Code: 9A02502

III B. Tech I Semester (R09) Regular Examinations, November 2011
TRANSMISSION OF ELECTRIC POWER
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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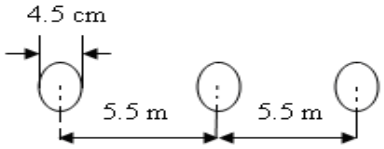
1 (a) Show that the capacitance per phase per meter of a double circuit regular hexagonal spacing transmission line is $C = \frac{4\pi\varepsilon_0}{\ln\frac{\sqrt{3}D}{2r}}$ F/meter/conductor, where D is conductor spacing and r is the radius of the conductor.

(b) Determine the inductance per km per phase of a single circuit 20kV line of given configuration as shown in fig. The conductors are transposed and have a diameter of 4.5 cm.



2 (a) Prove the relation AD-BC=1 by considering a two terminal pair network.

(b) A 132 kV, 3-Φ, 50Hz transmission line 200km long has the following distributed parameters L=1.3x10^{-3}H/km; C=9x10^{-9}F/km; r =0.2Ω/km; g=0. Find the sending end voltage.

3 Determine the corona characteristics of a 3- phase line 160 km long, conductor diameter 1.036 cm, 2.44 m delta spacing, air temperature 26.67^{o}C, altitude 2440m, corresponding to an approximate barometric pressure of 73.15 cm of Mercury, operating voltage 110 kv at 50 Hz. Assume data if required.

4 (a) What is a sag in an Overhead line? Discuss the disadvantages of providing too small or too large sag on a line.

(b) A 132kv transmission line has the following data: Weight of conductor=680 kg/km; length of span=260m, Ultimate strength=3100 kg, Safety factor=2. Calculate the height above the ground at which the conductor should be supported. Ground clearance required is 10 meters.

5 A 1-Φ, 50Hz generator supplies an inductive load of 5000KW at a power factor of 0.707 lagging by means of an overhead transmission line of 20km long. the line resistance and inductance are 0.0195Ω and 0.63mH per km. the voltage at the receiving end is required to be kept constant at 10kV.Find:

(a)The sending end voltage and the voltage regulation of the line.

(b) The value of capacitance to be placed in parallel with the load such that the regulation is reduced to 50% of that obtained in the part (a)

(c) Compare transmission efficiency in parts (a) and (b)

Contd. in Page 2

6 Write short notes on:
(a) Static shielding.
(b) Suspension type insulator.

7 Discuss the phenomenon of reflection and refraction in travelling waves. Derive the expressions for reflection and refraction coefficients when a travelling wave is terminated through a resistance.

8 (a) Show that in a three core belted cable the neutral capacitance to earth conductor C_n is equal to C_s+3 C_c where C_s and C_c are capacitances of each conductor to sheath and to each other respectively.

(b) The maximum and minimum stresses in the dielectric of a single core cable are 40kv/cm (r.m.s) and 10kv/cm (r.m.s) respectively. If the conductor diameter is 1 cm, find:
(i) Thickness of insulation.
(ii) Operating voltage.

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1 (a) Show that the ratio of maximum potential gradient to the minimum potential gradient is R/r. Where r and R are the conductor radius and sheath radius.
(b) Calculate the capacitance and charging current of a single core cable used on 3-phase, 66 kv system. The cable is 1km long having a core diameter of 15 cm and impregnated paper insulation of thickness 22.5 cm. The relative permittivity of the insulation may be taken as 3.5 and supply at 50 Hz.

2 (a) Define sag and what are the factors that effect the sag calculations.
(b) A transmission line has a span of 160 m between level supports. The conductor has a cross-sectional area of 2.1 cm^2. The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.6 kg/m length, calculate the sag and also calculate the vertical sag.

3 Find the corona characteristics of a 110kv, 50Hz, 3-phase transmission line 175km long line consisting of three 1cm diameter stranded copper conductors spaced in 3-meter delta arrangement. Temperature 26^0C and barometric pressure is 74 cm of Hg, m=0.85, m_v for local corona=0.72 and m_v for general corona 0.82.

4 A surge of 200kV traveling in a line of natural impedance 400ohms arrives at a junction with two lines of impedances 500ohms and 300ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current.

5 Evaluate A, B, C, D parameters for 160km section of 3-Φ line delivering 45MVA at 132KV and pf 0.8 lagging. Also, find the efficiency and regulation of line.
Resistance per line is 0.16Ω/km; spacing is 3.5m, 6.5m, and 7.4m transposed. Diameter of the conductor is 1.9cm.

6 (a) Write a short note on geometric mean distance and geometric mean radius.
(b) A three-phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 2m side. Calculate the capacitance of each line conductor per km. Given that the diameter of the conductor is 1.25cm.

7 (a) Define the regulation and efficiency of transmission line.
(b) A 3-Φ 50Hz 25km long overhead line supplies 1200kWat 11kV at 0.8 pf lagging. The line resistance and inductance are 0.04Ω and 0.8mH per phase per km. Determine:
(i) Percentage regulation (ii) Transmission efficiency of the line.

8 (a) What is an insulator? Where and why the insulators are used in power systems
(b) In a 33kv overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self capacitance of each insulator, find
(i)The distribution of voltage over 3 insulators and (ii) String Efficiency.

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III B. Tech I Semester (R09) Regular Examinations, November 2011

TRANSMISSION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

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1 A three-phase transmission line 100 Km long has its conductors of 0.5 cm diameter spaced at the corners of an equilateral triangle of 120 cm side. Find the inductance per phase of the system. Derive the formula used.

2 (a) Derive the expression for A, B, C, D parameters of nominal-π medium length transmission line.

(b) Input to a Single-phase short length line is 2000kw at 0.8 lagging p.f.. The line has a series impedance of (0.4+j0.4) ohms. If the load voltage is 3KV, find the load and receiving end power factor. Also find the supply voltage.

3 A single circuit 50Hz 3-Φ transmission line has the following parameters per km:
R=0.2Ω, L=1.3mH & C=0.01μF.
The voltage at the receiving end is 132 kV. Determine the efficiency of the line if the line is 170km long and delivers 40MW at132kV and 0.8 p.f. lagging.

4 What is meant by power system transients? Develop the differential equation for a transient in the transmission system. How voltage and current expressions are established from the above differential equations?

5 (a) Write short notes on Radio Interference.

(b) A 3-phase line has conductors 2 cm in diameter spaced equilaterally 1m apart. If the dielectric strength of air is 30 kv (max) per cm, find the disruptive critical voltage for the line. Take air density factor δ=0.952 and irregularity factor m_0=0.9.

6 (a) Explain why the voltage across the insulator string is not equal.

(b) A three phase overhead line is suspended by a suspension type insulator, which consists of three units. The potentials across top unit and middle unit are 9 kv and 11 kv respectively. Calculate:
(i) The ratio of capacitance between pin and earth to the self capacitance of each unit.
(ii) The line voltage and (iii) String efficiency.

7 (a) What is Sag-Template? What is its use?

(b) An overhead line has a span of 260 m. The weight of the line conductor is 0.68 kg per meter run. Calculate the maximum sag in the line. The maximum allowable tension in the line is 1550kg.

8 (a) Distinguish between Underground cables and overhead lines.

(b) A single-core cable has a conductor diameter of 1 cm and insulation thickness of 0.4 cm. If the specific resistance of insulation is 5×10^4 Ω-cm, calculate the insulation resistance for a 2 km length of the cable.

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III B. Tech I Semester (R09) Regular Examinations, November 2011
TRANSMISSION OF ELECTRIC POWER
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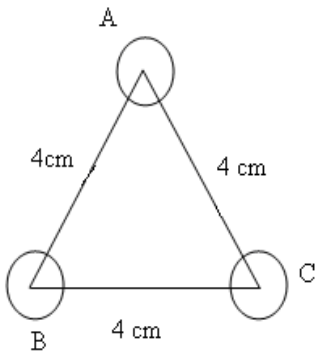
1 (a) What is the significance of transposing the power lines?
(b) A 3-ø transmission line has conductor diameter of 1.8cm each, the conductor being spaced as shown in the fig. The loads are balanced & the line is transposed. Find the inductance of the line per km per phase.



Fig

2 (a) Differentiate the long transmission line from other transmission lines based on their lengths and other parameters.
(b) Determine the equivalent T-network and π-network for long transmission line having auxiliary constants, A=D=0.945$\angle$1.02^o; B=82.3$\angle$73.03$^o\Omega$; C=0.001376$\angle$90.4^o mhos.

3 A 15000 KVA is received at 33 KV at 0.8 p. f. lagging over an 8 km three-phase overhead line. Each line has resistance of 0.29 ohms/km and an inductive reactance of 0.65 ohms per km. Calculate: (i) The voltage at the sending end
(ii) The power factor at the sending end
(iii) The Regulation and
(iv) The efficiency of the transmission line.

4 A Three-phase transmission line has conductors 2.4cm in diameter space 1 meter apart in equilateral formation. The resistance and leakage are negligible. Calculate:
(i) The natural impedance of the line.
(ii) The line current if a voltage wave of 11KV travels along the line.
(iii)The rate of energy absorption, the rate of reflection and the state and the form of reflection if the line is terminated through a star connected load of 1000Ω/ph.
(iv)The value of the terminating resistance for no reflection and
(v) The amount of reflected and transmitted power if the line is connected to a cable extension with Inductance and Capacitance per phase per cm of 0.246X10^{-8} H and 2.46X10^{-6} µF respectively.

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5 (a) State and explain the factors that effect the corona loss.
(b) A 3-phase, 220 KV, 50 Hz transmission line consists of 1.9 cm radius conductor spaced 2.3 meters apart in equilateral triangular formation. If the temperature is 40^0C and atmospheric pressure is 76cm of Mercury, calculate the corona loss per km of the line. Take m_0 is 0.85 and also assume the required data.

6 (a) Define string efficiency. Why is it necessary to have high stringing efficiency?
(b) The three bus-bar conductors in an outdoor substation are supported by units of post type insulators. Each unit consists of a stack of 3-pin type insulators fixed one on the top of the other. The voltage across the lowest insulator is 13.1kv and that across the next unit is 11kv. Find the bus-bar voltage of the station.

7 (a) Describe with a neat sketch, the construction of a single core cable. Discuss the limitations of such a cable.
(b) The insulation resistance of the single core one-kilo meter length cable is 495 Mega ohms per km. If the core diameter is 2.5 cm and resistivity of insulation is 4.5×10^{14} Ω-cm, find the insulation thickness.

8 (a) Write short notes on Sag templates.
(b) A transmission line has a span of 214 meters between level supports. The conductors have a cross-sectional area of 3.225 cm^2. Calculate the factor of safety under the following conditions Vertical sag=2.35m, Wing pressure=1.5 kg/m run, Breaking stress=2540kg/cm^2, Weight of conductor=1.125 kg/m run.

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Code: 9A02503

III B. Tech I Semester (R09) Regular Examinations, November 2011

CONTROL SYSTEMS

(Common to Electrical & Electronics Engineering, Electronics & Control Engineering, Electronics & Instrumentation Engineering & Electronics & Communication Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

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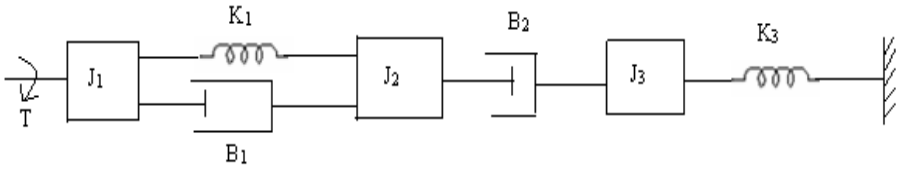
1 (a) What is a mathematical model of a physical system? Explain briefly.

(b) Write the differential equations governing the mechanical rotational systems shown in figure.



2 (a) What are the standard test signals? Give their representations mathematically and graphically.

(b) For the servomechanism with open loop transfer function given below, what type of input signal give rise to a constant steady state error and calculate their values:

G(s)= 20(s+2)/[s(s+1)(s+3)]

3 Obtain the Bode plot for the system with G(s) = 20(0.1s+1)/ [s^2 (0.2s+1) (0.02s+1)].

4 The open loop transfer function of an ufb system is G(s) = $\frac{K}{s(s+1)}$. It is desired to have the velocity error constant K_v=12sec^{-1} and phase margin as 40^0. Design a lead compensator to meet the above specifications.

5 Find the transfer function of the following:

(a) Field controlled d.c. servomotor (b) Armature controlled d.c. servomotor.

6 The unity feedback system whose open loop transfer function is given by G(s)=K/s(s^2 +6s+10)

Determine: (i) Angles of asymptotes (ii) Centroid

(iii)Break away and Break in points (iv) Angle of departure

7 Check the stability of the system by Nyquist criterion G(s) = 100/s(s+1) (s^2+2s+2).

8 For the state equation:

$$\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} r(t)$$

with the unit step input and the initial conditions are $X_0 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$.Find the following

(a) State transition matrix (b) Solution of the state equation.

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Code: 9A02503

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III B. Tech I Semester (R09) Regular Examinations, November 2011

CONTROL SYSTEMS

(Common to Electrical & Electronics Engineering, Electronics & Control Engineering, Electronics & Instrumentation Engineering & Electronics & Communication Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

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*****

1 (a) State the properties of STM.

(b) Diagonalize the following system matrix:

$$A=\begin{bmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{bmatrix}$$

2 A ufb system has OLTF $G_f(s) = \frac{K}{s^2(1+0.2s)}$. Design a lead compensator to meet the following specifications.

(i) Acceleration error constant K_a=10 (ii) Phase margin = 35^0.

3 Construct the complete Nyquist plot for a unity feedback control system whose open loop transfer function is G(s)H(s) = K/s(s^2+2s+2). Find the maximum value of K for which the system is stable.

4 For the following transfer function draw Bode plot and obtain gain cross over frequency G(s) = 20/[s (1+3s) (1+4s)].

5 (a) Analyze for the nature of the roots of F(s) = s^3 + $6s^2$ + 11s + 6=0 using Routh – Hurwitz criterion.

(b) Investigate the stability of the given characteristic equation using Routh-Hurwitz criterion F(s) = s^4 + $2s^3$ + $3s^2$ + 2s + 2.

6 What is Control system? Explain various types of control systems with examples and their advantages.

7 (a) Explain the operation of synchro transmitter and receiver pair. And mention the applications.

(b) Draw the torque-speed characteristics of A.C Servomotor and explain how it differs from normal induction motor.

8 (a) Derive the unit step response of a second order system.

(b) Find the steady state error for unit step, unit ramp and unit parabolic inputs for the following system G(s) = 10/[s (0.1s+1) (0.5s+1)].

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1 By means of relevant diagrams, explain the working principles of a open loop and closed loop control systems.

2 Construct the signal flow graph for the given set of algebraic equations and find the overall Gain using Mason gain formula.

$x_2 = a_{12}x_1 + a_{22}x_2 + a_{32}x_3 + a_{42}x_4 + a_{52}x_5$

$x_3 = a_{23}x_2$

$x_4 = a_{34}x_3 + a_{44}x_4$

$x_5 = a_{35}x_3 + a_{45}x_4$

3 Determine position error constant Kp, velocity error constant Kv, acceleration error constant Ka for Type 0 and Type 1 systems.

4 Determine the range of K for stability of unity feedback system whose open loop transfer function is G(s) =K/[s(s+1) (s+2)].

5 (a) Define the following terms:
(i) Gain cross over frequency (ii) Resonant peak
(iii) Resonant frequency (iv) Band width

(b) The damping ratio and natural frequency of oscillations of a second order system is 0.5 and 8 rad/sec respectively. Calculate the resonant peak and resonant frequency.

6 Obtain the range of values of K for which the system with the following open loop transfer function is stable. Use Nyquist stability criterion. G(s) H(s) = K(s+1)/ [s^2 (s+2)(s+4)].

7 Design a phase lag network for a system having G(s) =K/s(1+0.2s)^2 to have a phase margin of 30^0.

8 Given $\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$.

Find the solution of the state equation for the unit step input when, $X(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

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Code: 9A02503

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III B. Tech I Semester (R09) Regular Examinations, November 2011

CONTROL SYSTEMS

(Common to Electrical & Electronics Engineering, Electronics & Control Engineering, Electronics & Instrumentation Engineering & Electronics & Communication Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

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*****

1 A system is characterized by the following state space equations:

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}$$

(a) Find the transfer function of the system.

(b) Compute the state transition matrix.

2 Consider a unity feedback system with open loop transfer function is given by $G(s) = \frac{K}{s(s+8)}$

to meet the following specifications

(i) K_V>100sec^{-1} (ii) Phase margin $\Phi_m \geq 50^o$ (iii) Gain margin $G_m \geq$ 20 dB.

Design a suitable lead compensator.

3 (a) Explain the use of Nyquist stability criterion in the assessment of relative stability of a system.

(b) How do you select a Nyquist contour when there are poles on the imaginary axis in stability analysis of a given system?

4 (a) Define the following terms:

(i) Cut off rate (ii) Gain Margin

(iii) Phase margin (iv) Phase cross over frequency

(b) Draw the Bode Phase plot for the system having the following transfer function G(s) =100/[s (s^2+12s+100)].

5 (a) Using Routh– Hurwitz criterion investigate the location of roots of the given equation $s^6 + 2s^5 + 4s^4 + 4s^3 + 9s^2 + s + 6=0$.

(b) A unity feedback control system has an open loop transfer function G(s) =K/s (s^2 +4s+13). Determine: (i) Angles of asymptotes (ii) Angle of departure

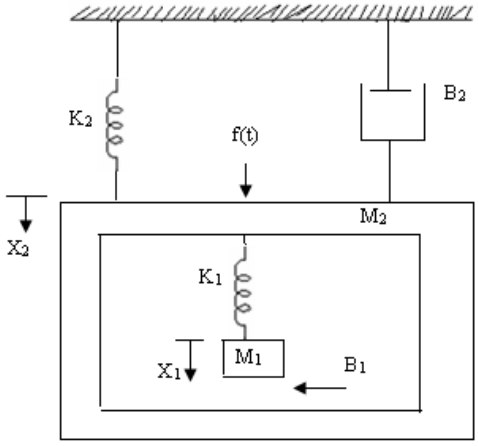
6 (a) What is meant by Steady state error? Derive the expression for steady state error.

(b) Find all the time domain specifications for a unity feedback control system whose open loop transfer function is given by G(s)=25/s(s+6).

Contd. in Page 2

7 Derive the Transfer Function for the field controlled D.C. servomotor with neat sketch.

8 Write the differential equations governing the mechanical system shown in figure. Draw the force-voltage and force-current electrical analogous circuits and verify by writing mesh and node equations.



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III B. Tech I Semester (R09) Regular Examinations, November 2011

POWER ELECTRONICS

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

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1 (a) Describe the different modes of operation of a thyristor with the help of its static characteristic.
(b) Explain the importance of breakdown voltages in SCR.

2 What is UJT firing circuit and explain it with suitable waveforms.

3 Describe the operation of 1-phase fully controlled bridge converter in the following modes:
(a) Rectifying mode (b) Inversion mode

4 (a) Describe the operation of single phase half-wave ac voltage regulator with the help of voltage and current waveforms. Also, derive the expression for average value of output voltage.
(b) A single-phase half-wave a.c voltage controller feeds power to resistive load of 6Ω from 230 V, 50Hz source. The firing angle of SCR is π/2. Calculate
(i) The RMS value of output voltage
(ii) The input power factor
(iii)The average input current.

5 (a) Derive an expression for output voltage in terms of duty-cycle for a step-up and step-down chopper.
(b) A step-up chopper is used to deliver load voltage of 500V from a 220V d. c. source. If the blocking period of the thyristor is 80μs. Compute the required pulse width.

6 (a) Explain the operation and principle of three phase semi-converter with R-load with associated waveforms.
(b) Compare 3-phase mid-point converters and bridge type converters and bring out important features.

7 (a) Draw and Explain the operation of 1-phase half controlled bridge converter with R-load with circuit diagram and necessary waveforms.
(b) Derive the load voltage and load current for α=30deg.for 1-phase half controlled bridge converter.

8 With the help of neat diagram and associated wave forms, explain the operation of 1- phase half bridge voltage sourced inverter with:
(a)Resistive load (b) Inductive load.

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Code: 9A02504

2

III B. Tech I Semester (R09) Regular Examinations, November 2011

POWER ELECTRONICS

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

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1 Derive the following expressions for 1-phase full bridge voltage sourced inverter
(a) RMS output voltage (b) Instantaneous output voltage
(c) n^{th} harmonic component (d) Switch voltage and current ratings

2 (a) For type-A chopper feeding an RLE load, show that the maximum value of average current rating for the freewheeling diode, in case load current remains constant, is given by $\left[\frac{Vs}{4R}\left(1-\frac{E}{Vs}\right)^2\right]$.

(b) For the ideal type-A chopper circuit, E_{dc}=220V, chopping frequency=500Hz; duty cycle α=0.3 and R=1Ω; L=3mH; and E_b=23V. Compute:
(i) Check whether the load current is continuous or not.
(ii) Average output current and average value of source current.
(iii) Maximum and minimum values of steady-state output current.
(iv) RMs values of first, second and third harmonics of load current.

3 (a) Analyze the output voltage waveform of single phase ac voltage regulator into various harmonics with Fourier series and find expression for amplitude of nth harmonic, $E_{n\,m}$ and its phase ¢$_{n.}$

(b) A single-phase half-wave ac voltage controller using two SCRs in antiparallel with a diode feeds 1kW, 230 V heater. Find the load power for a firing angle delay of (i) 0^0 (ii)180^0 (iii)70^0

4 (a) Derive the average output voltage, load current expressions for six pulse converter.

(b) A 3-phase fully controlled bridge rectifier is connected to 3-phase ac supply of 400V, 50Hz and operates at a firing angle α =30^0. The load current is maintained constant at 12A and the load voltage is 330V find:
(i)Source inductance (ii) Load resistance (iii)Overlap angle

5 (a) What is thyristor and what is its importance in the power control.

(b) Explain how thyristor is used as a switch.

6 What is Snubber circuit? Explain with a neat circuit and give the procedural steps for design.

7 (a) Draw and explain the operation of 1-phase half controlled bridge converter with RL load for discontinuous and continuous current mode of operations.

(b) Sketch and explain the waveforms for α=45deg.for above diagram.

8 (a) Explain the operation of a 1-phase fully controlled bridge converter with RL loads.

(b) Describe in detail with discontinuous conduction mode with associate waveforms.

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Code: 9A02504

3

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*****

1 (a) Explain the differences between saturation of a BJT and saturation of a MOSFET.
(b) What are the advantages and disadvantages of a MOSFET?

2 Discuss in detail the following:
(a) Line Commutation
(b) Resonant-Pulse Commutation

3 Derive an expression for the
(a) Average load voltage (b) Average load current (c) RMS load voltage,
For single-phase half controlled converter with resistive and inductive load

4 (a) Derive the expression for the input power factor of 1-phase fully controlled bridge rectifier.
(b) A single phase fully controlled bridge converter is supplied at 230V, 50Hz with source inductance of 3mH. Neglect resistance voltage drop, when the converter is operating at firing angle of 45deg.and the load current is constant at 15A. Determine the load voltage.

5 (a) Discuss the operation of a single-phase voltage controller with RL-load when firing angle α is less than, or equal to, load phase angle ¢. Hence show that for α less than ¢, output voltage of the ac voltage cannot be regulated.
(b) A single-phase half-wave a.c voltage controller feeds power to resistive load of 12Ω from 220 V, 50Hz source. The firing angle of SCR is π/3. Calculate
(i) The RMS value of output voltage
(ii) The input power factor
(iii) The average input current.

6 (a) Distinguish between three pulses and six pulses converters.
(b) Explain the operation of three phase mid-point converter with associate waveforms.

7 (a) Draw the schematic of type E chopper and explain the working of the same.
(b) Enumerate the advantages of the type-A chopper over the other choppers.

8 (a) Explain the Operation of 1-phase half bridge inverter with neat diagram.
(b) Derive the expressions for steady state analysis of 1-phase inverter.

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Code: 9A02504

4

III B. Tech I Semester (R09) Regular Examinations, November 2011

POWER ELECTRONICS

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

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*****

1 The full bridge inverter has a source voltage E_{dc}=220V. The inverter supplies an RLC load with R=10 Ω, L=10mH and C=52μF. The inverter frequency is 400Hz. Determine
(i) the RMS load current at fundamental frequency
(ii) the RMS value of load current
(iii) the power O/p
(iv)the average supply current

2 (a) show that the expression for per unit ripple in the load current is given by $\frac{\left(1-e^{-\alpha T/T_a}\right)\left(1-e^{-(1-\alpha)T/T_a}\right)}{\left(1-e^{-T/T_a}\right)}$ where T=Chopping period, α=duty cycle and $T_a = L/R$

(b) For type A chopper, source voltage V_s=220V chopping frequency=500Hz; T_{on}=800μs and R=1Ω; L=1mH; and E=72V. sketch the time variations of
(i) Gate signal i_g. (ii) Load current i_0. (iii) Load voltage v_0.

3 (a) Give the various configurations of three-phase a.c. regulators.
(b) List the important points of comparison between a.c. regulators circuits.

4 (a) Explain clearly the continuous mode of operation for 3-phase six pulse converters with RL-load with suitable waveforms.
(b) Explain the purpose of source impedance on the operation of three phase converters.

5 (a) Draw and discuss V-I characteristics of Light activated SCS.
(b) Draw and discuss V-I characteristics of TRIAC.

6 Discuss in detail the following:
(a) Resonant-Pulse Commutation (b) Impulse Commutation

7 Derive an expressions for
(a) Average load voltage (b) Average load current (c) RMS load voltage.
For a M-2 configuration with resistive and inductive load.

8 (a) Explain the operation of 1-phase fully controlled bridge converter with the help of neat diagram.
(b) A single phase fully-controlled bridge circuit is used for obtaining a regulated dc output voltage. The RMS value of the ac input voltage is 230V, and the firing angle is maintained at π/3, so that the load current is 4A. Calculate:
(i) The dc output voltage (ii) Active and reactive power input.

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Code: 9A02505

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL MACHINES III
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) What are the various terms related with windings? Explain each of them with their importance.

(b) Give the winding calculation for a 3-phase armature winding with following details, pole = 8, number of slots = 54, double layer windin.

2 (a) Draw and explain the phasor diagram of an alternator at lagging p.f.
(b) A 3-phase, star connected alternator is rated at 1600 kVA, 13500 V. The armature effective resistance & reactance is 1.5Ω/ph. & 30 Ω/ph. respectively. Calculate percentage regulation for a load of 1280 kW at power factors of
(i) 0.6 lagging. (ii) 0.6 leading.

3 (a) Explain the procedure how to bring the incoming machine to operate in parallel with running machines.
(b) A 2-pole, 50Hz, 3-phase turbo alternator is excited to generate a bus-bar voltage of 11kV on no load. The machine is star connected and the short circuit current for this excitation is 1000 A. calculate the synchronizing power per degree of mechanical displacement of the rotor and the corresponding synchronizing torque.

4 The open and short circuit test readings for a 3-phase, 1200 kVA, 2.2 kV, 50 Hz star connected alternator .having an effective per phase resistance of 0.22 ohm gave the following results:

I_f (A)	10	20	25	30	40	50
$V_{O.C.}$ terminal (V)	800	1500	1760	2000	2350	2600
$I_{S.C}$ (A)	-	200	250	300	-	-

Draw the characteristic curves and estimate the full-load percentage regulation at
(a) 0.8 p.f. lagging (b) 0.8 p.f. leading

5 (a) Discuss with suitable phasor diagrams the behavior of 3-phase synchronous motor at no load with the change of excitation.
(b) A 400 V, 7.46 kW, 3-phase synchronous motor has synchronous impedance of (0.35+ j2.8) ohm/ph. Find graphically or otherwise, the voltage to which the motor must be excited to give the full load output at 0.867 leading power factor. Assume an efficiency of 88%.

Contd. in Page 2

6 (a) Described the constructional feature and principle of operation of a shaded pole motor.
(b) Explain the ‘doubly removing field theory’ related to single-phase induction motor.

7 (a) Explain the performance characteristics of AC series motor.
(b) Compare variable reluctance stepper motor & permanent magnet stepper motor.

8 (a) Explain the various starting methods of synchronous motor.
(b) Explain the characteristics of synchronous induction motor.

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Code: 9A02505

2

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL MACHINES III
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) A 3-phase, 10 pole machine has 96 slots. Construct the winding table for one basic unit of poles. For the basic unit determine the distribution of coil groups and the phase sequence.
(b) Define the pitch factor and the distribution factor. Derive the expressions for it in terms of slot pitch, number of slots per pole per phase and short chording.

2 A 200 kVA, 480 V, 50Hz, star connected synchronous generator with rated field current of 5A was tested and the fallowing data was obtained.
O.C test: - 540V between lines on open circuit.
S.C test:- 300A
When D.C voltage of 10V was applied to two of its terminals, a current of 25 amps was measured, find the value of synchronous impedance, synchronous reactance, voltage regulation at 0.6 p.f leading?

3 Explain the potier-triangle method of detecting the voltage regulation of an alternator.

4 (a) What is an infinite bus? State the characteristics of an infinite bus. What are the operating characteristics of an alternator connected to an infinite bus?
(b) A 3 MVA, 6-pole alternator runs at 1000 r.p.m in parallel with other machines on 3.3 kV bus-bars. The synchronous reactance is 20%.Calculate the synchronizing power per one mechanical degree of displacement and the corresponding synchronizing torque.

5 (a) Explain synchronous condenser.
(b) A 400 V, 8 kW, 3-phase synchronous motor has a negligible resistance and a synchronous reactance of 8 ohm per phase. Determine the maximum current and the corresponding induced e.m.f for full load conduction. Assume an efficiency of 88%.

6 Explain the procedure to plot a ‘V curves’ with the help of ‘power circle’ and ‘excitation circle’.

7 (a) Why single phase motors are not self starting?
(b) Explain how the direction of a single-phase induction motor can be reversed.

8 (a) Compare AC series motor & Universal motor.
(b) Compare variable reluctance stepper motor & permanent magnet stepper motor.

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Code: 9A02505

3

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL MACHINES III
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Why stationary armature is preferred over rotating armature? Give the classification of alternators based on rotor used.
(b) Calculate the speed and open-circuit line and phase voltages of a 4-pole, 3-phase, 50 Hz star-connected alternator with 36 slots and30 conductors per slot. The flux per pole is 0.0496 wb and is sinusoidally distributed.

2 (a) Explain the characteristics and nature of harmonics present in generated emf of alternator.
(b) The flux density distribution in the air gap of an alternator is $B = B_1 \sin\theta + B_3 \sin 3\theta + B_5 \sin 5\theta$ wb/m^2, where $B_3 = 0.3B_1$ & $B_5 = 0.2B_1$. The total flux per pole is 0.08 wb. The coil span is 80% of pole pitch. Find the RMS value of EMF induced in single turn machine.

3 (a) Discuss the MMF method of calculating voltage regulation.
(b) A 3-phase, star-connected alternator is rated at 1600 kVA and 13500 V. The armature effective resistance and synchronous reactance per phase are 1.5Ω and 30 Ω respectively, calculate the percentage regulation for a load of 1280 kW at P.F of:
(a) 0.8 lagging (b) unity and (c) 0.8 leading.

4 Describe any two methods for synchronizing alternators.

5 (a) Compare (all 3-phase) synchronous motor, induction motor and transformer.
(b) A synchronous motor takes 25 kW from 400V supply mains. The synchronous reactance of the motor is 4 ohm. Find the power factor at which the motor would operate when the exacting current is also adjusted that the generated e.m.f is 500V.

6 Write short notes on the following:
(a) 'V' and 'inverted V' curves of synchronous motor.
(b) Synchronous condenser for power factor improvement.

7 (a) Explain the operation of 'split phase single phase Induction motor' with vector diagram.
(b) Explain the necessary arrangements made to make single phase induction motor self starting & with neat diagram explain the operations of same.

8 With neat diagram explain the construction and working of:
(a) Universal motor and (b) Variable Reluctance stepper motor.

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Code: 9A02505

4

III B. Tech I Semester (R09) Regular Examinations, November 2011

ELECTRICAL MACHINES III

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) What are harmonics? Explain how harmonics are present in generated e.m.f of alternator. What are the effects of harmonics an generated emf?

(b) A star connected 3-phase alternator has an induced EMF of 400 V between the lines. Due to presence of third harmonic component, the phase voltage is 244V. Find the value of 'I' and the value of third harmonic voltage.

2 (a) Explain the classification of alternator based on rotor used with the help of neat diagrams.

(b) Calculate the distribution factor for a single phase alternator having 6 slots/pole:
i) When all the slots are wound and
ii) When only 4 adjacent slots/pole are wound and the remaining being not wound.

3 (a) Describe the determination of X_d and Xq, from slip test of salient pole alternator.

(b) A 500V, 50 kVA, 1-phase alternator has an effective resistance of 0.2.A field current of 10A produces an armature current of 200A on short circuit and an emf of 450V on open circuit. Calculate: (i) Synchronous impedance and reactance
(ii) Full-load regulation with 0.8p.f. Lagging.

4 (a) Why parallel operation of alternators is necessary? Why are the advantages of connecting alternators in parrel?

(b) A 4.5 kVA, 50Hz, 3-phase synchronous generator having a synchronous reactance of 0.3 pu is running at 1500 r.p.m is and excited voltage 11 kV. If the rotor deviates slightly from its equilibrium position, what is the synchronizing torque in N-m per degree mechanical displacement?

5 A 3-phase, 18 MVA, 10 pole, 50 Hz, 11 kV, star connected synchronous motor has X_d = 5; Xq=3. It has negligible armature resistance. Calculate the following on full load at 0.8 pf leading: (a) The excitation voltage
(b) Power
(c) Maximum value of power angle and corresponding power.

6 (a) Discuss the methods of starting of synchronous motor.

(b) Show that the current locus of a synchronous motor developing constant power is a circle; determine its centre and radius.

Contd. in Page 2

7 (a) Explain the constructional details and principal of operation of a split phase induction motor. List out its industrial applications.

(b) A 220 V, 4 –pole, 50 Hz, capacitor split phase motor has the following impedance at stand still.
Auxiliary winding, Ra=3Ω; Xa=6Ω
Main winding Rm=2Ω, Xm=5Ω.
The resistance of the rotor winding is 0.5Ω.assuming the no of turns of the main winding and auxiliary winding are equal, estimate the starting torque and the capacitance to be inserted to get maximum starting torque.

8 (a) Draw and explain the torque - speed characteristics of single-phase induction motor based on the concept of double field revolving theory.

(b) Describe the construction and principle of operation of a split phase motor.

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Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to Civil Engineering, Bio-Technology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1 Define demand. Explain the various factors that influence the demand for a car?

2 What is elasticity of demand? Briefly various types of elasticity of demand.

3 Define B.E.P. How do you determine it? Show graphical presentation of B.E.A?

4 Explain important features of perfect competition market and how price is determined under perfect market?

5 What is sole trade form of organization? Explain the features, advantages and limitations of sole trader?

6 Consider the case of the company with the following 2 investment alternatives (A and B), each costing Rs. 9 lakhs each. The details of the cash in flows are given below:

Cash in flows	(Rs. In lakhs)	
	A	B
Year 1	3,00,000	6,00,000
Year 2	5,00,000	4,00,000
Year 3	6,00,000	3,00,000

The cost of capital is 10% per year. Which one do you choose under?
a) NPV method b) IRR method.

7 Explain the following:
a) Types of accounts with suitable examples.
b) Double-entry book keeping.
c) Journal.

8 What is meant by ratio analysis? Explain its objectives and importance in financial analysis.

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Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to Civil Engineering, BioTechnology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1 Define the "Law of Demand". What are its assumptions and exceptions?

2 Define elasticity of demand. Explain the factors governing it.

3 Explain the following:
a) Explicit cost and implicit cost.
b) Fixed cost and variable cost.
c) Opportunity cost.

4 Explain how price is determined in case of perfect competition. Illustrate.

5 Explain the features of sole trade form of organization. Discuss the advantages and limitations of sole trader.

6 What are the components of working capital? Explain each of them.

7 During January 2010, Naveen transacted the following business

Date		Rs.
1	Commenced business with cash	40,000
2	Purchased goods on credit from shyam	30,000
3	Received cash from murthy as advance goods ordered by him	3,000
4	Paid wages	500
5	Goods returned to shyam	200
6	Goods sold to kamal	10,000
7	Goods returned by kamal	500
8	Paid into bank	500
9	Goods sold for cash	750
10	Bought goods for cash	1,000

Journalize the above transactions and prepare cash accounts.

8 What are the limitations of ratio analysis? Does ratio analysis real measurements the financial performance of a company?

*****

Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to Civil Engineering, BioTechnology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1 Define managerial economics. Explain its nature and scope.

2 What is demand forecasting? Explain various factors governing demand forecasting.

3 Define B.E.P. How do you determine it show graphical presentation of B.E.A?

4 Define market. Explain how the markets are classified?

5 Explain the need of public sector enterprise in India. Do you think public sector enter prises as a whose have fulfilled that need.

6 Consider the case of the company with the following two investment alternatives (A and B) each costing Rs. 9 lakhs each. The details of the cash in flows are given below:

Cash in flows	(Rs. In lakh)	
	A	B
Year 1	3,00,000	6,00,000
Year 2	5,00,000	4,00,000
Year 3	6,00,000	3,00,000

The cost of capital is 10 % per year. Which one do you choose under
a) NPV method
b) IRR method.

7 Explain the following:
a) Double-entry book keeping.
b) Journal.
c) Cashbook.

8 What is meant by ratio analysis? Discuss its objectives and limitations.

*****

Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

(Common to Civil Engineering, BioTechnology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 What is managerial economics? Explain its focus areas.

2 Enumerate the factors involved in demand forecasting. State the purpose of forecasting, both short-term and long-term.

3 With the following information calculate
   a) P/V Ratio.
   b) Fixed cost.
   c) B.E.P
   d) Profit on estimated sales of Rs.1, 25,000.

	Period–I (Rs)	Period–II(Rs)
Sales	1,00,000	1,20,000
Profit	15,000	23,000

4 Compare and contrast between perfect competition and monopoly.

5 What are the reasons for joint stock company being popular as a form of organization?

6 Define “Accounting Rate of Return” (ARR) and ‘Pay Back Period’ method? Compare and contrast between two with suitable examples.

7 In the books of Hari and CO. Prepare trading, Profit & Loss Account and balance sheet for the year ending 31st march 2010, from the following particulars.

		Rs.
1	Opening stock	5,000
2	Salaries	500
3	Sales	70,400
4	Motar car	25,000
5	Travelling exep.	700
6	Cash in hand	5,000
7	Capital	30,000
8	Interest	1800
9	Bills recievables	4000
10	Wages	2000
11	Furniture&Fixtures	3600
12	Sundry debitors	14,000
13	Lighting	350
14	Printing&Stationary	100
15	Postage	50
16	Sales returns	6000
17	Purchases	25,000
18	Commission paid	1500
19	Bank balance	10,000
20	Advertisement	1000
21	Sundry creditors	5200

Adjustments:

1	Closing stock	40,000
2	Outstanding salaries	150

8 Explain and illustrate the types and significance of
   a) Liquidity Ratio’s.
   b) Solvency Ratios.

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Code: 9A02501

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL & ELECTRONIC MEASUREMENTS
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Explain how the current range of PMMC instrument is extended with the help of shunts.
(b) Discuss about Errors and Compensations of measuring instruments.

2 (a) List the advantages and disadvantages of instrument transformers.
(b) Discuss phase angle error.

3 (a) Explain driving system, moving system and breaking system in a 1-Φ induction type energy meter.
(b) Write short notes on three phase energy meter.

4 (a) Write short notes on polar standardization.
(b) Explain the operation of DC Crompton's potentiometer.

5 (a) With neat figure explain the working of a wheat stone's bridge.
(b) How do you measure inductance using Maxwell's bridge?

6 (a) Discuss A.C testing.
(b) Write explanatory notes on flux meter.

7 (a) With neat figure explain the working of a CRO.
(b) How do you measure phase and frequency using CRO?

8 (a) Explain the function of digital tachometer.
(b) Discuss the working of an integrating type voltmeter.

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Code: 9A02501

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL & ELECTRONIC MEASUREMENTS
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Explain the method of reducing errors in measuring instruments.
(b) With a neat figure explain dynamometer.

2 (a) Explain the working of a dynamometer.
(b) Discuss CT and PT.

3 (a) Explain the measurement of LPF and UPF.
(b) What is the significance of driving and breaking torques in a 1-Φ induction type energy meter?

4 (a) Explain the measurement of unknown resistance using DC Crompton's potentiometer.
(b) List the applications of potentiometer.

5 (a) Explain the measurement of high resistance-loss of change method.
(b) Explain the working of Anderson bridge.

6 (a) Explain the determination of B-H loop method of reversals.
(b) Write short notes on Lissajous pattern.

7 (a) Explain the constructional detail and working of a CRT.
(b) List the applications of CRO.

8 (a) Explain the working of a digital frequency meter.
(b) List the advantages of digital voltmeter.

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Code: 9A02501

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL & ELECTRONIC MEASUREMENTS
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Derive an expression for the deflecting torque and control torque.
(b) Give the general requirements for the construction of shunts.

2 (a) Discuss the different errors of PMMC.
(b) With neat figure explain the features of moving iron type PF meter.

3 (a) What is a phase meter? Discuss the merits and demerits of it.
(b) With a neat sketch explain the working of a single phase dynamometer wattmeter.

4 (a) With neat figure explain the working of an AC potentiometer.
(b) Discuss the significance of standardization.

5 (a) How do you measure capacitance using Wien's bridge? Explain.
(b) Explain the sensitivity of wheat stone's bridge and how do you measure it.

6 (a) Discuss the constructional details of Ballistic galvanometer.
(b) List the applications of CRO.

7 (a) How do you measure current and voltage using CRO?
(b) Discuss horizontal and vertical amplifiers of CRO.

8 (a) Explain the method of measurement of voltage using Ramp type voltmeter.
(b) List the advantages of digital multimeter and limitations of the same.

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4

Code: 9A02501

III B. Tech I Semester (R09) Regular Examinations, November 2011
ELECTRICAL & ELECTRONIC MEASUREMENTS
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Explain the working of a universal shunt used for multirange ammeter.
(b) Write the significance of control and damping torques.

2 (a) Define transformation ratio, nominal ratio and turns ratio as used for instrument transformers.
(b) List the advantages and disadvantages of moving iron type instruments.

3 (a) Discuss the errors and compensation of single phase energy meter.
(b) Obtain the expression for deflecting and control torques of a double element wattmeter.

4 (a) How do you measure current and voltage using potentiometer?
(b) Discuss coordinate type of standardization.

5 (a) Explain the working of a Kelvin's double bridge for measuring low resistance.
(b) Explain the features of Desauty bridge with a neat sketch.

6 (a) Derive the equation of motion in Ballistic galvanometer.
(b) Explain six point methods.

7 (a) What do you mean by Lissajous patterns? How do you measure them using a CRO?
(b) Draw a neat figure and explain the working of a CRO.

8 (a) Explain the method of measuring voltage in successive approximation method.
(b) Give salient features of digital multimeter.

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