Code : 1G233

R-13

II B.Tech. I Semester Regular Examinations Nov/Dec 2014

Electrical Circuits-I

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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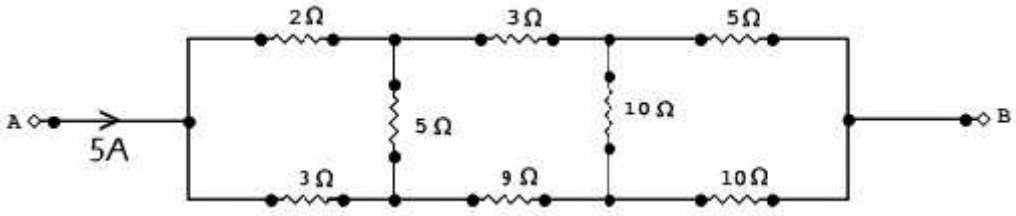
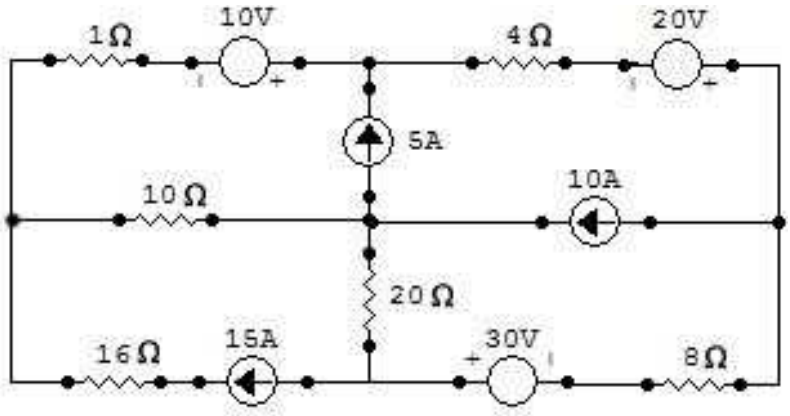
1. a) State the voltage current relationships for i) Inductance ii) capacitance 7M

   b) Find the voltage to be applied across AB in order to drive a current of 5A into the circuit by using star-delta transformation



7M

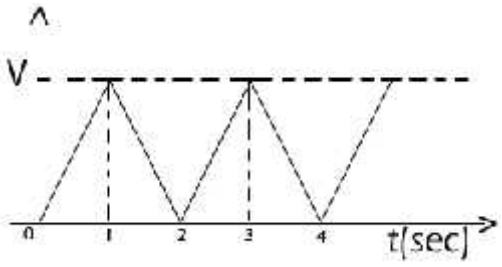
2. Determine loop currents for the circuit shown below.



14M

3. a) Define Time period, Form factor. 4M

   b) Find the RMS and average value for the following waveform.



10M

4. a) Show the current lags voltage in RL series circuit. 7M

   b) Give expression for frequency and current at resonance in series resonance circuit. 7M

5. a) Write advantage of 3-phase system over single phase system 6M

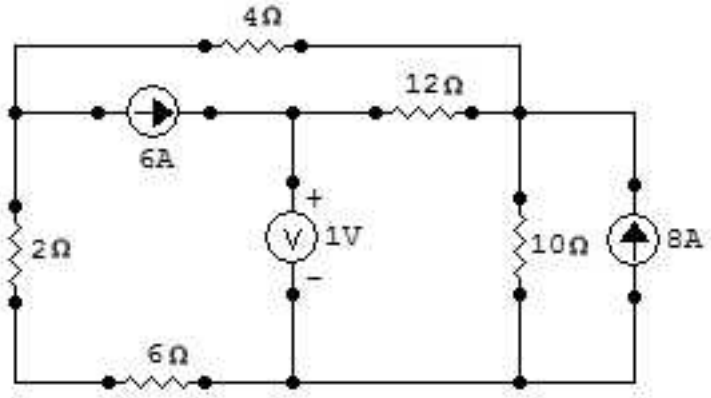
   b) Derive the expressions between phase and line voltages, phase and line currents for balanced 3 phase star connected loads. 8M

6. a) Bring out an analogy between magnetic circuits and electric circuits. 6M

   b) Derive expression for mutual inductance in terms of flux and current. 8M

7. a) State and explain maximum power transfer theorem. 6M

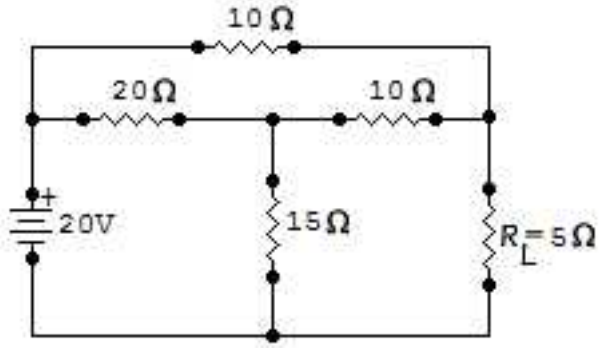
   b) Find current through 2Ω resistor using thevenin's theorem.



8M

8. a) State and explain Telligan theorem. 6M

   b) Calculate change in current of network given below using compensation theorem when load resistor changes to 10Ω.



8M

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R-13

Code : 1G234

II B.Tech. I Semester Regular Examinations Nov/Dec 2014

Electromagnetic Fields

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) State and prove Gauss Law as applied to Electric Fields. 6M

   b) Three equal positive charges 0.4μc each are located at the corners of a square side 40cm. Determine the magnitude and direction of electric field intensity at the vacant corner. 8M

2. a) What is a Dipole Moment? Derive the expression for potential and electric field intensity at any point in free space due to a dipole. 8M

   b) Given the filed $\mathbf{E} = 40\,xy\,\mathbf{a_x} + 20x^2\mathbf{a_y} + 2\mathbf{a_z}$ Volt/m, Calculate the potential between the two points P (1, -1, 0) and Q (2, 1, 3). 6M

3. a) Derive the boundary conditions for **E** and **D** at the boundary between two dielectrics. 8M

   b) Find the current passing through the downward direction in the cylinder defined by $0 \le z \le 1$, $0 \le r \le 1$ if the current density in the cylinder is $\mathbf{J} = 35\,e^{-2z}\,[r\,\mathbf{a_r} + \mathbf{a_z}]$ A/m^2. 6M

4. a) Find **H** on the axis of a circular loop of radius 'R' at a distance 'd' from the centre carrying a current of I amps in the counter clockwise direction. Specialize the result to the centre of the loop. 8M

   b) Calculate the flux density at the centre of a square loop of carrying 5A current if the side of the square is 2m. 6M

5. a) What is Ampere's Circuital law? Explain how ampere's circuital law can be used to obtain the magnetic field intensity due to an infinite sheet of current. 8M

   b) A current distribution gives rise to the vector magnetic potential $\mathbf{A} = x^2y\,\mathbf{a_x} + y^2x\,\mathbf{a_y} - 4xyz\,\mathbf{a_z}$ wb/m. Calculate **B** at (-1, 2, 5). 6M

6. a) Derive Lorentz Force Equation for a current carrying conductor placed in a magnetic field. 6M

   b) Two long straight parallel wires in air 2m apart carry currents I_1 and I_2 in the same direction. The field intensity H at mid way is 7.5 AT/m. If the force on each wire per unit length is 2.5×10^{-4} N. Determine the values of I_1 and I_2. 8M

7. a) Discuss the similarities and differences between electric and magnetic circuits and identify similar quantities in both. 6M

   b) Two coils are wound on a common circular magnetic circuit of 45 cm^2 in section and having mean radius of 50cm. One coil has 180 turns and other has 750 turns. Calculate the mutual inductance of coils if the relative permeability of iron path is 2400. If both the coils are connected in series, what would be the self inductance of coil? 8M

8. a) State and Explain Faraday's law of Electromagnetic Induction and Derive the point form of Faraday's Law in integral form. 8M

   b) Moist soil has a conductivity of 10^{-3} Siemens/m and $\varepsilon_r = 2.5$. Find Jc and J_D where $\mathbf{E} = 6 \times 10^{-6} \sin 9 \times 10^9\,t$ v/m. 6M

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Code : 1G232

R-13

II B.Tech. I Semester Regular Examinations Nov/Dec 2014

Electrical Machines-I

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Explain the principle of energy conversion of electromechanical system. 7M
   b) Derive the expression for the magnetic force developed in linear magnetic system 7M
2. a) Explain the construction of a DC machine with neat sketch & explain the function of each part in detail. 8M
   b) An 8-pole lap wound armature rotated at 2400 r.p.5 is required to generate 260 V. The useful flux per pole is about 0.0.5 Wb. If the armature has 120 slots, calculate a suitable number of conductors per slot and hence determine the actual value of flux required to generate the same voltage. 6M
3. a) Explain the voltage build up process in separately excited generator & also state the causes why self excited generator fails to develop the voltage? 8M
   b) A D.C shunt generator has the following open circuit magnetization curve running at 800 r.p.m.

Filed Current in (A)	0	0.5	1.0	2.0	3.0	4.0	5.0
E.M.F. (V)	10	50	100	175	220	245	262

   Find graphically the critical resistance of shunt field current & residual voltage. If the field resistance is changed to 75 ohms, what will be the critical speed for the machine to build up? 6M
4. a) Explain any two methods of improving the commutation 7M
   b) An 8 pole generator has an output of 200A at 500V; the lap connected arm has 1280 conductors, 160 commutator segments. If the brushes are advanced by 4 segments from the no load neutral axis, estimate the armature demagnetizing and cross-magnetizing ampere turns/pole. 7M
5. a) Explain the advantages & disadvantages with the parallel operation of DC generators. 4M
   b) Two D.C shunt generators with E.M.F's of 120 V and 115 V, armature resistance of 0.05 ohms 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? 10M
6. a) Explain the working principle of DC motor. 7M
   b) A 250V DC shunt motor on no load runs at 1000 r.p.m and takes a current of 5A. The armature & field resistances are 0.25Ω & 250Ω respectively. Calculate the speed of a motor when it takes a current of 41A. the armature reaction weakens the flux by 4% 7M
7. Explain the various method of speed control used for D.C. shunt motor. Discuss their merits & demerits 14M
8. a) Explain the indirect method of testing the DC machine. 6M
   b) When running on no-load, a 400-V shunt motor takes a current of 5A. armature resistance is 0.5 Ω & filed resistance is 200 Ω. Find the output of a motor & efficiency when running on full load & taking a current of 50 A. also find the % change in speed from no load to full load. 8M

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Code : 1GC32

R-13

II B.Tech. I Semester Regular Examinations Nov/Dec 2014

Engineering Mathematics

(Common to EEE & ECE)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) For what values of k, the equations x + y + z = 1, 4x + y + 10z = k^2, 2x + y + 4z = k are consistent and solve them completely. 7M

   b) Find the Eigen values and Eigen vectors of A^{-1} where $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. 7M

2. a) Find the real root of the equation x + tan x – 1 = 0 by using Regula-False method correct to three decimal places. 7M

   b) Find y(1.2) by Fourth order Runge Kutta method, given that $\frac{dy}{dx} = 2 + \sqrt{xy}$ with y(1) = 1. 7M

3. a) Fit an exponential curve of the form $y(x) = ae^{-bx}$ to the following data.

x	1	2	3	4	5
y	2.6	3.3	4.2	5.4	6.9

   7M

   b) A computer operator while calculating the coefficient between two variates *x* and *y* for 25 pairs of observations obtained the following constants :

   $n = 25, \sum x = 125, \sum x^2 = 650, \sum y = 100, \sum y^2 = 460, \sum xy = 508$

   It was however later discovered at the time of checking that he had copied down two pairs as (6, 14) and (8, 6) while the correct pairs were (8, 12) and (6, 8).Obtain the correct value of the correlation coefficient. 7M

4. a) Form the partial differential equation by eliminating the arbitrary functions from $z = f_1(y + 2x) + f_2(y - 3x)$. 7M

   b) Using the method of separation of variables, solve $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ if $u(x, 0) = 4x - \frac{1}{2}x^2$ 7M

5. a) Obtain the Fourier series to represent the function $f(x) = \frac{1}{4}(\pi - x)^2$; $0 < x < 2\pi$ 7M

   b) Develop $f(x) = \sin\left(\frac{\pi x}{L}\right)$ in a half-range cosine series in $0 < x < L$ 7M

6. a) Find the Fourier transform of $f(x) = \begin{cases} 1 & for\ |x| < 1 \\ 0 & for\ |x| > 1 \end{cases}$ hence evaluate $\int_0^\infty \frac{\sin x}{x}\,dx$ 7M

   b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $(a > 0)$ 7M

7. a) If X and Y are two discrete random variables, then prove that $E(X + Y) = E(X) + E(Y)$, provided $E(X)$ and $E(Y)$ exist. 7M

   b) For the following probability distribution

x	-3	6	9
p(x)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

   Find i) E(X) ii) $E(X^2)$ iii) $E[(2X + 1)^2]$ 7M

8. a) The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$ respectively. Find $P(X \geq 2)$. 7M

   b) Find the mean and standard deviation of a normal distribution in which 31% of items are under 45 and 8% are over 64. 7M

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Code : 1G536

R-13

II B.Tech. I Semester Regular Examinations Nov/Dec 2014

Fluid Mechanics & Hydraulic Mahines

(Electrical and Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) State the Newton's Law of viscosity and give examples of its application.

   b) Two large fixed parallel planes are 12mm apart. The space between the surfaces is filled with an oil of viscosity 0.9 N s/m^2. A flat thin plate 0.2 m^2 area moves through the oil at a velocity of 0.25 m/s. Calculate the drag force when the plate is equidistant from both the planes.

2. a) Distinguish between i) steady and unsteady flow ii)Laminar and turbulent flow

   b) Derive the continuity equation for one dimensional flow.

3. a) State the Momentum equation and mention some of its engineering applications.

   b) An oil of specific gravity 0.85 and viscosity 0.05 poise flows through a 20 cm diameter pipe at the rate of 75 liters per second. Find the head lost due to friction for a 500 m long pipe. Also calculate the power required to maintain this flow.

4. a) In case of a jet striking flat plates mounted on wheel, show that the efficiency will be maximum when tangential velocity of the wheel is half of the jet velocity.

   b) A nozzle of 5 cm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 mls. Find the force on the plate, the work done and the efficiency of the jet.

5. The following data is available for a hydro power plant:

   Available head=140m, catchment area= 2000 sq.km, annual average rainfall=145em, turbine efficiency=85%, generator efficiency=9% percolation and evaporation losses=16%. Determine the following:

   i) power generated

   ii) Suggest the type of turbine to be used if runner speed is to be kept below 240 rpm.

6. a) Compare Impulse and Reaction hydraulic turbines.

   b) A Pelton wheel is required to develop 6 MW when working under a head of 300 m. It rotates with a speed of 550 rpm. Assuming jet ratio as 10 and overall efficiency as 85%, calculate

   i) diameter of the wheel ii) quantity of water required

   iii) number of jets. Assume suitable values for the velocity coefficient and the speed ratio.

7. What is specific speed of the turbine? Derive the expression for specific speed of the turbine.

8. A single acting reciprocating pump has the plunger diameter of 20 cm and stroke of 30 cm. The pump discharges 0.53 m^3 of water per minute at 60 rpm. Find the theoretical discharge, co-efficient of discharge and percentage slip of the pump. Further, if suction and delivery heads are 4m and 12m respectively, work out for the power required to run the pump.

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Code : 1G231

R-13

II B.Tech. I Semester Regular Examinations Nov/Dec 2014

Switching Theory and Logic Design

(Electrical & Electronics Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Perform the following additions using the 2's complement method:
   i) 1101+1110.
   ii) +63 and +37.
   iii) Express the 3421 decimal in Gray code and Excess-3 code form. 7M

   b) The message below has been coded in the 7-bit Hamming code and transmitted through noisy channel. Decode the message assuming that at most a single error has occurred in each code word, 1001001, 0111001, 1110110, 0011011. 7M

2. a) State and prove De-Morgan's Laws. Mention gate equivalents. 4M

   b) Find the complement of the following functions:
   $i) F_1 = \overline{x}y\overline{z} + \overline{x}\ \overline{y}z$
   $ii) F_2 = x(\overline{y}\ \overline{z} + yz)$ 7M

   c) Realize XOR gate using minimum number of NAND gates. Which gate can be used as bit comparator? Why? 3M

3. a) Obtain minimal SOP expression for the following function and implement the same using NAND gates. $f(A,B,C,D) = \sum(0,2,3,5,7,8,13) + \sum_d(1,6,12)$ 10M

   b) List the Boolean function simplification rules in the K-map 4M

4. a) Implement the following function using a multiplexer of proper size.
   $F(w,x,y,z) = \sum m(0,1,2,3,4,9,13,14,15)$ 7M

   b) Explain how decoder can be converted to demultiplexer with relevant block diagrams and truth tables. 7M

5. a) Design a BCD to excess-3 code converter using:
   i.) ROM.
   ii.) PAL. 7M

   b) Implement the following function using PLA $f(a,b,c,d) = \sum m(0,1,6,8,9)$ 7M

6. a) What is race-around problem in JK flip-flop? Explain how it is eliminated in Master-Slave J-K flip-flop. 6M

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

7. a) Explain the capabilities and limitations of finite state machines. 6M

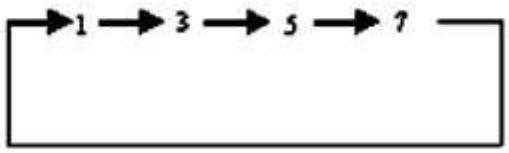
b) Determine minima state equivalent of the state table shown below.

PS	NS,Z	
	X=0	X=1
1	1,0	1,0
2	1,1	6,1
3	4,0	5,0
4	1,1	7,0
5	2,0	3,0
6	4,0	5,0
7	2,0	3,0

8M

8 a) Explain salient features of ASM chart. 5M

b) Design synchronous state machine to generate following sequence of status. Represent the machine by a state diagram 1 ASM chart and display the on set of state 7(111)with LED. Use J-K flip-flops.



9M

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