Code: 9A02405

1

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ANALOG ELECTRONIC CIRCUITS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Derive the voltage gain, current gain , input resistance and output resistance of a single stage CC amplifier with source resistance RS and load resistance RL.

2 (a) Draw hybrid - π model for a transistor in the CE configuration and explain the significance of every component in this model.
(b) Given a germanium p-n-p transistor whose base width is 10^{-4} cm. At room temperature and for a dc emitter current of 2 mA, find: (i) emitter diffusion capacitance, (ii) F_T [Assume diffusion constant as 47 cm^2/sec].

3 (a) How many types of feedbacks in amplifiers, explain?
(b) A negative feedback of 0.0005 is applied to an amplifier whose open loop gain is 60 dB. If the open loop gain gets reduced by 12%, how much the overall gain gets altered.

4 (a) Write down the expression for frequency of oscillation in Hartley and Colpitts oscillators.
(b) In a Colpitts oscillator, C_1= 0.16 μF, L = 15.8 mH and its frequency of oscillation is 10 kHz, calculate the value of capacitor C_2.

5 (a) Derive the expression, with necessary diagrams, to calculate the total harmonic distortion 'D' in power amplifiers using the five-point method of analysis.
(b) State the expression relating the total output power 'P'; total harmonic distortion 'D' and the fundamental power 'P_1' in power amplifiers. If total distortion in the amplifier is 9%; calculate its contribution to the total power.
(c) Discuss the effect of the increase in the order of harmonic frequency in power amplifier stage used in an instrument for listening to music.

6 (a) What is synchronized clamping? Explain.
(b) Design a diode clamper circuit to clamp the positive peaks of the input signal at zero level. The frequency of the input signal is 500 Hz.

7 (a) Explain the behavior of a BJT as a switch in circuits. Give examples.
(b) Write a short note on switching times of a transistor.

8 (a) Explain the reason for the occurrence of overshoot at the base of normally ON transistor of one shot. Derive an expression for overshoot.
(b) Discuss a few applications of a monostable multivibrator. Explain how it differs with that of a binary.

*****

Code: 9A02405

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ANALOG ELECTRONIC CIRCUITS

(Electrical & Electronics Engineering)

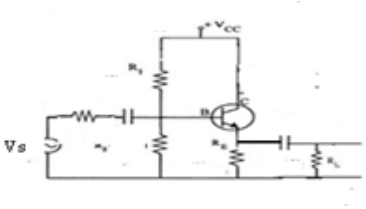
Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Draw hybrid - π model for a transistor in the CB configuration and explain the significance of every component in this model.

2 Draw the high frequency π model of a transistor and derive difference conductance's and gains.

3 (a) State the condition of (1 + $A\beta$) for which a feedback amplifier must satisfy in order to be stable.
(b) An emitter follower of Fighas the following values: $R_{s=}$ 600 Ω, R_L = 1 kΩ, h_{fe} = 100 and h_{ie} = 1 kΩ. Calculate A_i, R_i, A_v, R_o and $R_{of.}$



4 (a) Derive the voltage gain in terms of its tuned components in Hartley oscillator.
(b) The resonant circuit of a tuned-collector transistor oscillator has a resonant frequency of 5 MHz. If value of capacitance is increased by 50%, calculate the new resonance frequency.

5 (a) Calculate the second harmonic distortion, if the output signal waveform of a push pull amplifier has measured values of V_{CEmin} = 1 V; V_{CEmax} = 24 Volts and V_{CEQ} = 14 V; using an oscilloscope.
(b) Explain harmonic distortion and crossover distortions in power amplifiers.

6 (a) Prove that an RC circuit behaves as a reasonably good integrator if RC>>15 T, where T is the period of an input E_m Sin ωt.
(b) What is the ratio of the rise time of the three sections in cascade to the rise time of a single section of low pass RC circuit?

7 (a) Explain the behaviour of a BJT as a switch. Give applications.
(b) Write a short note on switching times of a transistor.

8 (a) Explain how a Schmitt trigger circuit acts as a comparator.
(b) What do you understand by hysteresis? What is hysterisis voltage? Explain how hysterisis can be eliminated in a Schmitt trigger.

*****

Code: 9A02405

3

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ANALOG ELECTRONIC CIRCUITS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Discuss about different types of distortions that occur in amplifier circuits
(b) Three identical non interacting amplifier stages in cascade have an overall gain of 2 dB down at 50 Hz compared to mid band. Calculate the lower cutoff frequency of the individual stages.

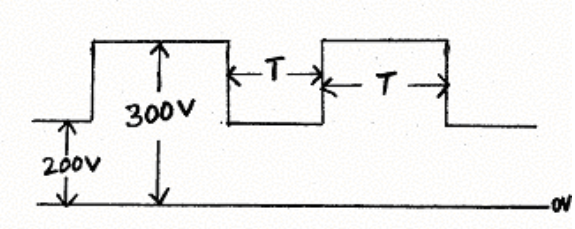
2 Derive the CE amplifier short circuit current gain and gain band width product using equivalent circuit and draw the variation of Ic with frequency.

3 Draw and explain voltage-series amplifier using h-parameter model, derive voltage gain, input resistance, output resistance and current gain closed loop and open loop.

4 Design a phase-shift oscillator to operate at a frequency of 6 kHz. Use JFET with $\mu = 60$ and $r_d = 5.5$ k. The phase shift network is not to load down the amplifier. Find the minimum value of the drain circuit resistance Rd for which and the circuit will oscillate, and find the product of RC.

5 (a) When are two transistors said to have complementary symmetry? Draw the circuit of complementary symmetry push pull class-B power amplifier and explain its operation together with characteristics of amplifier.
(b) Show that the even harmonics are eliminated in class-B push pull configuration.

6 The square wave shown is fed to an RC coupling network. What are the voltage waveforms across R and across C if:
(a) RC is very large, say RC = 10 T (b) RC is very small, say RC=T/10?



7 Write short notes on:
(a) Diode switching times (b) Switching characteristics of transistors (c) FET as a switch.

8 What is a monostable multivibrator? Explain with the help of a neat circuit diagram the principle of operation of a monostable multi, and derive an expression for pulse width. Draw the wave forms at collector and bases of both transistors.

*****

Code: 9A02405

4

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ANALOG ELECTRONIC CIRCUITS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

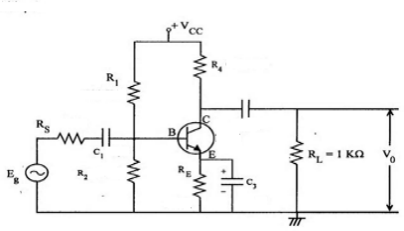
Answer any FIVE questions
All questions carry equal marks
*****

1 (a) What is meant by Miller 's theorem and applies this in CE amplifier with feedback from collector to base terminal, derive the voltage gain and input resistance?

(b) Find A_I, Ri, A_V, A_{VS} of CE amplifier with feedback resistance from collector to base is R_B = 200 k , R_C = 10 k, R_e =1 k and R_S = 10 k, using millers theorem. Assume, h_{fe} = 150, h_{ie} = 900 ohms, hoe = 25 µA/V.

2 (a) Discuss the effect of emitter bypass capacitor on low frequency response of BJT amplifiers.

(b) Calculate the coupling capacitor C_C required in Figure to provide a low frequency 3 dB point at 125 Hz if R_S = 600 Ω, h_{ie}= 1 kΩ, h_{fe}= 60, R_1 = 5 kΩ and R_2= 1.25 kΩ. For:
(a) an ideal bypass capacitor $C_{E,}$ (b) a practical bypass capacitor with R_{CE} = 25 Ω.



3 Draw and explain current-series amplifier using h-parameter model, derive voltage gain, input resistance, output resistance and current gain closed loop and open loop.

4 (a) Define gain and phase margins.

(b) In the Hartley oscillator, L_2= 0.4 mH and C = 0.004 µF. If the frequency of the oscillator is 120 kHz, find the value of L_1. Neglect the mutual inductance.

5 (a) For harmonic distortions of D_2 = 0.1, D_3 = 0.02 and D_4 = 0.01 with fundamental component of output signal I_1 = 4 A and R_L = 8 Ω. Calculate the total harmonic distortion, fundamental power component and total power.

(b) A power transistor working in class A operation has zero signal power dissipation of 5 watts. If A.C. power is 2 watts, find collector efficiency and power rating of the transistor.

6 (a) Prove that for any periodic input waveform the average level of the steady state output signal from the RC high pass circuit is always zero.

(b) Prove the above statement for (different periodic input waveforms) square wave input.

7 Derive the expression for collector to emitter voltage with open circuited base and draw the circuit.

8 Describe multivibrators from the viewpoints of construction, principle of working, classification based on the output states, applications and specifications. Mention one specific application of each.

*****

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

NETWORK THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

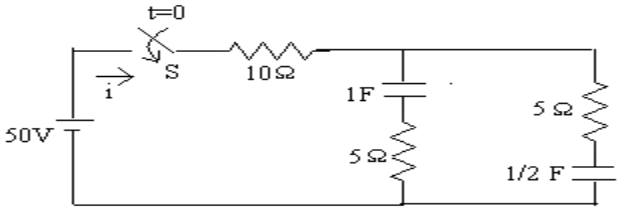
Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Derive the relation between phase and line values of a three phase star connected balanced system.

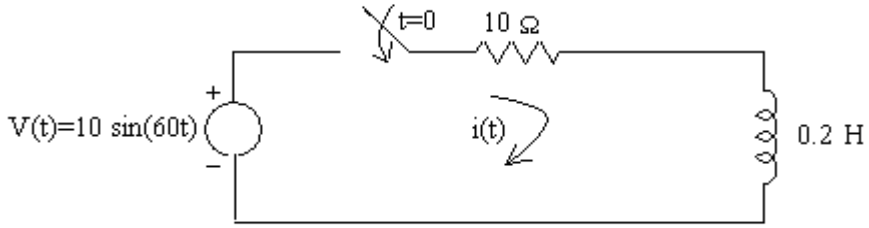
(b) Three inductive coils, each with a resistance of 15 Ω and an inductance of 0.03 H are connected in delta to three phases, 400 V, 50 Hz supply. Calculate: (i) phase current and line current (ii) total power absorbed.

2 A symmetrical 3-phase, 400 V, three wire supply feeds an unbalanced star connected load, with impedances of the load as, $Z_R = 25\angle 0^0\ \Omega$, $Z_Y = 11\angle -20^0\ \Omega$ and $Z_B = 15\angle 10^0\ \Omega$. Find: (i) Line currents (ii) Voltage across the impedances (iii) The displacement neutral voltage by Milliman's theorem.

3 In the network shown in figure below, the switch is closed at t=0 and there is no initial charge on either of the capacitors. Find the current 'i' by Laplace transform method.



4 A series RL circuit is shown in figure below. If the switch 'K' in the circuit is closed at t=0, Find an expression for i (t).



5 (a) What are Z-parameters?

(b) A two port network has the following Z-parameters:
$Z_{11} = 10\Omega; Z_{22} = 12\Omega;\ Z_{12} = Z_{21} = 5\Omega$ Complete the y parameters of the same network.

6 What is meant by cascading of networks? Obtain the parameters of a resulting network when two networks are cascaded.

7 Find the cosine and sine form of the Fourier series: $f(t) = 2 + \sum_{n-1}^{\infty} \frac{10}{n^3 + 1} \cos\left(2nt + \frac{n\pi}{4}\right)$

8 Derive the Fourier transform of a single rectangular pulse of width τ and height A.

*****

Code: 9A02406

2

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

NETWORK THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

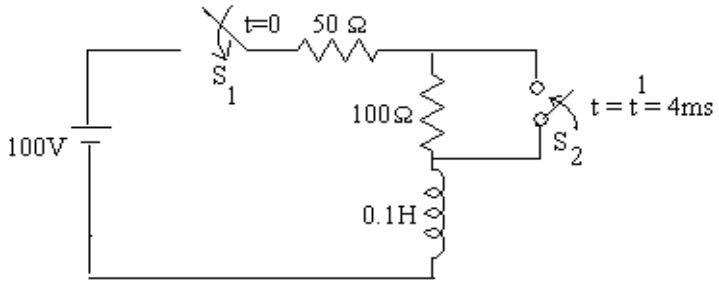
Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Show that line current is $\sqrt{3}$ times the phase current in a 3 -phase delta connected balanced system.

(b) Three inductive coils, each with a resistance of 15 Ω and an inductance of 0.03 H are connected in star to three phases, 220 V, 50 Hz supply. Calculate: (i) phase current and line current (ii) total power absorbed.

2 A symmetrical 3-phase, 400 V, three wire supply feeds an unbalanced star connected load, with impedances of the load as, $Z_R = 25\angle 0^0$ Ω, $Z_Y = 11\angle -20^0$ Ω and $Z_B = 15\angle 10^0$ Ω. Find: (i) Line currents (ii) Voltage across the impedances (iii) The displacement neutral voltage by using star-delta conversion method.

3 In the circuit shown in figure below, switch (1) is closed at t=0 and then switch (2) is closed at $t=t^1$=4ms. Find the expression for current i (t) in the intervals $0<t<t^1$ and $t>t^1$.



4 A series RL circuit with R= 50 Ω and L=0.2 H has a sinusoidal voltage source V=150 sin (500 t + Φ) volts applied at a time when Φ=0. Find the expression for total current.

5 (a) What are h-parameters?

(b) For a two-port network, compute h-parameters from the following data:
(i) With the output terminal short circuited: V_1=25V, I_1=1A, I_2=2A.
(ii) With the input terminals open circuited: V_1=10V; V_2=50V; I_2=2A.

6 Derive the expression for ABCD parameters of the resulting network when two networks are cascaded.

7 Express the Fourier series $f(t) = 10 + \sum_{n=1}^{\infty} \frac{4}{n^2+1}\cos 10nt + \frac{1}{n^3}\sin 10nt$ in a cosine and angle form.

8 Find the Fourier transform of the following functions.
(a) $4\,\delta(t+2)$ (b) sin $w_0 t$

*****

Code: 9A02406

3

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

NETWORK THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

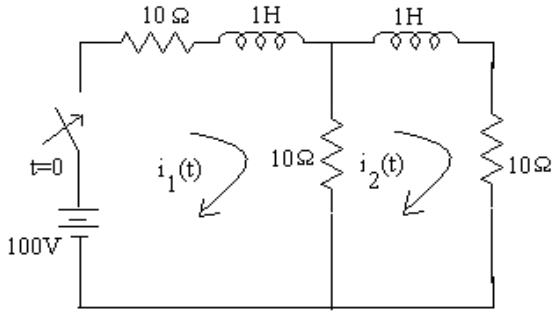
1 (a) Derive the expressions for phase and line voltages, phase and line currents in a three phase star connected balanced system.

(b) Three inductive coils, each with a resistance of 15 Ω and an inductance of 0.03 H are connected in delta to three phases, 220 V, 50 Hz supply. Calculate (i) phase current and line current (ii) total power absorbed.

2 A 400 V, 3-phase supply feeds an unbalanced three wire, star connected load, consisting of impedances $Z_R=7\angle 10^0$ Ω, $Z_Y=8\angle 30^0$ Ω and $Z_B=8\angle 50^0$ Ω. The phase sequence is RYB. Determine the line currents and total power taken by the load.

3 An ac voltage of V=V sin (500 πt) is applied to a series R-L circuit. If the R-L circuit has R =10 Ω and L=0.1H, calculate the ratio of maximum value to which the current rise to the steady state maximum value when the voltage is applied at an instant t=0.002 sec.

4 In the network shown in the fig below, the switch is closed at t= 0. Find the values of $i_1(t)$ and $i_2(t)$ assuming zero initial currents through inductors.



5 Derive the relations between: (i) y parameters and z-parameters (ii) h-parameters and Z-parameters.

6 Explain the concept of calculation of two port network parameters using transformed variables.

7 The voltage across a device is given by:
$v(t) = -2 + 10\cos 4t + 8\cos t + 6\cos 8t - 5\sin 4t - 3\sin 6t - \sin 8t$.
Find (i) the period of $v(t)$ (ii) the average value of $v(t)$ (iii) the effect value of $v(t)$.

8 Find the Fourier transform of the following functions:
(a) $\cos w_0 t$ (b) gate function, g (t) =u (t-1) – u (t-2).

*****

Code: 9A02406

4

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

NETWORK THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

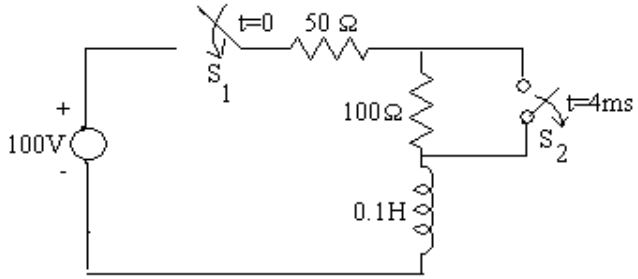
Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Explain how the reactive power can be measured by using single watt meter with a neat diagram.

(b) Three coils each having a resistance of 19 Ω and an inductive reactance of 14 Ω are connected in star and fed by a 3-phase, 220 V, 50 Hz system. Find:
(i) Line current (ii) Power and (iii) Power factor.

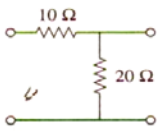
2 Two watt meters are connected to measure power in a 3-phase circuit. The reading of the one of the meter is 5 kW when the load power factor is unity. If the power factor of the load is changed to 0.707 lagging, without changing the total input power. Calculate the readings of the two watt meters. Derive the formula for power factor.

3 The circuit shown in fig below, the switch S_1 is closed at t=0 and switch S_2 is opened at t = 4 ms. Obtain 'i' for t>0 and sketch it.



4 A series R-C circuit has R = 20 Ω and C =100 μF. A voltage V=200 sin (314 t) is applied at t = 2.14 m sec. Obtain an expression for 'i'. Also, find the value of current after time 1 m sec from the switching instant.

5 Find h-parameters for the network shown below:



6 Discuss in detail the concepts of transformed networks and network parameters using transformed variables.

7 Derive the Fourier series of a square wave drawing a neat wave form.

8 Find the Fourier Transform of the following functions: (a) $\delta(t-t_0)$ (b) $\cos w_0 t$.

*****

Code: 9A02407

1

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTRICAL MACHINES - II

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Discuss the constructional details of single-phase transformer and hence obtain the expression for induced e. m. f. of transformer.

2 (a) Define voltage regulation of a transformer. Deduce the expression for the voltage regulation.
(b) The number of turns on the primary and secondary windings of a single phase transformer are 350 and 35 respectively. If the primary is connected to a 2.2 kV 50 HZ supply. Determine the secondary voltage.

3 What are the different losses occurring in a transformer on load? How can these losses be determined experimentally?

4 A three phase transformer is used to step down the supply voltage from 10000 V to 440 V. If the output capacity of the transformer is 132 kVA, find the secondary and primary currents of the transformer.

5 Why does the magnitude of the magnetic field remain constant, and also what is the speed of rotation of the magnetic field, so formed? Also what is meant by the term 'Synchronous Speed'.

6 (a) Derive the relationship between mechanical power developed, rotor input and rotor copper loss.
(b) Explain the tests to be conducted to find the equivalent circuit of an induction motor.

7 (a) Explain in detail about the working of rotor rheostat starter with a suitable diagram.
(b) Explain the tests to be carried out to draw circle diagram of an induction motor.

8 (a) Explain briefly different methods how speed control of induction motor is achieved.
(b) A certain 3 Φ 6-pole, 50 Hz induction motor when fully-loaded, runs with a slip of 3%, find the value of resistance necessary in series per phase of the rotor to reduce the speed by 10%, assume that the resistance per phase is 0.2 Ω.

*****

Code: 9A02407

2

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTRICAL MACHINES - II

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) What are the functions of a transformer?
(b) Derive an expression for voltage per turn of a transformer.

2 (a) Define efficiency of a transformer. Obtain the condition for maximum efficiency.
(b) A 25 KVA, 2500 / 250V, 1-phase transformer has the following losses. Iron loss = 960 watts, full load copper loss = 1500 watts. Calculate at what load maximum efficiency occurs, and the value of maximum efficiency at unity power factor.

3 (a) With neat circuit diagrams, explain the procedure for conducting OC & SC tests on a given single-phase transformer to predetermine its regulation & efficiency.
(b) A 100 KVA, 1000 V/10000 V, 50 Hz, single phase transformer has an iron loss of 1200 W, find the maximum efficiency at 0.8 power factor lagging if the copper loss is 500 W with 6 A in high voltage winding. Also calculate the corresponding regulation if the equivalent leakage reactance referred to HV is 10 ohms.

4 Explain the different methods of connecting windings of three phase transformers.

5 How does the rotor speed differ from synchronous speed explain in detail with neat diagram? Also what is meant by the term slip and explain its significance.

6 (a) Derive an expression for full load torque in 3-Φ induction motor and obtain the relation between full load torque and maximum torque
(b) What are the various losses in an induction motor and on what factors they depend?

7 (a) Briefly explain the working of star delta starter with a neat diagram.
(b) A squirrel cage induction motor when started by star delta starter develops a starting torque of 0.4 times the full load torque and takes from the supply a starting current of twice the full load current. Calculate the supply line current and starting torque if this induction motor is started by the line starter.

8 (a) Explain briefly how the speed control of induction motor is achieved from stator side.
(b) A certain 3 Φ 6-pole, 50 Hz induction motor when fully-loaded, runs with a slip of 3%, find the value of resistance necessary in series per phase of the rotor to reduce the speed by 10%, assume that the resistance per phase is 0.2 Ω.

*****

Code: 9A02407

3

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTRICAL MACHINES - II

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Discuss the operation of a transformer and sketch the phasor diagram for leading power factor.

2 (a) Explain the effect of variations of frequency and supply voltage on iron losses.
(b) A 1-phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233 Ω and 0.067 Ω. Calculate the equivalent resistance of (i) the primary in terms of the secondary winding, (ii) the secondary in terms of the primary winding, and (c) the total resistance of the transformer in terms of the primary.

3 (a) Compare the results & procedure of OC-SC tests & back to back tests conducted on transformer.
(b) An auto transformer used two windings with a turn's ratio of N1/N2 = k. Find the ratio of magnetizing current & short circuit current as auto transformer to two winding transformer.

4 Why should the tap changer be connected near the neutral? What about delta connected transformer?

5 What are the merits and demerits of the two types (cage and wound, or slip-ring) of rotors in induction motor?

6 (a) Derive the expression for torque in an induction motor.
(b) Derive the condition for maximum torque.

7 (a) A four pole, 3 – phase, 50Hz induction motor has a starting current which is 5 times its full load current when directly switched on. What will be the % reduction in starting torque if
(i) star delta switch is used for starting
(ii) autotransformer with 60% tapping is used for starting.
(b) Explain the need of starters for starting of a 3 - phase induction motor.

8 Explain all the modes of operation of induction machine. Plot the neat characteristics.

*****

Code: 9A02407

4

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTRICAL MACHINES - II

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Discuss the constructional features of transformers. Draw neat diagrams.
(b) Calculate the flux in the core of a single-phase transformer having a primary voltage of 230 V, at 50 Hz and 50 turns. If the flux density in the core is 1 Tesla, calculate the net cross-sectional area of the core.

2 (a) Derive the condition for maximum efficiency of a transformer.
(b) The parameters of the equivalent circuit for a 1-phase transformer are R_0 = 400 Ω X_0 = 231 Ω, R_t = 0.16 Ω and X_t = 0.7 Ω. The input voltage is 200 V, and load 5.96+j 4.44 Ω. (All values are referred to primary.) The ratio of secondary to primary turns is 10. Find the secondary terminal voltage; the primary current; and the efficiency.

3 (a) A 20 KVA, 2300/230 V, two winding transformer is to be used as an auto transformer, with constant source voltage of 2300 V. At full load of unity power factor, calculate the power output, power transformed and conducted. If the efficiency of the two winding transformer at 0.6 p.f.is 96%, find the auto transformer efficiency at the same power factor.
(b) Explain the conditions to be met for the parallel operation of a transformer.

4 Compare the different connections of 3-phase transformers.

5 (a) Does the induction motor have any similarities with the transformer. Compare the similarities and differences between them.
(b) Show that a rotating magnetic field is produced in the air-gap, when a balanced three-phase ac supply is given to the stator of a 3-phase induction motor. Justify your claim with necessary mathematical equations.

6 (a) What are the losses in an induction motor? Explain in detail.
(b) Derive the condition for maximum torque of a 3-Φ induction motor under running conditions.

7 (a) List out the types of starters used for starting of 3 – phase induction motors. Explain line starting of an induction motor.
(b) The full load slip of 400V 3 phase squirrel cage induction motor is 3.5% and with blocked rotor, full load current is circulated when 92 volts is applied between lines. Find necessary tapping on an auto transformer to limit the starting current to twice the full load current of the motor. Determine also the starting torque in terms of the full load torque.

8 (a) Explain the operation of induction motor as induction generator.
(b) A 4 pole, 50 Hz, wound rotor IM has a rotor resistance of 1.1 ph and runs at 1460 rpm at full load. Calculate the additional resistance per phase to be inserted in the rotor circuit to lower the speed to 1200 rpm, if the torque remains constant.

*****

Code: 9A04401

1

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

SWITCHING THEORY & LOGIC DESIGN

(Common to EEE, EIE, E.Con.E, ECE & ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

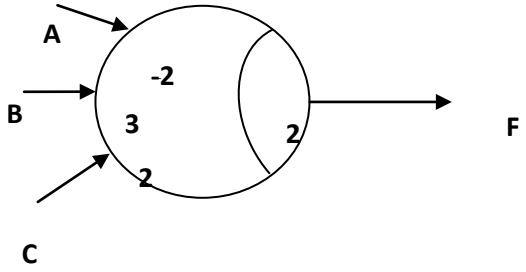
1 (a) What is the necessity of binary codes in computers?
(b) Why the ASCII code was developed? Explain ASCII code with table.
(c) Encode the word DIGITAL in to 7 bit ASCII code.

2 (a) What are universal gates? Realize AND, OR, NOT, XOR gates using universal gates.
(b) Determine the canonical sum of minterms form of the following function. F(W,X,Y,Z) = 1
(c) Prove the Boolean identity X+YZ = (X+Y) (X+Z).

3 (a) What are the advantages of tabulation method over K-map?
(b) Simplify the following Boolean function using tabulation method:
Y(A,B,C,D) = ∑ (0,1,3,7,8,9,11,15).

4 (a) Design a combinational circuit that accepts a three-bit binary number and generates an output binary number equal to the twice the input number.
(b) Design 2*4 decoder using NOR gates.

5 (a) For the figure given below obtain the logic expression for the threshold element and determine its equivalent gate circuit.



(b) What are the capabilities and limitations of T-gate?

6 (a) What is meant by race around condition? Briefly explain.
(b) Explain the operation of synchronous counter.

7 (a) Discuss mealy and Moore machine models of sequential machines.
(b) Explain the minimization procedure for determining the set of equivalent state of a specified machine M.

8 (a) How do you indicate Moore outputs and mealy outputs in an ASM block?
(b) Obtain the ASM chart for the following state transition. Start for State T_1; then if xy=00, go to T_2 if xy=01, go to T_3; if xy=10 go to T_1; otherwise go to T_3.

*****

Code: 9A04401

2

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

SWITCHING THEORY & LOGIC DESIGN

(Common to EEE, EIE, E.Con.E, ECE & ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) List the decimal numbers -8 to +7 in sign-magnitude, sign-1's complement and sign-2's complement representation and conclude the advantage of 2's complement representation in computers.

(b) What is the advantage of 2's complement representation in computers? Perform the following operations using 2's complement method: (i) (+55) – (+15) (ii) (-55) – (-15)

2 (a) State and prove De Morgan's laws. Mention gate equivalents.

(b) Determine the canonical sum of products form of the following function:
f (x, y, z) = z + (x'+ y)(x + y').

(c) Realize XOR gate using minimum number of NAND gates.

3 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.

4 A combinational circuit has four inputs and one output. The output is equal to 1 when
(i) all the inputs are equal to 1 or
(ii) none of the inputs are equal to 1 or
(iii) when even number of inputs are equal to 1
Design the above circuit using logic gates.

5 Program a 3 input and 4 output PLA Circuit to implemented the sum and carry outputs of a full adder.

6 (a) Show how mod-12 JK counter could be built using mod-3 & mod-4 counters.

(b) Explain the steps in synchronous sequential circuit design.

7 Explain the following related to sequential circuits with suitable examples.
(a) State diagram.
(b) State table.
(c) State assignment.

8 (a) Explain the symbols used in an ASM chart with neat diagrams.

(b) Explain the important features of the ASM chart.

*****

Code: 9A04401

3

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

SWITCHING THEORY & LOGIC DESIGN

(Common to EEE, EIE, E.Con.E, ECE & ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) List the binary, octal and hexa numbers for decimal 16 to 31.
(b) Perform the following operations using 2's complement method: (i) 48 – 23 (ii) 23 – 48.

2 (a) State and prove Boolean laws related to OR, AND, NOT gates.
(b) Given Boolean expression AB'+A'B = C. Show that AC'+A'C = B.
(c) Prove that OR-AND network is equivalent to NOR-NOR network.

3 (a) Simplify the following Boolean function for minimal SOP form using K-map
$F(W,X,Y,Z) = \sum(0,1,2,3,4,6,8,9,10,11)$
(b) Simplify the following Boolean functions using K-map.
(i) F(A,B,C) = A'B + B'C + A'B'C' (ii) F(A,B,C) = A'B' + AC' + B'C + A'BC'

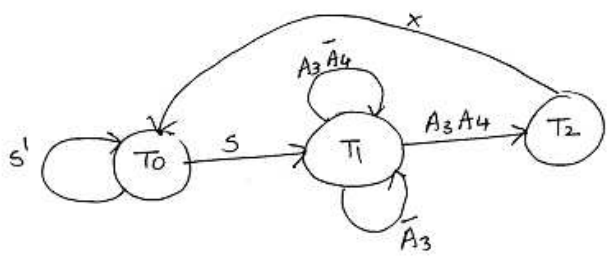
4 (a) Implement full adder using 4*1 multiplexer.
(b) Design 4*16 decoder using two 3*8 decoders with block diagram.

5 (a) Explain the general combinational PLD configuration with suitable block diagram.
(b) Give the logic implementation of a 32 x 4 bit & 8 x 4 bit ROM using suitable decoder.

6 (a) Draw the circuit diagram of 4 bit ring counter using D flip flops and explain its operation with the help of bit pattern.
(b) Distinguish between transition table and excitation table.

7 A clocked sequential circuit with simple input x and single output Z produce an output Z = 1 whenever the input x completes the sequence 1 0 1 1 and overlapping is allowed.
(a) Obtain its state - diagram.
(b) Obtain its minimal state - table and design the circuit with D - Flip-Flops.

8 (a) For the given control state diagram obtain its equivalent ASM chart.
(b) Design control logic circuit using multiplexers for the given state diagram.



*****

Code: 9A04401 4

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

SWITCHING THEORY & LOGIC DESIGN

(Common to EEE, EIE, E.Con.E, ECE & ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Why the computer hardware works for binary number system? List the binary, octal and hexa numbers for decimal 0 to 15.
(b) Given a = 10101001 and b = 1101. Find: (i) a + b (ii) a – b (iii) a. b (iv) a / b.

2 (a) Draw the symbols and truth tables of all logic gates and explain.
(b) Simplify the following Boolean functions to a minimum number of literals:
(i) x + x'y (ii) x (x' +y) (iii) x'y'z + x'yz + xy' (iv) xy + x'z +yz.

3 (a) What are don't-care conditions? Explain its advantage with example.
(b) Simplify the following Boolean function for minimal SOP form using K-map and implement using NAND gates. $F(W,X,Y,Z) = \sum(1,3,7,11,15) + d(0,2,5)$.

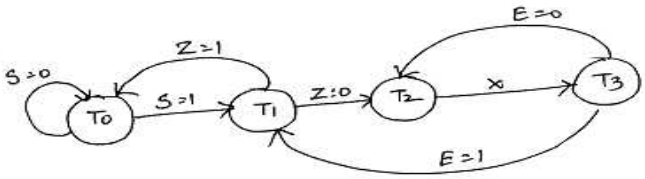
4 (a) What is decoder? Construct 3*8 decoder using logic gates and truth table.
(b) What is encoder? Design octal to binary encoder.

5 (a) Explain the internal structure of PLA.
(b) Design a full adder circuit using ROM.

6 (a) What are asynchronous inputs in flip flops? Explain its functionality.
(b) With neat sketch explain JK master slave flip flop.

7 (a) Write the differences between Mealy and Moore type machines.
(b) A sequential circuit has 2 inputs w_1=w_2 and an output z. Its function is to compare the input sequence on the two inputs. If w_1=w_2 during any four consecutive clock cycles, the circuit produces z=1 otherwise z=0.
w_1 = 0110111000110 w_2 = 1110101000111 z = 0000100001110

8 (a) For the given control state diagram obtain its ASM chart.
(b) Design the circuit.



*****

Code: 9A02403

1

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

GENERATION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 What are the factors to be considered for the selection of site of a nuclear power station?

2 Write a short note on types of concentrating collectors.

3 What are the factors to be considered for selection of the site for a thermal power station?

4 Discuss the advantages and disadvantages of wind energy.

5 Discuss the status of biomass conversion technologies.

6 Discuss the technology of Ocean Thermal Energy Conversion (OTEC).

7 Estimate the generating cost per kWh delivered from a generating station from the following data:
Plant capacity = 50 MW
Annual load factor = 40%
Capital cost – 1.2 crores; annual cost of wages, taxation etc = Rs 4 lakhs; cost of fuel, lubrication, maintenance etc = 1.0 paise/kWh generated. Interest 5% per annum, 6 % per annum of initial value.

8 (a) What are the principal factors involve in fixing of a tariff?
(b) An industrial consumer has maximum demand of 120 kW and maintains a load factor of 80%. The tariff in force is Rs. 60 per kVA of maximum demand plus 8 paise per unit. If the average p.f. is 0.8 lagging, calculate the total energy consumed per annum and the annual bill

*****

Code: 9A02403

2

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

GENERATION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 What do you mean by preventive maintenance of hydro plant?

2 What are the main components of a flat plate solar collector? Explain the function of each.

3 What are the types of steam turbine? Briefly discuss about their use and characteristics.

4 Explain with a real diagram a wind electric generating power plant.

5 What is biomass? What are the different sources used to extract biomass energy?

6 What are possible environmental effects as a result of an operation of an OTEC plant?

7 Loads on a feeder during 24 hours of a day are given below:

Time	Load(kW)	Time	Load(kW)	Time	Load(kW)
12 am	400	8 am	900	16 pm	1400
1 am	380	9 am	1200	17 pm	1300
2 am	350	10 am	1350	18 pm	1500
3 am	300	11 am	1200	19 pm	1800
4 am	350	12 pm	1000	20 pm	2333
5 am	500	13 pm	950	21 pm	1950
6 am	700	14 pm	1250	22 pm	1000
7 am	750	15 pm	1300	23 pm	800

Calculate the maximum demand, average demand and load factor of the feeder. If the feeder has the peak loss of 108 kW at peak load and annual loss factor of 0.14, find the following: (a) The average power loss of the feeder
(b) The total annual loss of the feeder
Also calculate the demand factor of the feeder if the connected demand is 2500 kW.

8 What are the factors which influence the tariff design in an electric supply system?

*****

Code: 9A02403

3

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

GENERATION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Discuss the advantages of nuclear power plant compared to thermal power plant.

2 What are the factors affecting the performance of flat plate collector?

3 What is “feed water”? What are the problems due to impurities in fuel water? How they can be eliminated?

4 Explain wind power battery chargers.

5 What are the advantages and disadvantages of floating drum plant?

6 Describe the working of closed cycle OTEC system. Discuss its advantages and disadvantages. What modifications can be carried out to the open cycle OTEC system to make it economically feasible?

7 What do you understand by power plant economics? Explain the fixed costs and operating cost of a power station.

8 What is meant by tariff? What are the various types of tariffs in common use? Explain the two part tariff.

*****

Code: 9A02403

4

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

GENERATION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 What do you mean by fission of nuclear fuel?

2 Describe in brief the different energy storage methods used in solar energy systems.

3 Explain the various steps in coal handling.

4 What are the advantages and disadvantages of wind energy? What are the environmental factors associated with wind energy?

5 (a) How biomass conversion takes place?
(b) What is the difference between biomass and biogas?

6 What are the main types of OTEC power plants? Describe their working in brief.

7 A generating station has the following date :
Installed capacity = 300 MW
Annual load factor = 60%
Annual cost of fuel, oil etc = Rs $9X10^7$; capital cost = Rs 10^9; annual interest and depreciation = 10%. Calculate:- (i) the maximum reserve capacity of the station and (ii) the cost per kWh generated.

8 List the types of tariff used in practice. Distinguish by suitable examples between,
(i) two-part tariff and
(ii) maximum demand tariff.

*****

Code: 9A02404

1

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Derive the expression for electric potential due to a dipole.
(b) Show that the family of equipotential for a dipole may be given by $r^2 = d_1 \cos\theta$. Further show that $r = d_2 \sin^2\theta$ represents the line of force of the dipole, where d_1 and d_2 are constants.

2 (a) State and explain Gauss's law.
(b) Derive an expression for potential difference between two co-axial cylindrical conductors of radii 'a' and 'b' (b > a), if the outer surface of the inner cylinder is charged with $Q_8 c/m^2$.

3 (a) Derive the conditions at a boundary between two dielectrics.
(b) State Ohm's law in paint form.

4 A single-phase circuit comprises two parallel conductors A and B, each 1 cm diameter and spaced 1 m apart. The conductors carry current of +100 and -100 Amps. Respectively. Determine the filed intensity at the surface of each conductor and also in space exactly midway between A and B.

5 (a) State and prove Amperes circuital law.
(b) Apply the Amperes circuital law to determine the magnetic field inside and outside a straight solid cylindrical conductor of radius 'a'. The conductor carries a current of I amperes. Sketch the fields.

6 (a) Derive an expression for the force on a differential current element placed in a magnetic field.
(b) Calculate the force on a straight conductor of length 30 cm carrying a current of 5 A in $\mathbf{a_z}$ direction and the magnetic field $\mathbf{B} = 3.5 \times 10^{-3} (\mathbf{a_x} - \mathbf{a_y})$ Tesla where $\mathbf{a_x}$ and $\mathbf{a_y}$ are unit vectors.

7 (a) Prove that in case of two mutually coupled coils $M = K\sqrt{L_1 L_2}$.
(b) A toriod is made up of closed ring wound with 300 turns of insulated copper wire. The cross sectional area of the ring is 5 sq.cm. the mean radius of the ring is 10 cm. relative permeability of iron is 1000. Find self inductance and derive the formula used.

8 Write down the Maxwell's equation in their general integral form. Derive the corresponding equations for fields varying harmonically with time.

*****

Code: 9A02404

2

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) State and explain Gauss's law as applied to electrostatic fields in differential form.
(b) Three equal positive charges of Q C each are located at three corners of a square, side 'a' meter. Determine the magnitude and direction of the resulted force experienced by a test charge if placed at the vacant corner of the square.

2 A regular tetrahedron has vertices at P_1 (2, 0, 0), P_2 (-1, $\sqrt{3}$, 0), P_3 (-1, -$\sqrt{3}$, 0) and P_4 (0,0, $2\sqrt{2}$). Charges of 1 mC are located at each of four vertices. If the configuration is located in free space (a) Find the magnitude of force on each charge (b) the angle between any two edges of tetrahedron.

3 A point change of 6 C is located at the origin, a uniform line change density of 180 nc/m lies along the x-axis and a uniform sheet of change equals to 25 nc/m^2 lies in the z = 0 plane. (a) Find $\overline{D}$ at A (0, 0, 4) ; (b) Find $\overline{D}$ at B (1, 2, 4) ; (c) Calculate the total electric flux leaving the surface of a sphere of 4 m radius centered at the origin.

4 (a) Sate and explain Biot-savarts law. Mention the units of the quantities used in the law.
(b) Find the magnetic field intensity at the origin due to a current element $50x10^{-6}U_z$ A-m at the point (4, -7, 0) in free space.

5 (a) Explain the physical significance of a curl.
(b) Discuss Stokes theorem show how Amperes circuital law may be obtained from curl **H** = **J** using stokes law.

6 (a) Obtain the expression for the force experienced by two current carrying conductors. What is the direction of force when they are carrying current in similar direction and opposite direction?
(b) A long linear conductor is coincident with z-axis carries 10 A current. The current flows in a_z direction. If B= ($3a_x$ + $4a_y$) T. find the force per unit length of conductor.

7 A straight long wire is situated parallel to one side of a square coil. Each side of the coil has a length of 5 cm. the distance between straight wire and the centre of the coil is 10 cm. find the mutual inductance of the system. Derive the formula used.

8 (a) State Maxwell's equation in point form, integral form and in words.
(b) If σ = 0 , ε = 2.5 ϵ_o, μ = μ_o determine whether or not the following pair of fields satisfy the Maxwell's equation: **E**=100 sin ($6x10^7$t) sin z $\mathbf{a_y}$, **H** = - 0.1328 cos ($6x10^7$t) cos z $\mathbf{a_x}$

*****

Code: 9A02404

3

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Determine the inductance of a solenoid carrying N turns on a magnetic core of axial length l meter and cross sectional area of A m^2.

(b) A solenoid of 10 cm in length consists of 1000 turns having the cross section radius of 1 cm. find the inductance of the solenoid. What is the value of current required to maintain a flux of 1 mWb in solenoid. Take $\mu_r = 1500$.

2 (a) Starting from faradays law of electromagnetic induction derive $\nabla x E = -\frac{\partial B}{\partial t}$

(b) A conductor carries a steady current of I amperes. The components of current density vector J are $J_x = 2a_x$ and $J_y = 2a_y$. Find the third component J_z. derive any relation employed.

3 Evaluate both sides of Stoke's theorem for the field $\overline{H} = \frac{y^2 z}{x} a_x + \frac{0.5 y^2 z^2}{x^2} a_z$ A/m and find the current in ay direction crossing the square surface in the plane y = 2 bounded by x = z = 1 and x = z = 2.

4 (a) Define a magnetic dipole and explain how a differential current loop can act as a magnetic dipole.

(b) The rectangular coil shown in figure 3 is in a field $B = 0.05\left(\frac{\overline{a_x} + \overline{a_y}}{\sqrt{2}}\right)$ T .find the torque about z-axis when the coil is in the position shown and carries current of 5 A.

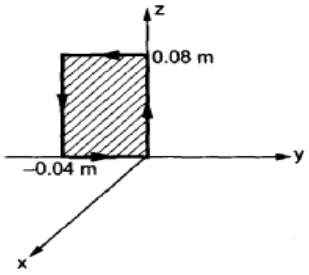


Fig. 3

5 (a) State and prove the conditions at the boundary between two dielectrics.
(b) Determine the resistance of a insulation in length 'L' of co-axial cable as inner and outer radii are 'a' and 'b' respectively

Contd. in Page 2

6 (a) State and explain Coulomb's law indicating clearly the units of quantities in the equation of force.
(b) Calculate the force on a unit positive charge at P(x=2m, y=0) due to the charges Q1 at origin and Q2 at (x=1m, y=0) where Q1 = 1000 pico coulombs Q2 = -2000 pico coulombs.

7 (a) Explain the concept of electric dipole.
(b) Obtain an expression for torque on an electric dipole placed in a uniform electric field.
(c) What is polarization?

8 (a) Derive the boundary conditions at the magnetic interfaces and show that $\tan \theta_1/\theta_2 = \mu_{r1}/\mu_{r2}$.
(b) Write Maxwell's first law and second law with examples.

*****

Code: 9A02404

4

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) State and explain Coulomb's law of electrostatic field in vector form.
(b) It is required to hold four equal point charges to each in equilibrium at the corners of a square. Find the point charge, which will do this if placed at the center of the square.

2 (a) A co axial cable with inner and outer conductor radii 'a' and 'b' respectively have the respective voltage V_a and V_b by using laplaces equation, find E at all points.
(b) The construction of a paper capacitor is as follows: Aluminum foil of 100−cm^2 area is placed on both sides of paper of thickness 0.03 mm. If the dielectric constant of paper is given as 3, and its dielectric breakdown strength is 200 kV/cm, what is the rating of the capacitor.

3 A capacitor is composed of two plates separated by a sheet of insulating material 5 mm thick and ε_r = 6. The distance between the plates is increased to allow the insertion of second sheet 8 mm thick and of relative permeability ε_r. If the capacitance of the capacitor so formed is one-half of the original capacitance. Determine the value of ε_r.

4 A current filament carrying 15 A in the a_z direction lies along the entire z –axis. Find H in a rectangular coordinates at (a) $P_a(5,0,4)$ and (b) $P_b(2,-4,4)$.

5 (a) State Amperes law and hence derive the corresponding Maxwell's equation in differential form.
(b) A 'z' directed current distribution is given by **J =** (ρ^2+uρ) for ρ ≤ a. Find **B** at any point ρ ≤ a using Amperes circuital law.

6 (a) A galvanometer has a rectangular coil suspended in a radial magnetic field so that the magnetic field always acts across the plane of the coil. If the coil is 10 mm by 10 mm side and has the 1000 turns and if the magnet provides a constant flux density of 0.3 tesla, find the torque entered on the coil for a current of 10 mA.
(b) Derive an expression for torque on a closed current loop placed in a magnetic field.

7 Prove that the internal inductance of a non-magnetic cylindrical wire of radius 'a' carrying a uniformly distributed current I is μ0/8 π Henries per mt.

8 (a) Starting form first principle derive Maxwell's equation using Faraday's law and show that div B=0.
(b) For a lossy dielectric σ = 5 S/m and ϵ_r = 1. the electric field intensity is E = 100 sin 10^{10}t. Find J_C, J_D and frequency at which both have equal magnitudes.

*****