-II

3. a) Realize EX-OR gate using NAND gates.

   b) Simplify the logic expression Y= Π M (0,1,2,3,4,7) using K-map and realize using basic gates

OR

4. a) Using the Quine-McCluskey method of tabular reduction minimize the given function f(A,B,C,D) = Σ m(0,1,5,7,8,10,14,15). and realize using basic gates.

   b) What are primeimplicants and essential primeimplicants ? Explain

UNIT-III

5. a) Design a combinational circuit using PAL for the following function
   y(A,B,C,D).= Σ (0,2,3,4,5,6,7,8,10,11,15)

   b) Draw the circuit diagram of master-Slave JK Flip-Flop and explain operation with help of Truth-Table.

OR

6. a) Implement the following multiple output functions using PROM
   $F_1 = \sum m$ (0, 1, 4, 7, 12, 14, 15) $F_2 = \sum m$ (1, 3, 6, 9, 12) $F_3 = \sum m$ (2, 3, 7, 8, 10)
   $F_4 = \sum m$ (1, 3, 5)

   b) Draw the circuit diagram of a J-K flip flop and explain its operation.

UNIT-IV

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

   b) Implement a 4x16 decoder using 2x4 decoders.

OR

8. a) Convert JK Flip-Flop into SR Flip-Flop.

   b) Design a mod-10 Asynchronous counter using T-flip-flops.

UNIT-V

9. a) Draw the ASM chart for the following state transitions, start from the initial state T1, then if XY = 00 go to T2, if XY = 01 go to T3, if XY = 10 go to T1, otherwise go to T3.

   b) Explain the capabilities and Limitations of Finite state machine.

OR

10. a) Compare Mealy model and Moore model.

    b) For the state table of the machine given below find the equivalent partition and a corresponding reduced machine in standard form.

PS	NS/Z	
	X=0	x=1
A	D/0	H/1
B	F/1	C/1
C	D/0	F/1
D	C/0	E/1
E	C/1	D/1
F	D/1	D/1

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