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Code No: R22026 **R10** SET - 1

II B. Tech II Semester Regular Examinations August - 2014
CONTROL SYSTEMS
(Com. to EEE, ECE, EIE, ECC, AE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) State essential differences by giving suitable examples and also highlight their merits and demerits for open loop and closed loop systems.
   b) Write the differential equations for the Mechanical rotational system shown in Figure 1. Draw the Torque-voltage and Torque-current electrical analogous circuits. (8M+7M)

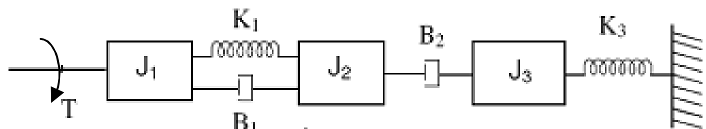

Figure 1

2. a) Derive the transfer function of armature controlled dc servomotor.
   b) For the system illustrated by the signal flow graph shown in Figure 2, obtain the overall transfer function by means of Mason's formula. (7M+8M)

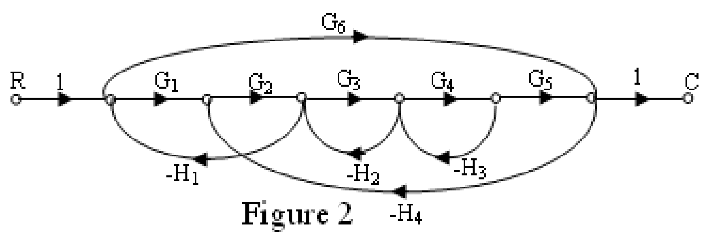

Figure 2

3. a) Illustrate the effects of proportional integral control on transient performance of feedback control systems.
   b) For a unity feedback system with open loop transfer function $G(s) = \dfrac{50}{(1+0.1s)(1+2s)}$ determine position, velocity and acceleration error constants. (8M+7M)

4. a) Construct Routh array and determine the stability of the system represented by the characteristic equation, $s^7 + 7s^6 + 20s^5 + 24s^4 + 24s^3 + 20s^2 + 20s + 15 = 0$. Comment on the location of the roots of characteristic equation.
   b) Sketch the root locus plot of unity feedback system having open loop transfer function given by: $G(s) = \dfrac{K(s+1.5)}{s(s+1)(s+5)}$. (7M+8M)
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5. The open loop transfer function of a unity feedback control system is given by:

$$G(s) = \frac{1000}{s(0.1s+1)(0.001s+1)}.$$

Draw Bode plots and from these plots determine gain margin and phase margin. (15M)

6. For a unity feedback system having open loop transfer function given by

$$G(s) = \frac{K}{s(s+1)(s+2)}.$$

Find the range of values of K for closed loop system stability using Nyquist criterion. (15M)

7. a) Draw electrical network configuration for phase-lead compensator and hence derive the transfer function for the same.
   b) Explain the procedural steps to design a phase lag compensator using Bode analysis.
   (7M+8M)

8. a) Explain about the concept of controllability and observability.
   b) Check the controllability and observability of the system described by (7M+8M)

$$\dot{x} = Ax + Bu$$
$$y = Cx$$

With

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad and \; C = \begin{bmatrix} 3 & 4 & 1 \end{bmatrix}$$

Code No: R22026 **R10** SET - 2

II B. Tech II Semester Regular Examinations August - 2014
CONTROL SYSTEMS
(Com. to EEE, ECE, EIE, ECC, AE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain the necessity and effect of feedback in control systems?
   b) Determine the transfer function $E_o(s)$ to $E_i(s)$ for the network shown in figure (1).

(7M+8M)

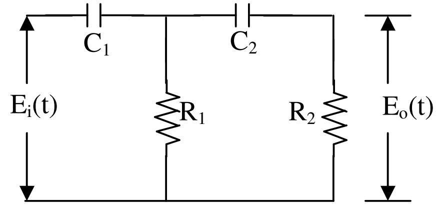

Figure (1)

2. a) Derive the transfer function for AC servomotor.
   b) Obtain the overall transfer function C(s)/R(s) of the system shown in figure 2 using block diagram reduction technique. Draw the signal flow graph for the same system and verify the result by using Mason's formula. (8M+7M)

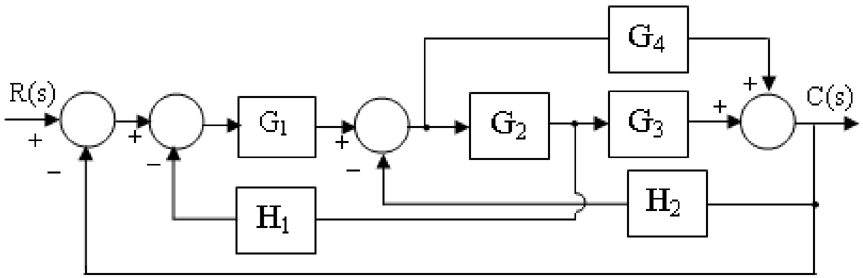

Figure 2

3. a) Sketch the unit step response of a prototype second order system and show that the percentage over shoot is a function of a damping factor alone.
   b) For a unity feedback system the open loop transfer function is given by
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4. a) Open loop transfer function of a unity feedback system is

$$G(s) = \frac{K}{(s+1)(s+3)(s^2+6s+25)}$$

By applying Routh Criterion, determine the values of K which will cause sustained oscillations in the closed-loop system. What are the corresponding oscillations of frequency?

b) Sketch the root locus diagram for the unity feedback system having open loop transfer function

$$G(s) = \frac{K}{s(s+4)(s^2+4s+20)}$$

(7M+8M)

5. Draw Bode plots for $G(s)H(s) = \frac{70}{s(0.25s+1)(0.1s+1)}$.

Determine gain margin and phase margin from these plots. (15M)

6. The open loop transfer function of a unity feedback control system is $G(s) = \frac{K}{(s+1)(2s+1)}$.

Use Nyquist stability criterion to determine the critical value of gain 'K' for stability. (15M)

7. a) Draw electrical network configuration for phase-lag compensator and hence derive the transfer function for the same.

b) Explain the procedural steps to design a phase lead compensator using Bode analysis.

(7M+8M)

8. a) What do you understand by state transition matrix? State and prove its properties.

b) Determine the time response of the following system

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$(t) = [1 \quad 0]\begin{bmatrix} x_1 \end{bmatrix}$$

Code No: R22026 **R10** SET - 3

II B. Tech II Semester Regular Examinations August - 2014
CONTROL SYSTEMS
(Com. to EEE, ECE, EIE, ECC, AE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What is the classification of control systems and discuss the importance of mathematical modeling of a control system.
   b) For the geared system shown below in Figure 1, find the transfer function relating the angular displacement θ_L to the input torque T_1, where J_1, J_2, J_3 refer to the inertia of the gears and corresponding shafts. N_1, N_2, N_3, and N_4 refer to the number of teeth on each gear wheel. (7M+8M)

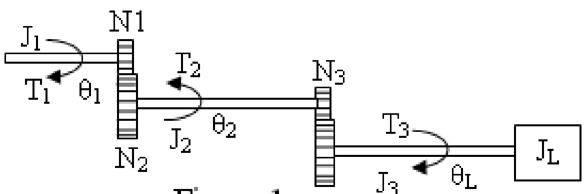

Figure 1

2. a) Explain the working of Synchro transmitter and receiver.
   b) For the system illustrated by the signal flow graph shown in Figure 2, obtain the overall transfer function by means of Mason's formula. (8M+7M)

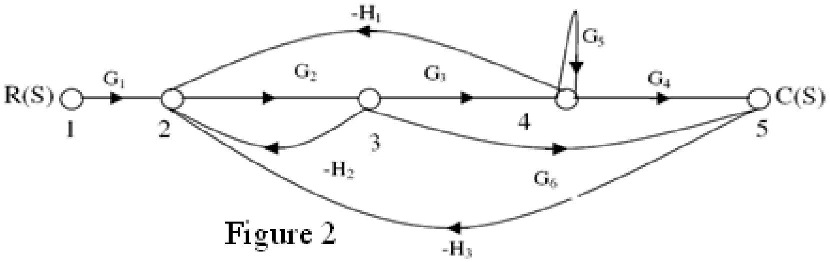

Figure 2

3. a) Illustrate the effects of proportional derivative control on transient performance of feedback
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4. a) For the system whose characteristic equation is given by
   $F(s) = s(s+5)(s+6)(s^2+4s+25) + K(s+3) = 0,$
   Determine the values of K which will cause sustained oscillations in the closed-loop system using Routh Criterion. What are the corresponding oscillations of frequency?
   b) Sketch the root locus for the unity feedback system having open loop transfer function

$$G(s) = \frac{K}{s(s+4)(s^2+4s+40)}.$$ (7M+8M)

5. The open loop transfer function of a unity feedback control system is given by
   $G(s) = \frac{K}{s(1+0.2s)(1+0.02s)}.$
   Draw Bode plots in magnitude and phase and hence determine the following:
   i) Gain margin when K = 1.
   ii) The value of K for gain margin to be 20 dB.
   iii) The phase margin corresponding to the above value of K.
   iv) Gain margin, phase margin and corresponding frequencies for K = 10. (15M)

6. Using Nyquist criterion determine condition for stability for the unity feedback system having open loop transfer function

$$G(s) = \frac{K}{s(1+\tau_1 s)(1+\tau_2 s)}.$$ (15M)

7. a) Draw electrical network configuration for phase lag-lead compensator and hence derive the transfer function for the same.
   b) Explain the design procedure for lag- lead compensation in frequency domain. (7M+8M)

8. a) Define the term state variable. What are the advantages of state space representation?

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II B. Tech II Semester Regular Examinations August - 2014

CONTROL SYSTEMS

(Com. to EEE, ECE, EIE, ECC, AE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions

All Questions carry **Equal** Marks

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1. a) Define the transfer function and discuss the limitations in transfer function representation.
   b) Write the differential equations for the Mechanical system shown in Figure 1. Determine the transfer function . (7M+8M)

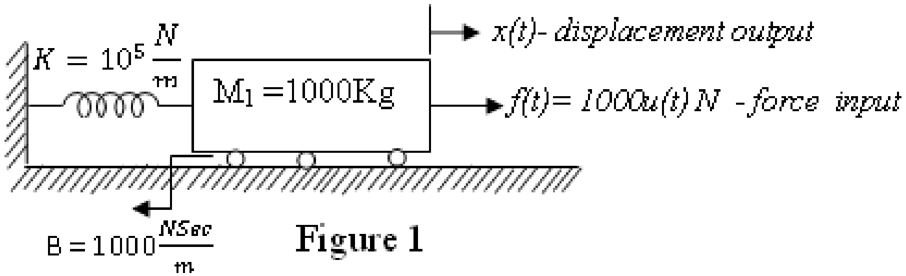

Figure 1

2. a) Derive the transfer function of field controlled dc servomotor.
   b) Obtain overall transfer function C(s)/R(s) of the system shown in figure 2 using block diagram reduction technique. Draw the signal flow graph for the same system and verify the result using Mason's gain formula. (7M+8M)

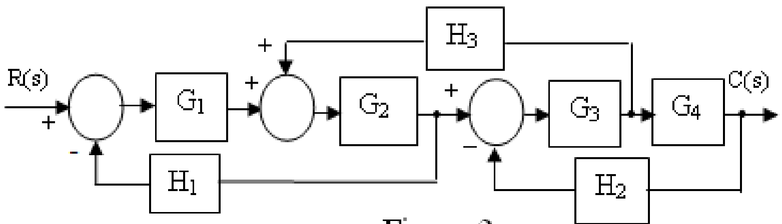

Figure 2

3. a) Illustrate the effect of the value of damping ratio on the location of closed-loop poles of a
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4. a) Briefly explain about Routh-Hurwitz criterion.

   b) A feedback control system has loop transfer function $G(s)H(s) = \frac{K}{s(s+2)(s+10)}$.

   Sketch the root locus and determine the range of ‘K’ for which the system is stable.

   (6M+9M)

5. A unity feedback control system has forward path transfer function as $G(s) = \frac{36}{(s+1)(s+3)^2}$.

   Construct Bode plots and find the following:

   i) Gain crossover and phase crossover frequencies.

   ii) Gain margin and phase margin. (15M)

6. Plot the Nyquist plot for $G(s)H(s) = \frac{K(s-1)}{s(s+1)}$.

   For K > 0 find the number of closed loop poles in the right half s-plane and comment on stability. (15M)

7. a) Design a lag compensator that will provide a phase lag of 50^0 and alternation of 15 dB at 2 rad/sec. Also determine the transfer function

   b) Write the transfer function of a lag compensator and draw its pole zero and frequency response plots. (7M+8M)

8. a) Explain the concept of state, state various and stoke model.

   b) Find $x_1(t)$ and $x_2(t)$ of the system described by $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ where the initial conditions are $x_1(0) = 1$ and $x_2(0) = -1$. (7M+8M)

Code No: R22025 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, August - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) For a star connected three phase system, derive the relationship between the i) phase voltages and line voltages ii) phase currents and line currents
   b) A balanced delta connected load takes a line current of 15 A when connected to a balanced three phase 400 V system. A wattmeter with its current coil in one line and its potential coil between the two remaining lines read 2000 W. Determine the load impedance.

2. The following impedances are connected in the form of a star connected unbalanced system and it is connected to a 400 V, 3-Ø supply: $Z_R = 4\angle 30^0\ \Omega$, $Z_Y = 5\angle 20^0\ \Omega$, $Z_B = 10\angle 0^0\ \Omega$. Calculate the line currents by using i) loop method ii) Star-delta transformation technique.

3. For the circuit shown in Figure 3. Find $i_1(t)$ and $i_2(t)$ for t > 0. Assume zero initial conditions.

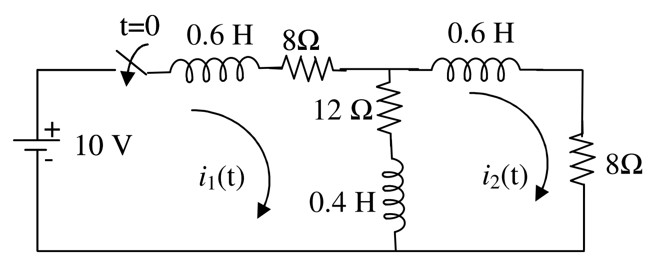

Figure 3

4. A series RL circuit with R=50 ohms and L= 0.2 H has a sinusoidal voltage source $20\sin(500t+\phi)$ applied at time when $\phi = 0$. i) Find the expression for current ii) At what value of ϕ must the switch be closed so that the current directly enter steady state.

5. a) Express y-parameters in terms of *h*-parameters and *ABCD*-parameters.
   b) Find the y-parameters for the network shown in Figure 5.

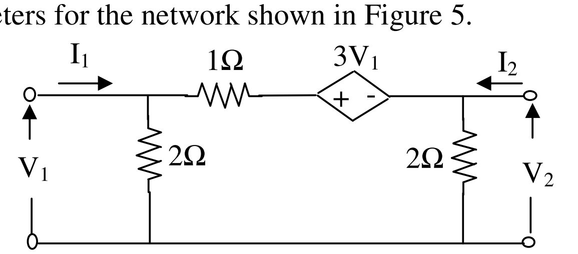

Figure 5

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6. a) Two 2-port networks N_1 and N_2 are connected in parallel. The z-parameters of N_1 and N_2 are $Z_{N_1} = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $Z_{N_2} = \begin{bmatrix} 5 & 7 \\ 7 & 8 \end{bmatrix}$. Determine z-parameters of combined parallel 2-port network.

   b) Derive the ABCD parameters for the network shown in Figure 6 as a connection of two identical networks.

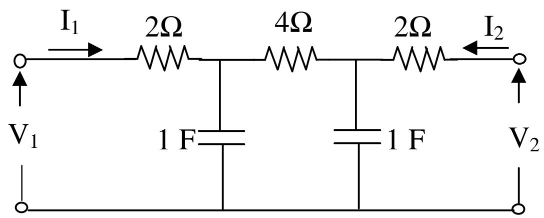

Figure 6

7. a) Explain about the exponential Fourier series.

   b) Obtain the trigonometric Fourier series for the waveform shown in Figure 7. Write down the amplitude and phase spectrum.

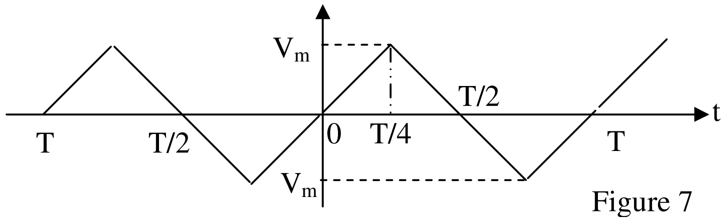

Figure 7

8. a) Explain the properties and applications of Fourier transform.

   b) Determine the Fourier transform of the signum function.

Code No: R22025 **R10** SET - 2

II B. Tech II Semester Supplementary Examinations, August - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain how the reactive power is measured in a 3-phase balanced system.
   b) In a three phase balanced load, each arm consists of a resistor of 20 ohms, an inductance of 0.5 H and a capacitor of 120 μF connected in series. The supply is a balanced 3-phase 415 V, 50 Hz. Calculate the line current, total power consumed in the load when the three arms are connected in star and delta.

2. A 400 V, 3-phase supply is connected to an unbalanced load having three impedances of $Z_R = 4 + j3\,\Omega$, $Z_Y = 4 - j3\,\Omega$, $Z_B = 2.5\,\Omega$. Also $Z_N = 0.3 + j1\,\Omega$. Find phase currents, voltage across loads and neutral current.

3. a) In the circuit shown in Figure 3(a), the switch S is in position 1 for 0.01 seconds and then changed to position 2. Find the time at which the current is zero and reversing its direction.
   b) In the circuit shown in Figure 3(b), find the time when the voltage across the capacitor becomes 25 V, after the switch is closed at t=0.

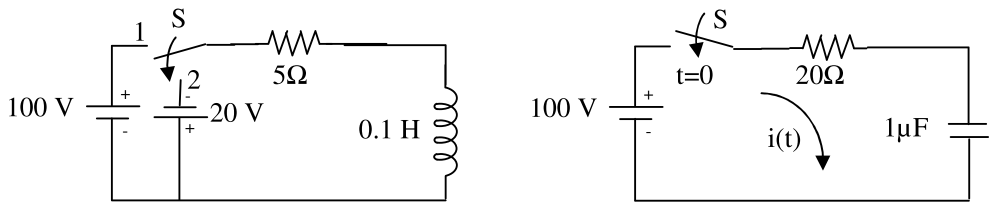

Figure 3(a) Figure 3(b)

4. a) A sinusoidal voltage $v(t) = V\sin 100\pi t$ is applied at t = 0.01 seconds to a series R-L circuit,
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5. a) Why Z-parameters are known as open circuit parameters and Y-parameters are known as short circuit parameters? Explain.
   b) Find the h-parameters of the following network shown in Figure 5.

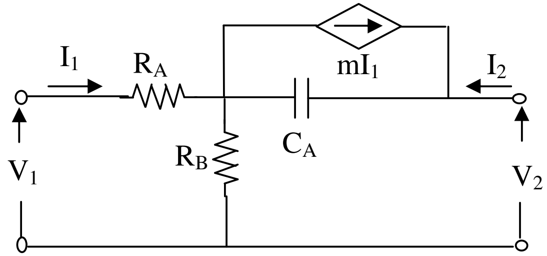

Figure 5

6. Find the y-parameters for the network shown in Figure 6 by considering it to be a parallel combination of a resistive network referred to as N_a and a capacitive network referred to as N_b.

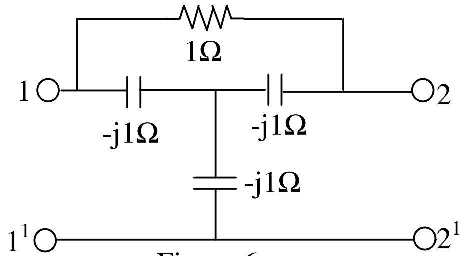

Figure 6

7. In the circuit shown in Figure 7, the input voltage is a periodic signal with period 2 as shown. Determine: i) the exponential Fourier series representation of input signal ii) the trigonometric Fourier series representation of input signal iii) the exponential Fourier series representation of output signal

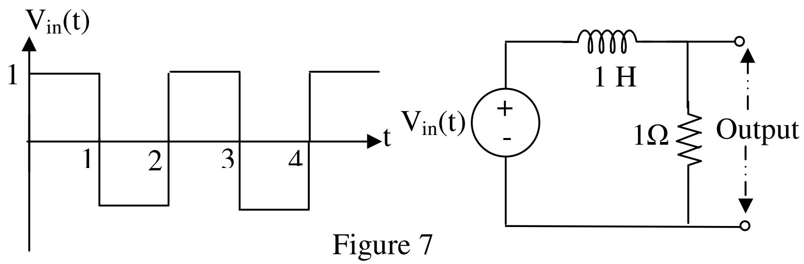

Figure 7

8. a) Determine the Fourier Transform of unit impulse function.

Code No: R22025 **R10** SET - 3

II B. Tech II Semester Supplementary Examinations, August - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) For a Delta connected three phase system, derive the relationship between the i) phase voltages and line voltages ii) phase currents and line currents
   b) Three identical coils each having a resistance of 20 ohms and a reactance of 20 ohms are connected in star and delta across 440 V three phase supply. Two wattmeters are connected in the system to measure power. Calculate line current and reading in each wattmeter when the loads are connected in star and delta.

2. A three phase 400 V star connected balanced supply is connected to star connected three load of $25\angle 0^0\ \Omega$, $11\angle -20^0\ \Omega$, and $15\angle 10^0\ \Omega$, Find line current, power and current in neutral of the (i) four wire system (ii) three wire system. Assume zero neutral impedance.

3. For a network is shown in Figure 3, find the currents i_1(t) and i_2(t) after switching. Initial potential of capacitor is 4 V and initial currents through the inductor and capacitor are zero.

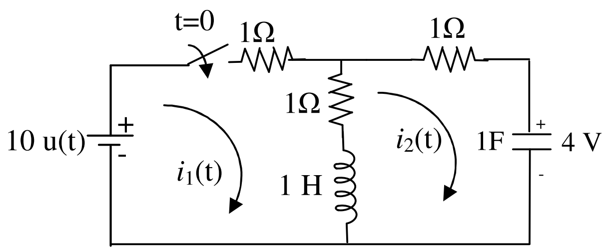

Figure 3

4. a) Determine the transient and steady state currents through a series R-C circuit when it is connected to a sinusoidal voltage source.
   b) Find the expression for current at t > 0 when switch S is moved from 1 to 2 position at t=0 in Figure 4(b). Assume a steady state current of 1 A in the R-L circuit when the switch is
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Code No: R22025 **R10** SET - 3

5. a) Explain the concept of reciprocity and symmetry. Derive the above condition for *h* and *ABCD* parameters.
   b) Obtain the Z parameters of the network shown in Figure 5.

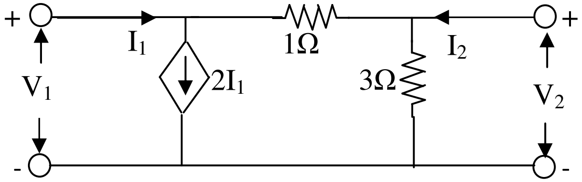


Figure 5

6. a) The h-parameters of certain two-port network are $h = \begin{bmatrix} 10 & -2 \\ 20 & 0.2 \end{bmatrix}$. Find the new h-parameters that result, if a 1 ohm resistor is connected in series with i) input terminals of the network ii) output terminals of the network.
   b) Two 2-port networks A and B are connected in parallel. Each of these networks has their own y-parameters. Show that resultant y-parameters of the combined parallel network is sum of y-parameters of the individual networks A and B.

7. Determine the current i(t) flowing through the circuit shown in Figure 7.

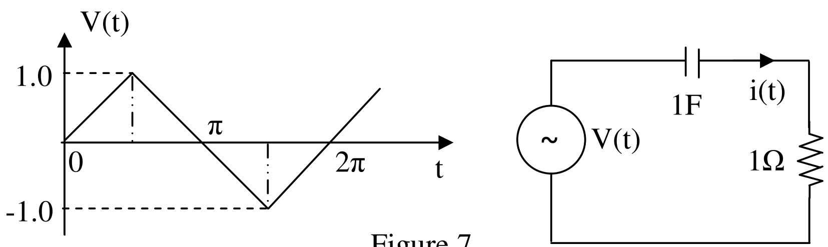
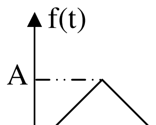


Figure 7

8. a) Determine the Fourier transform of the triangular function shown in Figure 8.



Code No: R22025 **R10** SET - 4

II B. Tech II Semester Supplementary Examinations, August - 2014
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Compare a three phase star connected system with a delta-connected system. Discuss merits and demerits of the two systems.
   b) Show that power consumed by three identical phase loads connected in delta is equal to three times power consumed when phase loads are connected in star.

2. a) Explain how the three-phase power is measured using two-wattmeter method.
   b) A 100 V, 3-Ø balanced supply is connected to an unbalanced delta load having three impedances $Z_{AB} = 106\angle -90^0\ \Omega$, $Z_{BC} = 63.25\angle 71.56^0\ \Omega$, $Z_{CA} = 100\ \Omega$. Calculate line currents and power consumed if (i) the phase sequence is ABC (ii) the phase sequence ACB.

3. In a series RLC circuit L=1 H, and C=1 F. A DC voltage of 20 V is applied at t=0. Obtain i (t) when i) R=5 ohms, ii) R=2 ohms, iii) R=1 ohm.

4. Find the current i(t) in the network shown in Figure 4 for t>0. At $t=0^-$ the network was un energized.

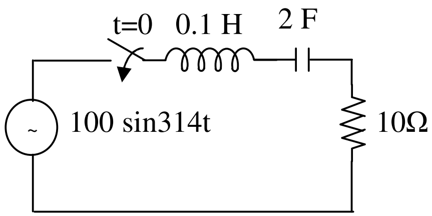

Figure 4

5. a) For a network, the equations are
   $\bar{I}_1 = 0.5V_1 - 0.2V_2$
   $\bar{I}_2 = -0.2V_1 + V_2$
   Find Z and ABCD parameters.
   b) Find Y and Z parameters of the network shown in Figure 5.
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6. Determine the Y parameters of the two-port network shown in Figure 6.

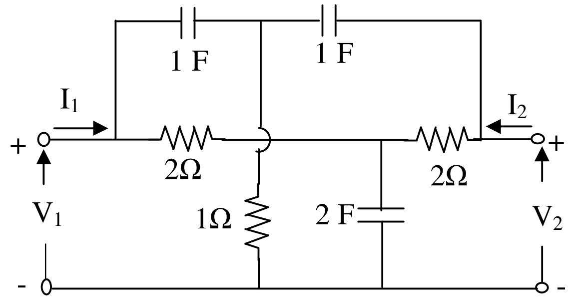

Figure 6

7. a) Explain about the trignometric form of Fourier series.

b) A voltage $v(t) = \frac{4}{\pi}\left[\frac{\sin 2\pi t}{1} + \frac{\sin 6\pi t}{3} + \frac{\sin 10\pi t}{5} + \ldots\ldots + \infty\right]$ is applied to a circuit consisting of resistance R=4 ohms in series with an inductance of $L = \frac{1}{\pi}$H. Calculate the current in the circuit.

8. Determine the Fourier transform of the function shown in Figure 8.

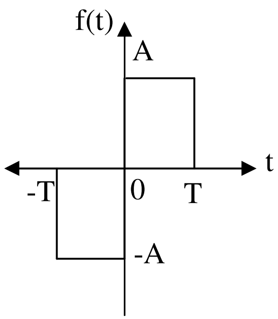

Figure 8

Code No: R22024 **R10** SET - 1

II B. Tech II Semester Regular Examinations, August – 2014
ELECTRICAL MACHINES - II
(Electronics and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain the principle of operation of transformer and develop the phasor diagram under load condition assuming lagging power factor load?
   b) The primary winding of step down transformer takes a current of 22 A at 3300 V when working at full load. If the transformation ratio is 15:1, calculate the secondary voltage and current? (10M+5M)

2. a) With the help of relevant expressions explain how the iron loss is varied by the variation of supply voltage and frequency?
   b) A 100 kVA, 2000/200 V, 50 Hz distribution transformer has core loss of 750 W at rated voltage and copper loss of 1500 W at full load. It has the following load cycle: (8M+7M)

% load	0%	50%	75%	100%	110%
Power factor	-	0.95 lag	0.8 lag	0.85 lag	0.95 lag
Hours	3	6	8	5	2

   Determine the all-day efficiency of the transformer?

3. a) Derive the expressions for load shared by two transformers in parallel when no-load voltages of these transformers are not equal. What will be the load distribution if the voltage ratio is exactly equal?
   b) Draw the equivalent circuit of 3000/400V single phase transformer on which the following test results were obtained. Input to high voltage winding when low voltage winding is open circuited: 3000V, 0.5A, 500W. Input to low voltage winding when high voltage winding is short circuited: 11V, 100A, 5000W. Insert the appropriate values of resistance and reactance. And find regulation of transformer at full load and 0.8 p.f. lagging? (7M+8M)

4. a) Explain open delta connection to carry out 3-phase operation with the help of two transformers. State the disadvantages in this operation?
   b) Two single phase transformers are supplied at 250V from a 6600 V, 3-phase system through a pair of Scott-connected transformers. If the load on the main transformer is 85 kW at 0.9 p.f. lagging and that on teaser transformer is 69 kW at 0.8 p.f. lagging, find the values of line currents on the 3-phase side. Neglect the magnetizing and core loss currents in the transformers? (5M+10M)
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5. a) Compare the cage and wound 3-phase induction motors with respect to their construction and performance?
   b) A 3-phase, 4 Pole, 1440 rpm, 50 Hz induction motor has star connected rotor winding, having a resistance of 0.2 Ω per phase and standstill leakage reactance of 1 Ω per phase. When the stator is energized at rated voltage and frequency, the rotor induced e.m.f. at standstill is 110 V per phase.
   Calculate the rotor current, rotor power factor and torque both at starting and at full load
   If an external resistance of 1 Ω per phase is inserted in rotor circuit, calculate rotor current, rotor power factor and torque at the time of starting? (7M+8M)

6. a) Prove that in 3-phase induction motor the ratio of maximum torque to starting torque is $\frac{(1+k^2)}{2k}$, where k is ratio of rotor resistance to rotor reactance. Neglect stator impedance?
   b) Explain the phenomenon of cogging and crawling in 3-phase induction motor in brief? (7M+8M)

7. a) Why the starters are necessary for starting induction motors? List the different starting methods?
   b) A three phase, 400 V, 50 Hz, 4-Pole, delta connected, squirrel cage induction motor has the following data:
   No-load: 400 V, 3.0 A, 300 W
   Blocked rotor: 120 V, 7.0 A 500 W
   Draw the circle diagram and determine starting torque, maximum torque and efficiency when the motor works with a slip of 5%. The stator effective resistance per phase is equal to 4 Ω? (5M+10M)

8. a) Discuss the pole-changing methods of speed control of 3-phase induction motor?
   b) Explain stator voltage control of 3-phase induction motors? (7M+8M)

Code No: R22024 **R10** SET - 2

II B. Tech II Semester Regular Examinations, August – 2014
ELECTRICAL MACHINES - II
(Electronics and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Derive the expressions for the r.m.s. values of the induced voltages in the two windings of a single phase transformer connected to sinusoidal supply?
   b) A 1-phase 3300/400V transformer has the primary resistance, R1=0.7Ω, secondary resistance, R2=0.011Ω primary leakage reactance, X1=3.6Ω and secondary leakage reactance, X2=0.045Ω. The secondary is connected to a coil having the resistance of 2.5Ω and inductance of 0.01H. Calculate the secondary terminal voltage and power consumed by the coil? (8M+7M)

2. a) Develop the exact equivalent circuit of a 1-phase transformer. From this derive the approximate and simplified equivalent circuits. State the various assumptions made?
   b) A single phase transformer working at unity power factor has an efficiency of 0.9 p.u. both at half load and at the full load of 500 W. Determine the efficiency at full load at 0.8 pf lagging? (5M+10M)

3. a) Explain Sumpner's test on single phase transformer and also list its advantages?
   b) Derive an expression for approximate relative weights of conductor material in an autotransformer and 2-winding transformer, the primary voltage being V1, and secondary voltage V2. Compare the weights of conductor material when the transformation ratio is 3. Ignore the magnetizing current? (8M+7M)

4. a) What are distinguishing features of Y-Y, Y-Δ, Δ-Y and Δ- Δ three phase connections? Compare their advantages and disadvantages?
   b) Describe the configuration and working principle of on load tap changer with neat sketches? (8M+7M)
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6. a) With the help of relevant expressions develop speed-torque characteristics of 3-phase induction motor and discuss the effect rotor resistance in the variation of these characteristic?

   b) A 3-phase induction motor has a synchronous speed of 250 rpm and 5% slip at full load. The rotor has a resistance of 0.02 Ω per phase and a standstill leakage reactance of 0.25 Ω per phase. Calculate:
   a) The speed at which the maximum torque developed
   b) The ratio of maximum to full load torque
   c) The ratio of maximum to starting torque
   d) What should be the rotor resistance per phase to produce starting torque equal to three forth of maximum torque? (7M+8M)

7. a) Briefly describe why the starting current is high in the direct on line starting of 3-phase induction motor?

   b) A three phase, 15 kW, 400 V, 50 Hz, 4-pole, star connected squirrel cage induction motor has the following data:
   No-load: 400 V, 5.0 A, p.f= 0.2
   Blocked rotor: 120 V, 20.0 A p.f= 0.6
   The ratio of stator to rotor copper losses on short circuit was unity. Draw the circle diagram and determine: i) the full load current and power factor ii) the maximum power developed iii) starting torque. (5M+10M)

8. a) Describe how the stator voltage control method of speed control of 3-phase induction motor?

   b) Explain the principle of working of induction generator? Briefly discriminate motoring and generating operations of 3-phase induction motor? (7M+8M)

Code No: R22024 **R10** SET - 3

II B. Tech II Semester Regular Examinations, August – 2014

ELECTRICAL MACHINES - II

(Electronics and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions

All Questions carry **Equal** Marks

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1. a) Develop the phasor diagram of 1-phase transformer under loaded condition for all power factor loads?

   b) A 1-phase, 50 Hz core type transformer has square core of 20 cm side. The permissible maximum flux density is 1 T. Calculate the number of turns per limb on the high voltage and low voltage sides of 3000/220 V ratio? (10M+5M)

2. a) In a transformer if the load current is kept constant, find the power factor at which the maximum efficiency occurs?

   b) The efficiency of 20 kVA, 2500/250 V, single phase transformer at unity power factor is 98 % at rated load and also at half rated load. Determine: i) transformer core loss, ii) full load copper loss iii) per unit value of the equivalent resistance of the transformer (7M+8M)

3. a) Derive the expressions for load shared by two transformers in parallel when no-load voltages of these transformers are not equal. What will be the load distribution if the voltage ratio is exactly equal?

   b) Two similar 200 kVA, 1-phase transformers gave the following results when tested by back-to-back method: W_1 in the supply line, 4 kW, W_2 in the primary series circuit, when full-load current circulated through the secondary, 6 kW. Calculate the efficiency of each transformer (7M+8M)

4. a) For what purpose tertiary windings used on 3-phase transformers? Explain how they can assist in unbalanced loading condition if suitably connected?

   b) A Scott connected transformer supplies two single phase furnaces at 200V, each taking 200 kW. The load on the leading phase is at unity power factor and that on the other phase is 0.8 power factor. The three phase input line voltage is 6600 V. Calculate the values of line
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5. a) Give the constructional details of wound rotor 3-phase induction motor? What are its advantages over squirrel cage rotor?
   b) A 6 pole, 50 Hz, 3-phase induction motor running on full load develops a useful torque of 160 N-m. When the rotor e.m.f makes 120 complete cycles per minute. Calculate the power input, if the mechanical torque lost in friction and windage loss is 10 N-m. Also calculate: i) the copper loss in the rotor winding ii) the efficiency. The stator loss given to be 800 W.
   (7M+8M)

6. a) Deduce and discuss the equivalent circuit of 3-phase induction motor?
   b) A 440V, 50Hz squirrel cage induction motor has a ratio of standstill reactance of rotor per phase of 3 to1 and a maximum torque which is 4 times the normal full load torque. Calculate: i) full-load slip ii) ratio of starting torque to full load torque iii) minimum voltage required to develop normal full load torque at starting? (7M+8M)

7. a) Draw and explain the circle diagram of 3-phase induction motor? How the different performance quantities are determined from circle diagram
   b) An induction motor is to be started directly from mains. If the starting torque is equal to full load torque, find the starting current in terms of full load current if the slip of the motor at full load is 5%? (10M+5M)

8. a) Explain the method of speed control of 3-phase induction motor by varying the rotor resistance?
   b) Explain the induction motor operation under injection of an e.m.f. into the rotor circuit?
   (7M+8M)

Code No: R22024 **R10** SET - 4

II B. Tech II Semester Regular Examinations, August – 2014
ELECTRICAL MACHINES - II
(Electronics and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Discuss:
   i) Why the primary of transformer draws current form mains when the secondary is not carrying any load?
   ii) How the primary of transformer draws current from mains when the secondary is loaded?
   b) A single phase 230V/15V, 50 Hz transformer has the secondary full load current of 8A. It has 45 turns on the secondary. Calculate: i) the voltage per turn ii) the number of primary turns iii) the full load primary current and iv) kVA output of the transformer?
   (7M+8M)

2. a) Derive an expression for computing per-unit voltage regulation of a transformer for lagging power factor load?
   b) An 800 kVA transformer at normal voltage and frequency requires an input of 7.5 kW on no load. At reduced voltage and full load current it requires 1.42 kW input when secondary is short circuited. Calculate all day efficiency if the transformer operates on the following load cycle:

6 hours	500 kW	0.8 pf
4 hours	700 kW	0.9 pf
4 hours	300 kW	0.95 pf
10 hours	no load	

(7M+8M)

3. a) How iron losses are separated in single phase transformer, explain with the help of relevant test?
   b) A 110/400V, 1-phase transformer gave the following test results
   Open circuit test 110V, 1A, 80W on l.v. side
   Short circuit test 20V, 15A, 120W on h.v. side
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5. a) Describe the principle of operation of the 3-phase induction motor? What are the different types of induction motors?
   b) A 3-phase slip ring induction motor gives a reading of 60V across slip rings when at rest with normal stator voltage? The rotor is star connected and has impedance of (0.6+j5) Ω per phase. Find the rotor current when the machine is i) at stand still with the slip rings joined to a star connected starter with a phase impedance of (4+j2) Ω and ii) running normally with a 4% slip. (7M+8M)

6. a) Explain how improved starting performance of 3-phase squirrel cage motors may be obtained by means of double cage rotor windings? Compare the speed – torque characteristics of double cage rotor with normal squirrel cage motor?
   b) A 4-pole, 50Hz, 3-phase induction motor has a rotor resistance and standstill rotor reactance of 0.025 Ω and 0.1 Ω per phase respectively. Calculate: i) the speed at which maximum torque occurs ii) the value of rotor resistance per phase to be inserted to obtain 80% of maximum torque at starting? (7M+8M)

7. a) Explain the procedure of drawing circle diagram of an induction motor. What information can be drawn from the circle diagram?
   b) A 15 HP, 3-phase, 6 pole, 50 Hz, 400 V, delta connected IM runs at 960 rpm on full load. If it takes 86.4 A on direct starting, find the ratio of starting torque to full load torque with a star delta starter. Full load efficiency and power factor are 88% and 0.85 respectively? (10M+5M)

8. a) Explain the speed control of induction motor by the cascade connection method?
   b) Explain the principle of operation of induction generator? What are its limitations? (7M+8M)

Code No: R22022 **R10** SET - 1

II B. Tech II Semester Regular Examinations August - 2014
POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain the factors to be considered for the selection of the site for a thermal power station
   b) Explain the functions of Economizer and super heater in a thermal power plant. (8M+7M)

2. a) Explain the different Nuclear materials used in a Nuclear power station
   b) Explain the Basic components of a Nuclear reactor with a neat diagram (7M+8M)

3. a) Explain the functions of different components of a Gas turbine power plant with a neat block diagram
   b) Explain about the point focusing collector of solar power generation? (8M+7M)

4. a) List the advantages of ring mains system of distribution over the radial system
   b) A DC ring main ABCDA is fed from point A with 230 V supply and the loop resistances of various sections are AB = 0.04 ohms; BC = 0.35 ohms; CD = 0.5 ohms and DA = 0.05 ohms. The main supplies 100 A at B, 150A at C and 200 A at D. Calculate the voltages at each load point. If the points A and C are inter connected through a link of 0.05 ohm. (7M+8M)

5. a) Compare Air insulated and gas insulated substations.
   b) Explain with a neat lay out diagram of main and transfer bus bar system (7M+8M)

6. a) What is meant by capacitance grading of a cable?
   b) Find the most economical diameter of a single core cable to be used on a 132 kV, 3-phase system. Find also the overall diameter of the insulation if the peak permissible stress is not to exceed 60 kV per cm. (7M+8M)

7. a) Explain Two-part tariff and compare it with power factor tariff.
   b) A system has a straight line annual load duration curve with maximum and minimum demands of 1500MW and 500 MW respectively. The annual cost characteristics of base load and peak loads stations are respectively given by
      C_1 = (Rs.10, 00,000 + Rs. 1000/kW + Rs 6/kWh)
      C_2 = (Rs.8, 00,000 + Rs. 600/kW + Rs 8/kWh).
      Determine the operating schedule of peak load station for minimum annual cost. Also calculate the overall cost per kWh. (7M+8M)

8. Write short notes on the Following:
   a) Importance of control rods in nuclear power stations
   b) Stepped distributor in Distribution systems
   c) Integrated load duration curves (5M+5M+5M)
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Code No: R22022 **R10** SET - 2

II B. Tech II Semester Regular Examinations August - 2014
POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain with a neat lay out diagram with main parts and the working of a steam power station.
   b) What are the limitations of a thermal power plant? (10M+5M)

2. a) List the advantages and disadvantages of a pressurized water reactor (PWR).
   b) Explain the classification of nuclear reactor and briefly discuss about each one. (7M+8M)

3. a) What is Solar cell? Explain its principle of operation.
   b) Explain the following terms with reference to a solar concentrator
   i) Aperture area ii) Acceptance angle iii) Absorber area
   iv) Optical efficiency v) Thermal efficiency (5M+10M)

4. a) What is an inter connector? Discuss its advantages in a distribution system
   b) Discuss in detail about different types of distributors used in distribution system. (7M+8M)

5. a) Explain with a neat layout diagram of a single bus bar system with sectionalization and list merits and demerits.
   b) List the advantages and disadvantages of Gas-insulated substation. (10M+5M)

6. Show that in a 3-core (belted type) cable the neutral capacitance of each conductor C_n is equal to $C_s + 3C_c$, where C_s and C_c are the capacitances of each conductor to sheath and to each other respectively. And further explain how these capacitances can be measured experimentally. (15M)

7. a) Define the following with respect to the economic aspects power generation
   i) Load duration curve ii) Demand factor
   iii) Diversity factor iv) Maximum demand
   b) A generating station has a maximum demand of 500 MW. The annual load factor is 50 % and capacity factor is 40 %. Find the reserve capacity of the plant. (8M+7M)
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Code No: R22022 **R10** SET - 3

II B. Tech II Semester Regular Examinations August - 2014

POWER SYSTEMS - I

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions

All Questions carry **Equal** Marks

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1. a) Explain briefly the types of fuels used in Thermal Power stations
   b) What is feed water? What are the problems associated due to impurities in feed water? How they can be eliminated. (7M+8M)

2. a) Explain the methods of producing nuclear reaction? What is chain reaction?
   b) Explain the following with respect to Nuclear power station
   i) Isotope ii) Atomic mass unit iii) Binding energy and mass defect (7M+8M)

3. a) Explain the economic feasibility of harnessing solar energy.
   b) Explain the construction and working principle of operation of a flat plate solar energy collector with a neat diagram (5M+10M)

4. a) Explain clearly the criteria for selecting a suitable size of the conductor for a feeder and distributor
   b) Explain in detail about the distribution feeder fed from both ends with equal voltages and derive the expressions for voltage drop of each section. (7M+8M)

5. a) What are the factors to be considered for selecting bus bars?
   b) Explain with a neat lay out diagram of a single bus bar arrangement and list its merits and demerits. (5M+10M)

6. Explain classification of cables and discuss their general construction with neat sketch. (15M)

7. a) Explain the terms load factor and diversity factor and discuss their effect on the cost of generation of electrical energy.
   b) A 1000MW power station delivers 1000 MW for 2 hours, 500 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 60 days annually. Calculate its annual load factor. (8M+7M)

8. Write short notes on the Following:
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Code No: R22022 **R10** SET - 4

II B. Tech II Semester Regular Examinations August - 2014
POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) List the advantages and disadvantages of a thermal power station.
   b) Explain the functions of Cooling tower and condenser with respect to a thermal power station. (8M+7M)

2. a) Explain the mechanism of energy release in a nuclear reaction?
   b) Explain the factors for selecting the site for a nuclear power stations (8M+7M)

3. a) Explain the methods to improve thermal efficiency of gas turbine plant
   b) Explain open cycle and closed cycle gas turbine plants (8M+7M)

4. a) Explain briefly about various electric distribution systems
   b) Explain about the stepped distributor? (8M+7M)

5. a) Explain the factors to be considered when selecting a location for a substation
   b) List the merits and demerits of indoor substations over outdoor substations. (7M+8M)

6. a) Explain the purpose of using inters heaths in a cable.
   b) A single core cable has a conductor diameter of 2.5 cm and a sheath of inside diameter 6cm. Calculate the maximum stress. It is desired to reduce the maximum stress by using two inters heaths. Determine their best position, the maximum stress and the voltage on each. Consider the System voltage as 3-phase 66 kV. (5M+10M)

7. a) Define the following with respect to the economic aspects power generation
   i) Connected load ii) Load factor iii) Plant capacity factor
   b) Calculate the generating cost per kWH, delivered from a generating station from the following data. Plant capacity 500 MW; annual load factor 45 %; capital cost Rs.1200×10^6; annual cost of fuel etc Rs.160 × 10^6, interest 9.2 % per annum of initial value (8M+7M)
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Code No: R22021 **R10** SET - 1

II B. Tech II Semester Regular Examinations, August – 2014
PULSE AND DIGITAL CIRCUITS
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What is meant by linear wave shaping? Give some examples of linear wave shaping circuits.
   b) Show that the output of a differentiator circuit is derivative of the input. What are the assumptions to be made in the derivation?

2. a) What is meant by comparator? Give the applications of voltage comparators?
   b) Determine the peak output voltage for a negative series clipper circuit connected to an input sinusoidal signal of peak value 12 V. The barrier potential for silicon diode is 0.7 V. Draw the circuit diagram and output waveform.

3. a) Describe and illustrate how the transistor acts a switch?
   b) Compare the various logic families?

4. a) What are different types of multivibrators? Explain the stable state of a multivibrator.
   b) Sketch the circuit diagram of Schmitt trigger and explain its operation.

5. a) In an astable multivibrator, the base resistors are of 12.5 kΩ and the capacitors are of 0.01μF Determine the pulse repetition rate.
   b) With the help of circuit diagrams explain the working of monostable multivibrator.

6. a) Define the following terms:
   i) Time base ii) Sweep voltage
   iii) Sweep speed error iv) Displacement error
   b) Enumerate the various methods which are employed for generating time base waves.

7. a) Explain the process of synchronization of a sweep circuit.
   b) Write notes on:
   i) Astable relaxation circuits ii) Monostable relaxation circuits

8. a) Draw the diagram of two diode sampling gates and explain
   b) Distinguish between *unidirectional* and *bi-directional* sampling gates.
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Code No: R22021 **R10** SET - 2

II B. Tech II Semester Regular Examinations, August – 2014
PULSE AND DIGITAL CIRCUITS
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Draw RC high-pass circuit. Input to this circuit is represented as $Vu(t)-Vu(t-t_p)$.
   Sketch the input and output waveforms of this circuit.
   b) Explain how new wave shapes are generated from another waveform using some network.

2. a) What is the difference between the output from a clipping circuit and a clamping circuit? Explain with neat sketches.
   b) Determine the peak output voltage for a positive shunt clipper circuit connected to an input AC sinusoidal signal of peak value 10 V. The barrier potential for germanium diode is 0.3 V. Series resistor is of 400 Ω and load resistor is of 2 kΩ.

3. a) Compare the performance of TTL and ECL logic gates with respect to power dissipation, noise margin, cost and propagation delay time.
   b) Draw the circuit, symbol and truth-table of a normally open tri-state switch.

4. a) What is meant by multivibrator? Explain the operation of fixed-bias multivibrator.
   b) Explain how the astable multivibrator can be used as voltage to frequency converter.

5. a) For a monostable multivibrator calculate the input pulse width for the design values of R_C = 2 kΩ, R_B = 10 kΩ, C = 0.1 μF, V_{CC} = 10 V, $V_{BE(sat)}$ = 0.8 V.
   b) Explain the *triggering* in monostable multivibrator.

6. a) How time base generators can be classified? Differentiate between a triggered ramp generator and free-running time base generator.
   b) Explain with circuit diagrams Miller sweep and Miller bootstrap time base generators.
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Code No: R22021 **R10** SET - 3

II B. Tech II Semester Regular Examinations, August – 2014
PULSE AND DIGITAL CIRCUITS
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Define unit-step function, ramp function and impulse function. Show that a pulse is combination of unit-step functions.
   b) What is meant by linear wave shaping?
   c) Why a capacitor in a high-pass RC circuit is named as blocking capacitor.

2. a) Define clipper. Explain the clipping using zero diodes.
   b) Draw a transistor clipper and explain its operation.

3. a) What is the difference between bipolar logic family and unipolar logic family? Explain.
   b) What do you understand by the terms fan-in and fan-out? Draw an RTL circuit.

4. a) Draw the circuit diagram of a Schmitt trigger and explain its operation.
   b) Write the applications of Schmitt trigger?

5. a) What is the function of commutating capacitors? What causes the rounded leading edge in the output waveforms of a multivibrator?
   b) Draw the circuit diagram of astable multivibrator and explains its operation.

6. a) What is meant by time base generator? Explain the expositional sweep circuit.
   b) Explain the basic principles of Miller and Bootstrap time base generator?

7. a) With the help of a circuit diagram explain how a tuned-collector sinusoidal oscillator is synchronized.
   b) Write notes on:
   i) Stability of relaxation dividers ii) Sine wave frequency division
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Code No: R22021 **R10** SET - 4

II B. Tech II Semester Regular Examinations, August – 2014
PULSE AND DIGITAL CIRCUITS
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What is a differentiator? Discuss how does it operate.
   b) Draw high-pass RC circuit. Explain its response to a square-wave input.

2. a) Explain how clipping at two independent levels can be achieved.
   b) Explain the operation of a diode comparator with a ramp input signal.

3. a) Draw the circuit diagram of CMOS NAND gate and explain its operation.
   b) Compare the performance of TTL and MOSFET logic gates.

4. a) How is an electronic switch superior to a mechanical switch? Why trigger pulses are essential for the operation of a bistable multivibrator?
   b) Draw the circuit of collector-coupled astable multivibrator and explain its operation.

5. a) Write notes on the following:
      i) Triggering in monostable multivibrator
      ii) Single-shot multivibrator
   b) Explain how an astable multivibrator gives a square-wave.

6. a) Draw transistor Bootstrap time base generator and explain its operation
   b) Which type of time base generator is used in electromagnetic and electrostatic deflection systems? Explain.

7. a) What do you understand by the term phase stability? Explain.
   b) Explain about frequency division in the sweep circuit.

8. Write notes on the following
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Code No: R22023 **R10** SET - 1

II B. Tech II Semester Regular Examinations August - 2014
SWITCHING THEORY AND LOGIC DESIGN
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Deduce $(70.65)_8 = (\quad)_2 = (\quad)_{16}$
   b) Represent numeric digits 0 to 9 at least in any two self complementing codes?
   c) Explain 1's complement representation of signed number? (5M+5M+5M)

2. a) Simplify and draw the AND/OR implementations for the following switching functions?
   i) $(\overline{A}+B)(\overline{B}+C)+(AB+C)$ ii) $\overline{(A+B)}\,\overline{(ABC)}+(\overline{\overline{A}C})$
   b) Explain how hamming code is constructed for single bit error detection and correction? (8M+7M)

3. a) Find the minimum product-of-sums form for the following functions
   i) $f_1 = \prod(0, 1, 2, 3, 4, 9, 10, 13, 14)$ ii) $f_2 = AB\overline{C} + AB + C + B\overline{C} + D\overline{B}$
   b) XS3 code is used to represent the ten decimal digits. Develop the decode logic for converting from XS3 to decimal? (8M+7M)

4. a) Implement 3 bit carry-look-ahead adder, what are its advantages?
   b) Design 4 bit XS3 adder/subtractor circuit and explain the circuit operation? (8M+7M)

5. a) What is the difference between encoder and priority encoder? How do you implement decimal to BCD priority encoder?
   b) Implement the following logic functions using 8 × 1 and 4 × 1 multiplexers?
   $f(A, B, C, D) = \sum m(1, 3, 4, 6, 7, 9, 10, 11, 14)$ (7M+8M)

6. a) Draw the logic diagram to implement 16 × 8 ROM and explain its architecture?
   b) Implement 4 bit binary to gray code conversion logic functions in PLA. (7M+8M)

7. a) Explain the operation of NAND latch J-K flip-flop with preset and clear inputs?
   b) Design 4 bit twisted ring counter. Also draw its state diagram and sequence table? (8M+7M)

8. Implement the following state table using S-R flip flops (15M)

PS	inputs, x_1, x_0		
	01	10	11
A	B,0	C,1	C,0
B	A,0	D,1	D,0
C	D,0	C,0	A,1
D	C,0	A,0	D,1
	NS, Z		

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Code No: R22023 **R10** SET - 2

II B. Tech II Semester Regular Examinations August - 2014
SWITCHING THEORY AND LOGIC DESIGN
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain how octal and hexadecimal number system is represented?
   b) Describe Excess – 3 code representation of numeric digits? What are its advantages?
   c) Subtract (– 127) from (– 115) using eight bit twos complement method? (5M+5M+5M)

2. a) How many of the input minterms are included in each of the following functions and how many are not? What are the minterm expressions for these two functions?
   i) $f_1 = A + C + BD$ ii) $f_2 = \overline{\overline{A+B}+\overline{C+D}}$
   b) Briefly describe how four bit gray code is constructed? What are its advantages? (10M+5M)

3. Minimize the following function using the Quine-McCluskey tabular method:
   $f(A, B, C, D, E) = \sum(0, 3, 4, 5, 11, 12, 13, 15)$ with don't care terms 2,6,8. (15M)

4. a) Implement a parallel adder to perform addition between two 8 bit numbers 11110011_2 and 10001101_2? Explore the result when the input carry at lowest bit is 0 and 1.
   b) Draw the logic diagram of BCD adder circuit? Explain its operation for 4 bit addition of two numbers. (8M+7M)

5. a) Explain with the help of logic diagram the operation of 3-to-8 line decoder? How such decoders are used in the realization of 1:64 de-multiplexers?
   b) A logic function has four inputs A, B, C and D that will produce output 1 whenever two adjacent input variables are 1s. Treat A and D are also adjacent. Implement this logic function using 8 × 1 and 4 × 1 multiplexers (7M+8M)

6. a) Write the programming table to implement BCD to using a PLA?
   b) Describe briefly how PAL is used to implement logic functions? Take the example of binary to BCD code conversion? (7M+8M)

7. a) Design up/down counter using J-K flip-flops to count the sequence 0, 3, 2, 6, 4, 0, …..
   b) Explain the working of 3-bit bi-directional shift register with the help of diagram? (8M+7M)
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Code No: R22023 **R10** SET - 3

II B. Tech II Semester Regular Examinations August - 2014
SWITCHING THEORY AND LOGIC DESIGN
(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) How do you convert hexadecimal fractional number into decimal number and binary number?

   b) Describe different types of numeric codes? Explain them with suitable examples? (7M+8M)

2. a) Implement the following switching functions with minimum number of NOR gates?

   i) $\left(A\overline{C}+BC\right)\left(\overline{A}+C\right)$ ii) $A\overline{B}+\left(\overline{B}+\overline{C}\right)\overline{A}$

   b) What are the different degenerative and non degenerative forms of logic gate combinations in two level realization? Briefly explain them? (8M+7M)

3. Simplify the following Boolean expression using tabulation method?

   $f\left(A, B, C, D, E\right)=\sum\left(2, 3, 4, 7, 8, 11, 13, 14\right)$ with don't care terms 1, 5, 10. (15M)

4. a) Design half subtractor? Realize full subtractor using half subtractors and explain the circuit operation?

   b) Draw the logic diagram and explain the operation of the 4 bit XS3 adder/subtractor? (7M+8M)

5. a) Obtain logical functions to design decimal to octal priority encoder? Implement the circuit with NAND gates?

   b) Implement the following Boolean function using 1 × 8 de-multiplexer and 4 × 1 multiplexer? $F\left(A, B, C\right)=\overline{A}B+AC+\overline{B}C+\overline{A}\,\overline{C}$ (7M+8M)
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6. a) How the ROM architecture is constructed? Draw structure of for 32×8 ROM?

   b) How the programming tables are prepared for PAL and PLA, use the following logic functions?

   i) $A\,(w, x, y, z) = \Sigma(0, 2, 5, 7, 8, 10, 12, 13)$

   ii) $B\,(w, x, y, z) = \Sigma(0, 1, 2, 6, 8, 9, 14, 15)$

   iii) $C\,(w, x, y, z) = \Sigma(0, 8, 14, 15)$ (8M+7M)

7. a) Explain the operation of J-K flip-flop? What is race around condition and how it is eliminated?

   b) Design a synchronous counter to count 3, 4, 6, 7, 3, 4, …….using J-K flip flops? (7M+8M)

8. Obtain a minimal state table using partition technique for the state table given below. Find the minimum length sequence that distinguishes state from A from state B. (15M)

PS	NS, Z	
	X=0	X=1
A	B,0	H,1
B	F,0	D,1
C	D,1	E,0
D	C,1	F,0
E	D,0	E,1
F	C,0	E,1
G	C,0	D,1
H	C,1	A,0

Code No: R22023 **R10** SET - 4

II B. Tech II Semester Regular Examinations August - 2014

SWITCHING THEORY AND LOGIC DESIGN

(Com. to EEE, ECE, ECC, BME, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions

All Questions carry **Equal** Marks

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1. a) Deduce X from the following?

   (i) $(A0.C)_{16} = (X)_8$ (ii) $(2.22)_3 = (X)_2$

   b) Briefly describe different methods of representing negative numbers? (8M+7M)

2. a) Simplify the following expressions

   i) $f_1 = \left(A+B+\overline{C}\right)\left(A+\overline{B}+\overline{C}\right)\left(\overline{A}+B+\overline{C}\right)\left(\overline{A}+\overline{B}+\overline{C}\right)$

   ii) $f_2 = A\,.\left[\overline{\left(\overline{A\oplus B}\right)\oplus C}\right]$

   b) What is meant by parity checking? Explain the different parity checking methods for single bit error detection and correction with suitable examples? (8M+7M)

3. a) Reduce the following expressions using Karnaugh map?

   i) $f_1 = AB + A\overline{C} + C + AD + A\overline{B}C + ABC$

   ii) $f_2 = \prod(0, 2, 8, 9, 10, 12, 13, 14)$

   b) Draw Karnaugh map and assign variables to the inputs of the AND XOR circuit shown in Figure 1, so that its output is $F(A, B, C, D) = \prod(6, 7, 12, 13)$ (8M+7M)

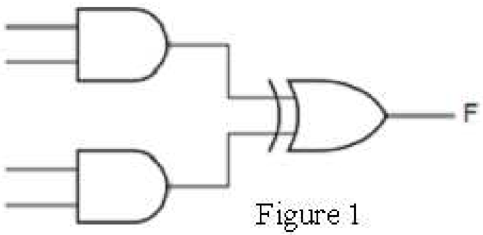

Figure 1

4. a) Describe the operation of full subtractor? Realize 4 bit binary subtractor and explain circuit operation?
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5. a) Draw the circuit diagram of 8 × 1 channel multiplexer and explain the circuit operation?
   b) Implement the following logic functions using 4-to-16-line decoder and 16 × 1 demultiplexer?
      i) $f_1 = \sum m\,(0, 1, 4, 7, 12, 14, 15)$
      ii) $f_2 = \sum m\,(1, 3, 6, 9, 12)$ (7M+8M)

6. a) What are the programmable logic devices? Explain them in brief?
   b) Obtain programmable logic to implement the following functions in PLA.
      $x(A, B, C, D) = \sum m\,(0, 2, 6, 7, 8, 9, 12, 13, 14)$
      $y(A, B, C, D) = \sum m\,(0, 3, 7, 9, 11, 12, 14)$ (7M+8M)

7. a) Describe the operation of universal shift register with the help of diagram?
   b) Design mod-9 asynchronous counter using D flip flop?
   (7M+8M)

8. Simplify the state table

PS	inputs, xy			
	xy=00	01	10	11
A	A,0	A,0	B,1	C,0
B	A,0	B,0	D,0	F,1
C	C,0	B,0	B,1	A,0
D	D,0	C,0	E,1	C,0
E	A,0	E,0	B,1	C,0
F	E,0	E,0	F,0	F,0
	NS, Z			

(15M)