Code No: T0202/R05 **Set No. 1**

II B.Tech II Semester Supplementary Examinations, November 2010
ELECTRICAL MACHINES-II
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the construction & working principle of transformer.
   (b) In detail explain the classification of transformer? [8+8]

2. (a) What are the various losses taking place in the transformer? Explain them.
   (b) A 40 kVA single phase step down transformer has a full load secondary current of 200 A. and the total resistance referred to secondary is 0.08 Ω. Find the efficiency of the transformer at full load and 0.8 pf lagging, if iron losses of transformer are 190 W. [6+10]

3. (a) Explain the procedure for OC test of transformer.
   (b) A single phase transformer has the following data: Turns ratio 10:1, Z_1= 1.6 +j 4.3 Ω, Z_2 = 0.019 + j0.048 Ω. The input voltage of the transformer is 5000 V and the load current at the secondary is 250 A at 0.8 pf lagging. Neglecting no load current, calculate secondary terminal voltage and output power. [6+10]

4. (a) With neat phasor diagram, explain the voltage regulation of three-phase transformer.
   (b) An ideal 3-Φ step down transformer connected in delta/star delivers power to a balanced 3-Φ load of 120 kVA at 0.8 pf. The input line voltage is 11 kV and the turn's ratio of transformer (phase to phase) is 10. Determine the line voltage line currents, phase voltages, phase currents on both primary & secondary sides. [8+8]

5. (a) A 3-Φ, 50 Hz, 4 pole, 400 V, wound rotor IM has a Δ connected stator winding and star connected rotor winding. Rotor conductors are 80 % of stator conductors. For speed of 1425 RPM calculate slip, the rotor induced emf/ph between the two slip rings and frequency of rotor current.
   (b) Explain the differences between slip ring & Squirrel cage IM. [8+8]

6. (a) Obtain the condition for maximum torque of IM. Give your observations.
   (b) A 3-Φ, 50 Hz, 6 pole slip ring IM gives a reading of 1500 V across slip rings on open circuit, when at rest and supplied with normal supply voltage. The rotor impedance per phase is 0.3 + j1.5 Ω. Find the rotor current and torque when machine is running at 5 % slip. Also find the maximum torque & slip at which it occurs. [8+8]

Code No: T0202/R05 **Set No. 1**

7. With neat diagram explain the various tests to be conducted on 3-Φ IM to plot the circle diagram. [16]

8. Explain all the modes of operation of Induction machine. Plot the neat characteristics. [16]

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Code No: T0202/R05 **Set No. 2**

II B.Tech II Semester Supplementary Examinations, November 2010
ELECTRICAL MACHINES-II
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the various losses taking place in transformer? How these losses can be minimized?
   (b) A 2.4 kV / 115 V transformer has sinusoidal flux density expressed by 0.113 sin 188.5t. Determine the primary & secondary turns. [8+8]

2. A 5 kVA, 220/110 V transformer has maximum efficiency of 98.96 % at 0.8 PF lagging. Its core loss is 50 W and the full load regulation is 5 % with pf of 0.8 lagging. Find
   (a) the efficiency and regulation at full load & 0.9 pf lagging.
   (b) PF at which VR is maximum
   (c) Minimum secondary voltage & Maximum value of VR
   (d) PF at which VR is Zero
   (e) Maximum possible efficiency. [6+2+4+2+2]

3. (a) Explain why open circuit test is conducted on transformer. Give related calculations.
   (b) Calculate the efficiency of a 200/400 V, 4 kVA transformer at full load, pf. 0.8 lagging & half full load, 0.75 leading with following test data:
   OC test: 200 V, 0.8 A, 70 W (LV side)
   SC test: 20 V, 10 A, 60 W (HV side) [6+10]

4. (a) With neat phasor diagram, explain the voltage regulation of three-phase transformer.
   (b) An ideal 3-Φ step down transformer connected in delta/star delivers power to a balanced 3-Φ load of 120 kVA at 0.8 pf. The input line voltage is 11 kV and the turn's ratio of transformer (phase to phase) is 10. Determine the line voltage line currents, phase voltages, phase currents on both primary & secondary sides. [8+8]

5. (a) With neat diagram explain the construction of Sq. cage IM.
   (b) Calculate the speed in RPM & RPS for a 6 pole IM which has a slip of 6 % at full load with a supply frequency of 50 Hz. What will be the speed of a 4 pole alternator supplying power to this motor? [8+8]

6. (a) Obtain the ratio of Maximum torque to Full load torque & Maximum torque to staring torque.

(b) A 4-pole, 50 Hz, 3-Φ IM has rotor impedance of 0.04 + j 0.16 Ω. Calculate the value of external rotor resistance to be inserted in rotor circuit to obtain 70 % of maximum torque at starting. [8+8]

7. A 3-Φ, Δ connected, 32 HP, 480 V, 6-pole, 50 Hz IM gave the following test results:

   No load Test: 480 V, 10 A, +1.89 kW & -0.59 kW

   Blocked rotor test: 96 V, 36 A, + 1.67 kW & -0.07 kW

   All above are the line values. Input power is measured by two wattmeter method. Plot the circle diagram and for full load find:

   (a) The line current
   (b) The power factor
   (c) Slip
   (d) Torque
   (e) Efficiency
   (f) Torque

   Given that rotor copper losses are equal to stator copper losses at stand still. [16]

8. (a) Explain the pole changing method of speed control of IM.

   (b) Two 50 Hz, 3-Φ IM having 6 & 4 poles respectively are connected in cumulative cascade of which the 6 pole motor is connected to mains supply. Calculate the rotor frequency & and slip of each motor referred to respective stator fields if the set has a slip of 3 %. [8+8]

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Code No: T0202/R05 **Set No. 3**

II B.Tech II Semester Supplementary Examinations, November 2010
ELECTRICAL MACHINES-II
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the EMF equation of transformer? Hence derive the voltage ratio.
   (b) A 15kVA 2400-240-V, 60 Hz transformer has a magnetic core of 50-cm^2 cross section and a mean length of 66.7 cm. The application of 2400 V causes magnetic field intensity of 450 AT/m (RMS) and a maximum flux density of 1.5 T . Determine
      i. The turn's ratio
      ii. The numbers of turns in each winding
      iii. The magnetizing current [8+8]

2. (a) Derive the condition for maximum efficiency of a transformer.
   (b) A single phase 150 kVA transformer has efficiency of 96 % at full load, 0.8 pf and at half load, 0.8 pf lagging. Find maximum efficiency of transformer and corresponding load. [8+8]

3. (a) What is parallel operation of transformer? Why parallel operation of transformer is required?
   (b) An auto transformer is used to step down 250 V to 200 V. The load on 200 V side is 100 A. Find the power transferred conductively and ratio of kVA rating of auto transformer to that of 2-winding transformer for the same load condition. State assumption made. [8+8]

4. (a) With neat phasor diagram, explain the voltage regulation of three-phase transformer.
   (b) An ideal 3-Φ step down transformer connected in delta/star delivers power to a balanced 3-Φ load of 120 kVA at 0.8 pf. The input line voltage is 11 kV and the turn's ratio of transformer (phase to phase) is 10. Determine the line voltage line currents, phase voltages, phase currents on both primary & secondary sides. [8+8]

5. (a) Deduce the expression for rotor current, rotor power factor, frequency of rotor current and per phase rotor EMF for a slip ring IM when rotating with slip s.
   (b) If the EMF in the stator of a 4 pole, 3-Φ IM is revolving at 50 Hz and that of rotor at 1.5 Hz. Find the motor slip and speed of rotation.
   (c) If the EMF in the stator of a 8 pole, 3-Φ IM is revolving at 50 Hz and that of rotor at 2.5 Hz. Find the motor slip and speed of rotation. [8+4+4]

6. (a) With neat diagram the explain Torque-Slip characteristics of IM.

(b) A 3-Φ, 50 Hz, 4 pole slip ring IM gives a reading of 120 V across slip rings on open circuit, when at rest and supplied with normal supply voltage. The rotor impedance per phase is 0.3 + j1.5 Ω. Find the rotor current and torque when machine is running at 5 % slip. [8+8]

7. A 3-Φ, Δ connected, 20 HP, 440 V, 6-pole, 50 Hz IM gave the following test results:

   No load Test: 440 V, 10 A, PF = 0.2

   Blocked rotor test: 200 V, 50 A, PF = 0.4

   All above are the line values. Plot the circle diagram and for full load find:

   (a) The line current
   (b) The power factor
   (c) Slip
   (d) Torque
   (e) Efficiency
   (f) Maximum Power factor

   Given that rotor copper losses are equal to stator copper losses at stand still. [16]

8. (a) Explain the speed control of IM by rotor resistance control method. How this method of speed control is different from stator side speed control methods.

   (b) A 4 pole, 50 Hz, wound rotor IM has a rotor resistance of 0.56 Ωph and runs at 1430 rpm at full load. Calculate the additional resistance per phase to be inserted in the rotor circuit to lower the speed to 1200 rpm, if the torque remains constant. [8+8]

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Code No: T0202/R05 **Set No. 4**

II B.Tech II Semester Supplementary Examinations, November 2010
ELECTRICAL MACHINES-II
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A 400/200 V, 50 Hz transformer has primary impedance of 1.2 + j 3.2 Ω & secondary impedance of 0.4 + j 1.0 Ω. A short circuit occurs on secondary of transformer with 400 V applied to primary. Calculate the primary current & its power factor. (Neglect magnetising current).
   (b) Derive the EMF equation of transformer? Hence derive the voltage ratio. [8+8]

2. (a) Explain the term voltage regulation. Obtain the expression for same.
   (b) Maximum efficiency of a 3300/440 V, 3 kVA single phase transformer is 97 % and occurs at 75 % of load at unity power factor. If the transformer impedance is 0.9 Ω, calculate regulation at full load, 0.8 pf lagging. [6+10]

3. (a) Explain the various simple tests conducted on a single transformer to find the approximate equivalent circuit of transformer.
   (b) OC test is preferred to conduct on LV side & SC test is preferred to conduct on HV side. Explain the reasons. [10+6]

4. A star/star/delta transformer and primary, secondary & tertiary line voltages of 11kV, 3.3 kV and 400 V has a magnetising current of 3 A. There is a balanced load of 600 kVA at 0.8 pf lagging on secondary winding and a balanced load of 300 kW on the tertiary winding. Find primary & tertiary line currents if the primary pf is 0.8 lagging. Neglect losses. [16]

5. (a) With neat diagram explain the construction of slip ring IM.
   (b) Two 3-Φ IMs when connected to 440 V, 50 Hz and running at 940 & 1440 RPM respectively. Determine their probable synchronous speeds and also find which motor is running at higher speed. [8+8]

6. (a) Explain term Maximum torque, Full load torque, Starting torque & No-load torque.
   (b) An 8-pole, 50 Hz, 3-Φ slip ring IM has effective resistance of 0.08 Ω/phase. The speed correspond to maximum torque is 650 rpm. What is the value of resistance to be inserted in rotor circuit to obtain maximum torque at starting? [8+8]

7. (a) Determine approximately the staring torque of IM in terms of full load torque when started by means of
      i. Star delta starter

ii. Auto transformer starter with 50 % tapping.

Ignore the magnetising current. The short circuit current of the motor at normal voltage is 6 times the full load current and full load slip is 4 %.

(b) Explain the advantages & disadvantages of auto transformer starter over star delta starter. Why auto transformer starters are preferred for high power IMs. [8+8]

8. Explain all the modes of operation of Induction machine. Plot the neat characteristics. [16]

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Code No: X0223/ R07

SET - 1

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

PULSE AND DIGITAL CIRCUITS

(Com. to EEE, EIE)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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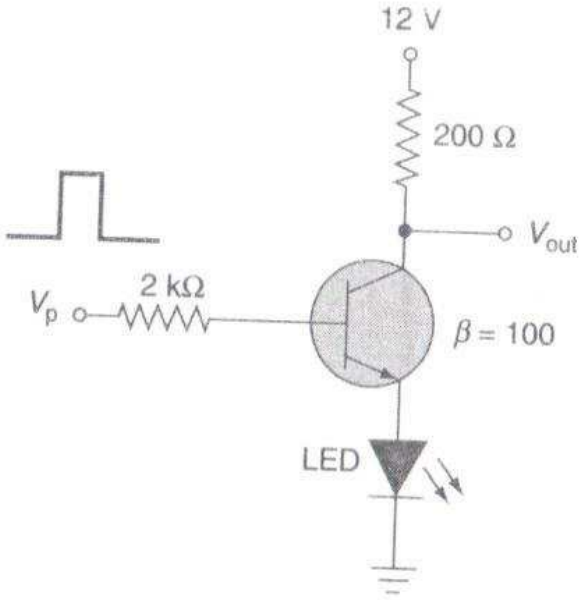
1. a) Discuss the response of High pass RC circuit with the help of waveforms
   i) Step Input
   ii) Ramp input
   b) Explain how Low pass RC circuit will act as Integrator.

2. a) Draw the circuit of transistor clipper and explain its operation with the help of waveforms.
   b) List out applications of voltage comparators.

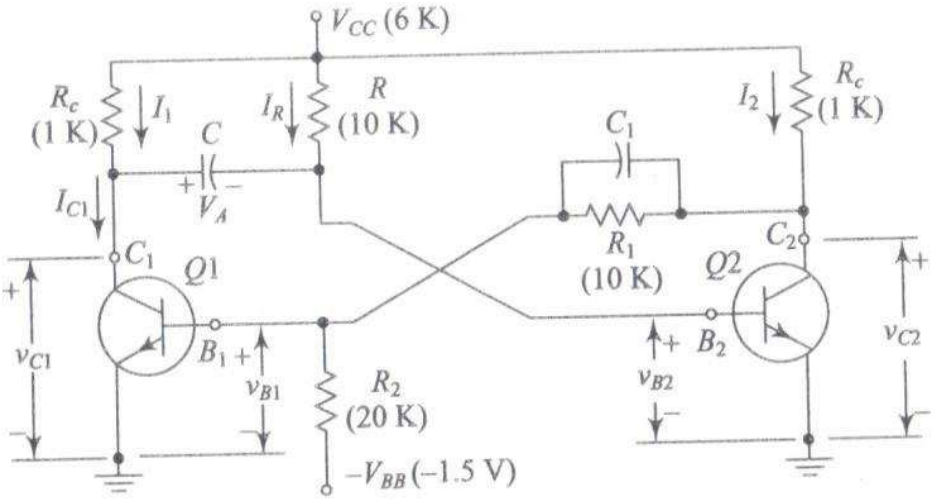
3. An input pulse is applied to the transistor switch shown in figure below. What is the minimum input voltage required to make the LED to glow? Also find out the minimum input voltage required to put the transistor in saturation. It is given that the minimum current required by the LED to glow is 10mA, voltage drop across the LED is 1.5V, base – emitter voltage of the transistor is 0.7V, collector – emitter voltage of the transistor in saturation is 0.5V.



Code No: X0223/ R07

SET - 1

4. Compute the voltage levels of collector coupled monostable multivibrator at bases and collectors for the circuit shown below.



5. Draw and explain the operation of sweep circuit using UJT with necessary waveforms. Explain limitations of the circuit.

6. Discuss the concept of pulse synchronization of relaxation devices.

7. a) Distinguish between sampling gates and logic gates.
   b) Explain the working principle unidirectional diode gate also illustrate the effect of control voltage on gate output.

8. Explain the operation of 3- input NAND gate using RTL negative logic.

Code No: X0223/ R07

SET - 2

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

PULSE AND DIGITAL CIRCUITS

(Com. to EEE, EIE)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

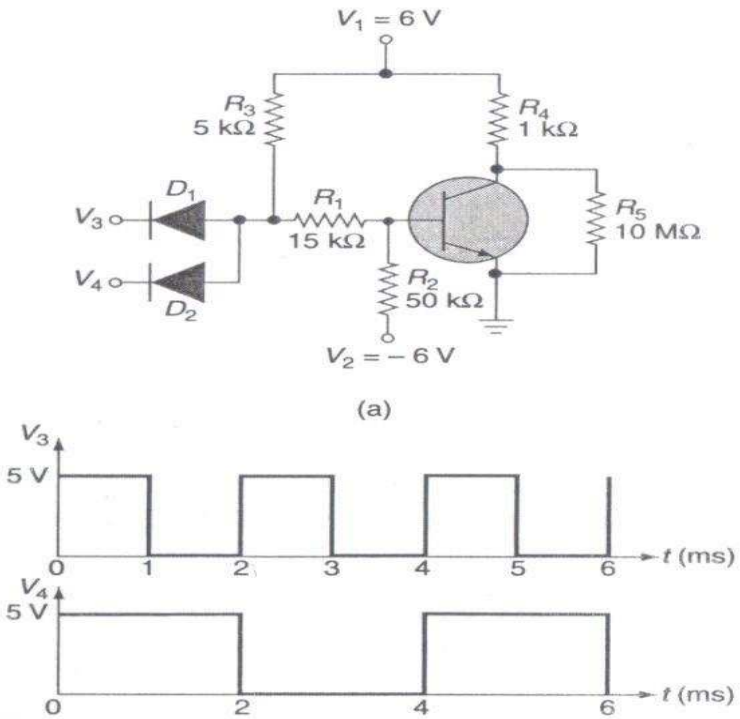
All Questions carry equal marks

---

1. a) Discuss the response of Low pass RC circuit with the help of waveforms
   i) Step Input
   ii) Ramp input
   b) Explain how high pass RC circuit will act as Differentiator.

2. a) Draw the circuit of two diode clipper and explain its operation with the help of waveforms.
   b) Explain the effect of diode characteristics on clamping voltage.

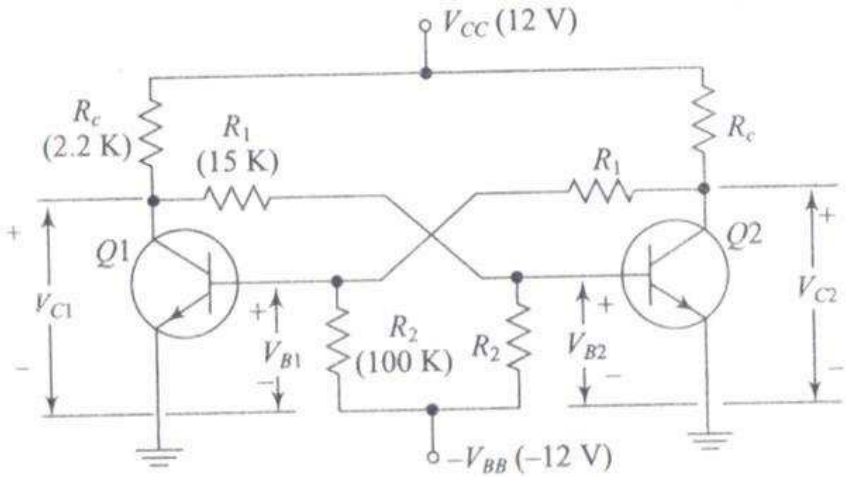
3. A simple switching circuit is shown figure below. The input voltages V_3 and V_4 applied are also shown below. Draw the output waveform across resistor R_5. Assume $V_{CE(Sat)}$ is zero.



Code No: X0223/ R07

SET - 2

4. Calculate the stable state currents and voltages for the bi-stable multi vibrator circuit shown below. Assume that the transistors have a minimum h_{FE} value of 20.



5. Design a UJT sweep generator with the sweep amplitude of 6 volts. The sweep interval of the waveform is expected to be 3ms with negligible retrace interval. The slope error, e_s = 0.75. Determine the values of R_{b1}, R_{b2},V_{BB}, V, R and C

6. Discuss the concept of frequency division in the sweep circuits.

7. Discuss the bidirectional sampling gate using single transistor and two transistors.

8. Explain the operation of 3 input NOR gate using RTL positive logic.

Code No: X0223/ R07

SET - 3

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

PULSE AND DIGITAL CIRCUITS

(Com. to EEE, EIE)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

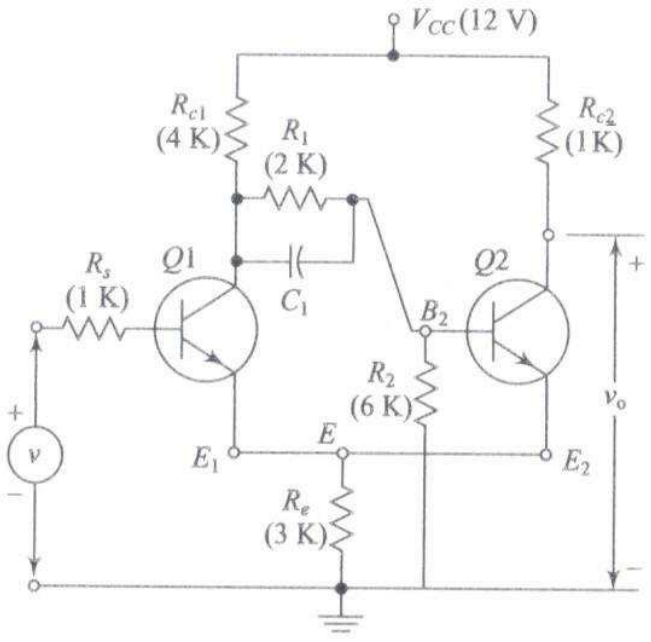
---

1. a) Discuss the response of High pass RC circuit for square wave input. Also sketch the necessary wave forms.
   b) Explain the concept of attenuators.

2. a) State and prove clamping circuit theorem.
   b) Draw an ideal clamping circuit for which output to satisfy following conditions
      i) Positive peaks to be at zero level
      ii) Negative peaks to be at zero level
   Assume sinusoidal input and justify your answer.

3. Explain in detail about transistor switching times.

4. Calculate the lower and upper triggering voltages for the Schmitt trigger circuit shown below.



5. Explain the Millar sweep circuit. Also derive an expression for slope error and sweep speed.

Code No: X0223/ R07

SET - 3

6. With the help of circuit and necessary waveforms explain the concept of synchronization in astable multivibrator.

7. Explain the bidirectional sampling gate using diodes. Also derive the expression for gain.

8. Draw the circuits for OR gate using diodes for negative logic and positive logic and explain the operation.

Code No: X0223/ R07

SET - 4

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

PULSE AND DIGITAL CIRCUITS

(Com. to EEE, EIE)

Time: 3 hours Max Marks: 80

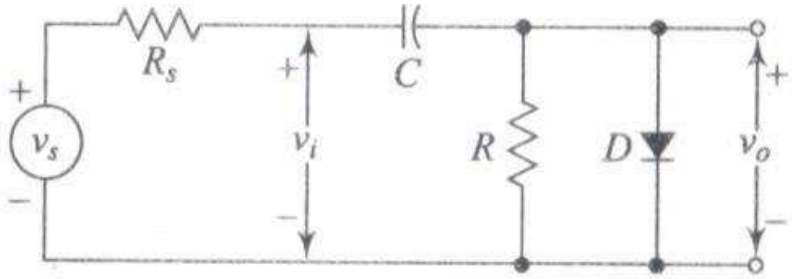
Answer any FIVE Questions

All Questions carry equal marks

---

1. a) Discuss the response of Low pass RC circuit for square wave input. Also sketch the necessary wave forms.
   b) Explain the concept of ringing circuit.

2. For the clamping circuit shown below, a symmetrical square wave is applied at t=0 with amplitude ranging from 0 to 10 Volts and frequency of 5 kHz. Compute and sketch the output waveform for first several cycles.



3. a) Explain piecewise linear characteristics of diode.
   b) With the circuit explain how transistor works as switch.

4. With the help of circuit and waveforms explain the operation of collector coupled astable multivibrator. Also derive an expression for pulse width.

5. Explain the Millar sweep circuit. Also derive expressions for slope error and sweep speed.

6. With the help of block diagram and necessary waveforms explain about stability of relaxation dividers.

7. Explain the working principle four diode sampling gate and derive expression for gain.

8. Draw the circuits for AND gate using diodes for negative logic and positive logic and explain the operation.

Code No: T0221 /R07 SET - 1

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec 2010

POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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1. a) Draw the schematic diagram of thermal power station and explain its working principle
   b) Explain the function of condenser

2. a)What are the main parts of a nuclear reactor and explain their functions
   b) Explain the Fast Breeder Reactor with neat diagram

3. a) Discuss briefly various electrical distribution systems
   b)Calculate the minimum consumer voltage of a dc 2 - wire distributor PQ 700m long is fed from both ends at 230V loads of 25A, 40A, 75 A, 60 A are tapped at distances of 75m, 300m, 450m,525m from the end P respectively. If the area of cross section of distributor conductor is 1.5 cm^2 and resistivity = $1.7 \mu\Omega - cm$?

4. A single-phase distributor 2 km long supplies a load of 100 A at 0.8 power factor lagging at its far end and a load of 90 A at 0.8 power factor lagging at its midpoint. Both power factors are referred to the voltage at the far end. The impedance per km (go and return) is (0.2+ j0.3) ohms. If the voltage at the far end is maintained at 220 V, determine the following
   i) Voltage at the sending end and
   ii) Phase angle between the voltages at both the ends.

5. a)Briefly discuss the equipments of substations
   b) Explain the constructional aspects of GIS

6. a) Show with the aid of a vector diagram, how the voltage at the receiving end of a transmission line can be maintained constant by the use of a synchronous phase modifier
   b) It is desired to correct the power factor to 0.9 by means of static capacitors connected across each phase of a 3-phase, 400V, and 50Hz motor installation having a maximum load of 75kVA at a power factor of 0.7.What must be the capacity of each delta connected condenser?

Code No: T0221 /R07 SET - 1

7. a) Discuss the difference between load curve and load duration curve
   b) Both base load station and a standby station of capacities are 20MW and 15 MW respectively share a common load. Calculate the annual load factors and capacity factors of each station which are having the following data.
      i) Annual standby station output = $5x10^6$kWh
      ii) Annual base load station output =$100x10^6$kWh
      iii) Peak load on standby station=10MW
      iv) Hours of use of standby station/year = 2000 hours

8. a) Discus the various costs that go into the generation of electrical energy
   b) A 100kVA transformer with a copper loss of 1.5 kW at full load and iron loss of 1.1 kW has the operating schedule per year as following:
      i) Efficiency of transformer = 90%
      ii) Full load at 0.7 p.f for 2,000 hrs
      iii) Half – full load at 0.8 p.f for 2,000 hrs
      iv) No – load for the remaining hours.
      Calculate the total annual electricity bill if the flat rate tariff is 50 paise/kWh.

Code No: T0221 /R07 SET - 2

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec 2010

POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

---

1. Draw one line diagram of thermal power station and explain the various components

2. a) What are the radiation hazards of nuclear power station and explain
   b) Explain the Pressurized Water Reactor with neat diagram

3. a) Contrast between overhead and underground distribution systems
   b) An electric train runs between two sub stations 5 km a part maintained at voltages 550 V and 530 V respectively and draws a constant current of 250A while in motion. The resistances of the track for go and return path is $0.02\Omega/km$. Determine the following
   i) The point along the track where minimum potential occurs
   ii) The current supplied by the two substations when the trains are at the point of minimum potential

4. A single phase 1km long distributor PMQ fed at P has resistance and reactance per conductor of 0.2Ω and 0.3 Ω respectively. The voltage at far end V_Q = 230V and the current is 75A at 0.85 p.f lag. At the midpoint M of the distributor a current of 110A is tapped at a p.f of 0.707 lag with reference to the voltage V_M at the midpoint. Calculate the following
   i) Voltage at mid point
   ii) Sending end voltage V_P and
   iii) Phase angle between V_P and V_Q

5. a) Explain the single bus bar arrangement and list out its merits as well as demerits
   b) What are the different types of GIS and explain any one type

Code No: T0221 /R07 SET - 2

6. a)Why voltage control is required in power systems? Mention the different methods of voltage control employed in power system.
b) A star connected 500 H.P, 3000 V, 50Hz motor works at a power factor of 0.707 lagging. A bank of mesh connected condensers is used to raise the power factor to 0.95 lagging. Find the capacitance of each unit and total number of units required, if each is rated 600 V, 50 Hz. The motor efficiency is 90%.

7. a) Explain the significance of load duration curve and load factor
b) A power system supplies as per the following schedule

Type of load	Maximum demand (kW)	Diversity of group	Demand factor
Domestic	1000	1.3	0.75
Commercial	3000	1.0	0.85
Industrial	9000	1.35	1.0

Calculate i) the maximum demand and ii) connected load of each type, if the overall system diversity factor is 1.3.

8. a) What is a tariff? Discuss and compare various tariffs used in practice
b) A factory requires 6×10^5 kWh per month with a maximum demand of 1.5 MW. Find the annual cost of energy and overall cost per unit for the following cases
i) If supplied from an electric utility at the rate of Rs. 120 per kW of maximum demand plus 5 paise per unit
ii) If supplied from a private generating set costs Rs. 650 per kW and having running cost of 8 paise per unit. Interest and depreciation 16% for the private set. Comment on the results.

Code No: T0221 /R07 SET - 3

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec 2010

POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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1. a) Describe the various types of cooling towers
   b) What are the classification of boilers and explain the water tube boiler

2. a) Draw the schematic diagram of nuclear power station and explain its working principle
   b) Discuss the nuclear chain reaction

3. a) What are the requirements and design features of distribution systems
   b) A dc two wire distributors are fed at F_1 and F_2 at 220 V and 225 V respectively. The total length of the distributor is 250 m. The loads tapped off from fed end F_1 are

Load in ampere	:	15	30	20	40
Distance in metre	:	40	100	150	200

   The resistance per km of one conductor is 0.4Ω. Determine the current in various sections of the distributor and the voltage at the point of minimum potential.

4. A single-phase distributor has loop resistance of 0.2Ω and a reactance of 0.3Ω. The far end of the distributor has a load current of 120A and a power factor 0.707 lagging at 220 V. The midpoint Q of the distributor has a load current of 40 A at power factor 0.8 lagging with reference to voltage Q. Determine the sending end voltage and power.

5. a) Explain the single bus bar system with sectionalization and list out their merits and demerits
   b) What are the merits of gas insulated substations?

6. a) What are the causes of low power factor
   b) A 3-phase induction motor delivers a load of 450HP at an efficiency of 92% with 0.85 p.f lag. A synchronous motor with a power consumption of 100 kW is connected in parallel with the induction motor. What will be the kVA rating and the operating p.f of the synchronous motor when the overall p.f of combined system is unity?

Code No: T0221 /R07 SET - 3

7. a) Explain the significance of load factor and diversity factor
   b) A power station supplied energy to two substations P and Q, four feeders take off from each of the sub-stations, the maximum demand are as follows:
   Power Station = 12MW Feeders on substation P: 1,3,6,2 MW
   Substation P = 8MW Feeders on substation Q: 2,5,3,1 MW
   Substation Q = 10MW
   Determine the diversity factors between i) substations, ii) feeders on substation P and iii) Feeders on substation Q.

8. a) What is two part tariff? Compare it with p.f tariff
   b)A power station has a maximum demand of 15 MW. Find the cost per units generated from the following data: Annual load factor =45%, capital cost =Rs.13,00,000/-, annual cost of fuel and oil = Rs. 7,50,000, taxes, wages and salaries = Rs. 6,00,000, Interest and depreciation = 12%.

Code No: T0221 /R07 SET - 4

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec 2010

POWER SYSTEMS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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1. a) Explain the function of super heater with neat diagram
   b) Describe the various types of steam turbines used in thermal power stations

2. a) Draw the schematic diagram of gas power station and explain its working principle
   b) Discuss the principle of operation of nuclear reactor

3. a) What are the advantages of feeding a distributor at both ends
   b) A 2- wire DC distributor PQ is 1.5 km long and supplies loads of 50A, 100A, 750A, 25A situated 400 m, 750m, 1200m and 1500 m from the feeding point P. Each conductor has a resistance of $0.025\Omega/km$. If a supply voltage 220V is maintained at point P, determined the voltage at each load point?

4. A single-phase ring distributor PQR is fed at P. The loads at Q and R are 40A and 60A both at power factor of 0.8 lagging both expressed relative to voltage at P. The total impedance of the three sections PQ, QR and RP are (3+j1), (2+j4) and (3+j6) ohms respectively. Find the current in each section with respect to the supply voltage at P.

5. a) What are the merits and demerits of indoor substations over outdoor substations?
   b) Draw the single line diagram of GIS and explain its operation

6. a) Describe 'off load 'and 'on load' tap changing transformers.
   b) An industry requires a steady load of 3 MW at a p.f. of 0.7 lagging and pays Rs. 120 per annum per kVA of maximum demand. If the phase advancing equipment costs Rs. 220 per kVAr, calculate the capacity of the phase advancing equipment required for minimum overall annual expenditure. Assume interest and depreciation charge on phase advancing equipment is 12% , what is the new p.f. of the supply.

Code No: T0221 /R07 SET - 4

7. a) Explain the importance of load duration and integrated load duration curves
b) The load shared by a base load station of capacity 20 MW and standby power station of Capacity 25 MW as follows

Annual standby station output	= 8.0×10^6 kWh
Annual base load station output	= 110×10^6 kWh
Peak load on the standby station	= 15 MW
Hours of use of standby station during the year	= 2200 hours.

Calculate i) annual load factor, ii) use factor and iii) capacity factor of each power station.

8. a) What are the desirable characteristics of a tariff methods
b) A generating station annual working cost is represented by the formula Rs. (a +b kW+c kWh) where the various terms have their usual meaning. Calculate the values of a, b and c for a 75MW station operating at annual load factor of 60% from the following data:
   i) Capital cost of building and equipment = Rs. $6x10^6$
   ii) The annual cost of fuel, oil, taxation & wages of operating staff = Rs 8, 00,000
   iii) The annual interest & depreciation on building & equipment = 12%
   iv) Annual cost of organization and interest on the cost of site, etc = Rs 4, 50,000

Code No: X0224/R07

SET - 1

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

SWITCHING THEORY AND LOGIC DESIGN

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

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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1. a) Write short notes on different types of 4 bit codes. State their properties and explain with examples. (8M)
   b) Convert the following hexa decimal number to octal, decimal and binary.
   i) CA732 ii) 1AC78 (8M)

2. a) Show that the dual of the exclusive-or is equal to its complement (8M)
   b) Express the complement of the following function in sum of min terms forms.
   i) F(x, y, z)= xy + xz
   ii) F(A,B,C)= π(2,4,5,7) (8M)

3. a) Minimize the function using Karnaugh-map and obtain minimal SOP function.
   f(A,B,C,D) = π(1,2,3,4,6,9,10,12,14) + d(5,7,11). (10M)
   b) Determine canonical POS form for the function T(x,y,z) = x($\bar{y}$ + z). (6M)

4. a) Explain the operation of priority Encoder? (12M)
   b) Mention the applications of multi stage synthesis. (4M)

5. a) Design a BCD to excess -3 code converter using i) ROM , ii)PAL. (8M)
   b) How a 4×16 decoder can be constructed with two 3×8 decoders. (8M)

6. a) Compare merits and demerits of ripple and synchronous counters. (6M)
   b) Design a modulo-12 up synchronous counter using T flip flops and draw the circuit diagram. Explain the operation of priority Encoder? (10M)

7. Find the equivalence partition and corresponding reduced machine in standard form (16M)

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

8. Construct an ASM block that has 3 input variables (A, B, C), 4 output variables (W, X, Y, Z) and 2 exit paths. For this block, output Z is always 1, and W is 1 if A and B both are 1, If C=1 and A=0, Y=1 and exit path 1 is taken. If C=0 or A=1, X=1 and exit path 2 is taken. Realize the above using multiplexer and register. (16M)

Code No: X0224/R07

SET - 2

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

SWITCHING THEORY AND LOGIC DESIGN

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

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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1. a) The message below has been coded in the 7 bit Hamming code and transmitted through noisy channel. Decode the message assuming that at most a single error has occurred in each code word 1001001,0111001,1110110,0011011. (8M)
   b) Generate Hamming code for a 4-bit Excess-3 messages to detect and correct single bit errors. (8M)

2. a) i) Find the complement of the Boolean function $(B\overline{C} + \overline{A}D)(A\overline{B} + C\overline{D})$ and reduce it to a minimum number of literals.
   ii) Convert the function f(x, y, z) = π(0,3,6,7) to the other canonical form. (8M)
   b) Show that a positive logic NAND gate is a negative logic NOR gate and vice versa. (8M)

3. Simplify the following Boolean function by first finding the essential prime implicans F(A,B,C,D)=∑ (1,3,4,5,10,11,12,13,14,15) (16M)

4. Write short notes on 3 to 8 line decoder. (16M)

5. a) Realize the following Boolean function using Threshold gate.
   F(a,b,c,d) = ∑(0,1,3,4,5,7,9,11,13,). (12M)
   b) What is a programmable logic array? (4M)

6. a) Design a Mod-6 synchronous counter using JK flip-flops. (10M)
   b) Compare combinational and sequential circuits. (6M)

7. a) Distinguish between Melay and Moore machines. (6M)
   b) Find the equivalence partition for the given machine and a standard form of the corresponding reduced machine. (10M)

PS	NS,2	
	X=0	X=1
A	B,0	E,0
B	E,0	D,0
C	D,1	A,0
D	C,1	E,0
E	B,0	D,0

8. Construct an ASM block that has 3 input variables (A, B, C), 4 output variables (w,x,y,z), and two exit paths. For this block, output Z is always 1, and W is 1 if A & B are both 1 .If C=1&A=0, Y=1 and exit path 1 is taken. If C=0, or A=1, X=1 and exit path 2 is taken. Realize the above using the One flip flop per state. (16M)

Code No: X0224/R07

SET - 3

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

SWITCHING THEORY AND LOGIC DESIGN

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

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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1. a) What is a self complementary code? Explain with examples. (8M)
   b) Convert the following numbers
   i) $(3456)_{10}$ to base 8 ii) $(6547)_{12}$ to base 16 (8M)
2. a) Express the Boolean function F=A+B'C as a sum of min-terms. (8M)
   b) Show that a positive logic NAND gate is negative logic NOR gate and vice versa. (8M)

3. For the given function F(A,B,C,D)= ∑ (0,3,4,7,8,9,11,12,14,15,16,20,23,24,27)+ ∑d(1,2,10,13,17,18,19, 22,26). Obtain the minimal SOP expression using K map. (16M)

4. Implement the following function using a multiplexer with an 8 × 1 multiplexer?
   F(A,B,C,D) =∑ (0,3,5,6,8,9,14,15) (16M)
5. a) A combinational circuit is defined by the functions
   F1(A,B,C)=∑m(2,4,6.,7)
   F2(A,B,C)=∑m(0,2,5,7) (10M)
   Implement the circuit with a PLA having three inputs, 4 product terms and two outputs.
   b) Compare combinational and Sequential logic circuits (6M)
6. a) Define
   i) Hold time, ii) Setup time and iii) Propagation delay time. (6M)
   b) Draw the circuit of a negative edge triggered JK flip-flop with active high preset &clear. Explain its operation with the help of truth table. (10M)

7. Find the equivalence partition and corresponding reduced machine in standard form for the machine given below. (16M)

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

8. Construct an ASM block that has 3 input variables (A, B, C), 4 output variables (W,X,Y,Z) and 2 exit paths. For this block, output Z is always 1, and W is 1. if A and B both are 1, If C=1 and A=0,Y=1 and exit path 1 is taken. If C=0 or A=1, X=1 and exit path 2 is taken. Realize the above using the PLA control and give the PLA table. (16M)

Code No: X0224/R07

SET - 4

II B.Tech I Semester (R07) Regular Examinations, Nov- 2010

SWITCHING THEORY AND LOGIC DESIGN

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

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

---

1. a) Express decimal digits 0 to 9 in BCD code and 2-4-2-1 code, excess-3 code ,BCD code and 6-3-1-1 code. (8M)
   b) Explain error correction and error detection codes with examples. (8M)

2. a) Reduce the following Boolean expression to the minimum number of literals (8M)
      i) x(x'+y) ii) xy+x'z+yz iii) (x+y)(x+y')
   b) Draw the logic diagrams to implement the following Boolean expressions (8M)
      i) Y= A+B+B'(A+C')
      ii) Y= A (B $\oplus$ D)+ C'
      iii) Y= A+CD+ABC
      iv) Y= (A $\oplus$C)'+B

3. Use the tabulation procedure to generate a set of prime implicants and obtain all the minimal expressions for the following functions.
   G(w,x,y,z) =$\sum$m (0,1,3,4, 7,8,12,14,15)+$\sum$d(2,6,10) (16M)

4. a) Write a short notes on 4-to-1-multiplexer? (12M)
   b) What are the applications of decoders and multiplexers? (4M)

5. Implement the following functions using a PROM.
   i) F(w,x,y,z) = $\sum$(1,9,12,15).
   ii) G(w,x,y,z) = $\sum$(0,1,2,3,,4,6,7,8,9,12,13,14,15). (16M)

6. Design a modulo-6 up/down synchronous counter using T- flip flops and draw the circuit diagram. (16M)

7. Obtain the equivalent classes using partitions method and give proper assignment. (16M)

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

8. Construct an ASM block that has 3 input variables (D,E,F) and output variables(P,Q,R,S) and 2 exit paths. For this block, output P is always 1, and Q is 1 if D=1. If D & F are 1 or if D&E are 0, R=1 and exit path 2 is taken. If (D=0&E=1) or (D=1&F=0), S=1 and exit path 1 is taken. Realize it with JK flip flop and gates. (16M)

Code No: V0223 /R07

SET - 1

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec- 2010

CONTROL SYSTEMS
(Com to EEE, ECE, E.CON.E, ECC)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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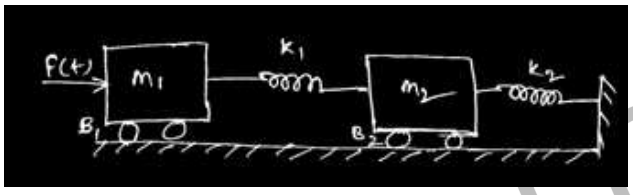
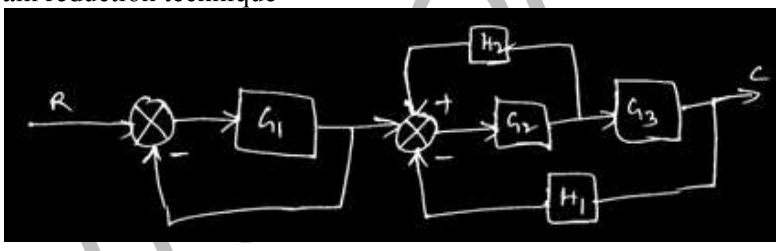
1. a) What are the feedback characteristics and explain its effect on stability

   b) Find the transfer function $\frac{X_1(s)}{F(s)}$ for a given mechanical translational system as shown in below figure



2. a) Explain the AC servo motor and draw its torque and speed characteristics
   b) Find the overall transfer function for the block diagram as shown in below figure by using block diagram reduction technique



3. a) Explain time domain specifications
   b) The open loop transfer function of a control system with unity feed back system is

   $G(s)=\frac{150}{s(1+0.25s)}$

   i) Evaluate the error series for the system.

   ii) Determine the steady state error for an input $\left(1+5t+\frac{3t^2}{2}\right)$

4. a) Define and derive the breakaway point on the root locus

   b) The open loop transfer function of unity feedback system given by $G(s)=\frac{k}{s(s^2+8s+T)}$.

   Using Routh's criterion, determine the values of k and T which will correspond to a stable system.

Code No: V0223 /R07

SET - 1

5. a) Discuss the correlation between time domain and frequency domain specifications
   b) Sketch the bode plot for the following function $G(s)=\frac{10}{s(2+s)\ (4+s)}$
   Also find the gain margin and phase margin

6. a) State and explain the Nyquist stability criterion
   b) Sketch the polar plot for a given open loop transfer function.
   $G(s)=\frac{8}{s(s+1)\ (s+4)}$

7. a) Explain the design procedure for lead compensator in frequency domain
   b) Describe the PID controllers

8. The state variable formulation of a system is given by
   $[\dot{x}]=\begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}[x]+\begin{bmatrix}0\\ 1\end{bmatrix}u$ *and* $y=[1 \quad 0][x]$. Determine the following
   i) Transfer function of the system
   ii) State transaction matrix and
   iii) State equation for a unit step input under zero initial condition.

Code No: V0223 /R07

SET - 2

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec- 2010

CONTROL SYSTEMS

(Com to EEE, ECE, E.CON.E, ECC)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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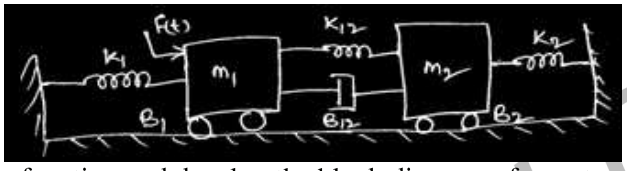
1. a) What do you mean by the sensitivity of the control system and discuss the effect of feedback on sensitivity
   b) A mechanical system is shown in below figure, derive its transfer function



2. Derive the transfer function and develop the block diagram of armature controlled DC servo motor

3. a) Determine the time response of second order system with unit step input
   b) A unity feedback system is characterized by the open loop transfer function $G(s)=\frac{1}{s(1+0.5s)\,(1+0.2s)}$. Determine the steady state error for unity step, unity ramp and unity acceleration inputs. Also determine the damping factor and natural frequency of dominant roots.

4. a) Explain the construction rules for root locus
   b) Test the stability of the system with the following characteristic equation by Routh's test: $s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$.

5. Determine the value of the gain constant K for the system with open loop transfer function $G(s)=\frac{K}{s(1+0.1s)\,(1+0.01s)}$, so that it has a phase margin of about 45^0. For this value of K, find the new gain margin.

6. a) Explain the procedure for constructing the polar plots
   b) Draw the Nyquist plot for the open loop system $G(s)=\frac{K(s+3)}{s(s-1)}$ and find its stability.

Code No: V0223 /R07

SET - 2

7. Consider a unity feedback system with open loop transfer function $G(s)=\frac{K}{s(1+s)\ (2+s)}$.

   Design a suitable compensator so that the compensated system has

   i) $K_v = 10\ \text{sec}^{-1}$

   ii) Phase margin=50^0

   iii) Gain margin= 10 db

8. a) State and explain the controllability and observability of a system

   b) The state equation of a system is given by $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u(t), t>0$

   i) Is the system controllable?

   ii) Compute the state transition matrix

   iii) Compute $x_1(t)$ under zero initial condition and a unit step input

Code No: V0223 /R07

SET - 3

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec- 2010

CONTROL SYSTEMS

(Com to EEE, ECE, E.CON.E ETM, ECC)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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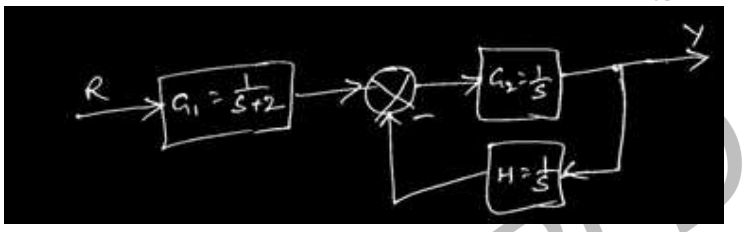
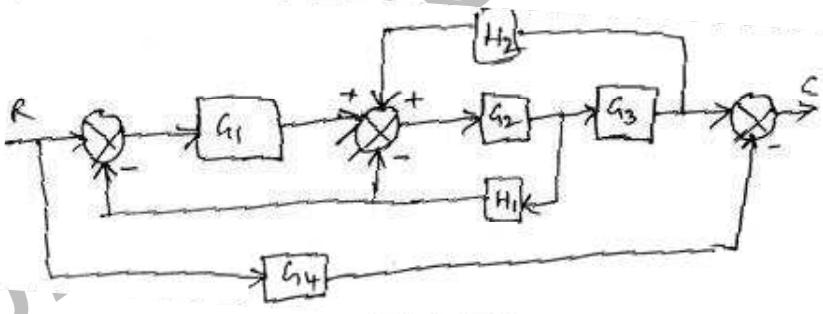
1. a) Describe the closed loop control system with an examples

   b) A closed loop system is shown in below figure, find sensitivity S_{G1}^{T} and S_{G2}^{T}



2. Find the overall gain of the system using block diagram reduction technique for a given block diagram as shown in below figure and verify the same using signal flow graph approach



3. a) Derive the time domain specifications of second order system with unit step input

   b) Given the open loop transfer function of a servo system with unity feedback is $G(s) = \frac{10}{s(1+0.1s)}$. Obtain the steady state error of the system when subjected to an input signal given by r(t)= $a_0 + a_1 t + \frac{a_2 t^2}{2}$

4. a) State and explain Routh's stability criterion

   b) The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{k}{s(s+3)^2}$. Sketch the root locus plot of the closed loop system for positive values of k and there from determine the value of k that would make the system to be stable.

Code No: V0223 /R07

SET - 3

5. a) Explain frequency domain specifications
   b) Describe the stability analysis using bode plots

6. Draw the Nyquist plot for a given open loop transfer function and test the stability. Find Gain margin and phase crossover frequency.

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

7. Design a phase lag network for a plant with the open loop transfer function $G(s) = \frac{1}{s(1+0.2s)^2}$ to have a phase margin of 45^0. Verify the performance of the compensated system with the specification.

8. a) State and prove the properties of STM
   b) The state equation of the LTIV system are given by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u; \; y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

   i) Determine the STM
   ii) Find the solution for y(t) and
   iii) If a unit step is given to the input, what will be the behavior of the output?

Code No: V0223 /R07

SET - 4

II B.Tech II Semester (R07) Supplementary Examinations, Nov/Dec- 2010

CONTROL SYSTEMS

(Com to EEE, ECE, E.CON.E ETM, ECC)

Time: 3 hours Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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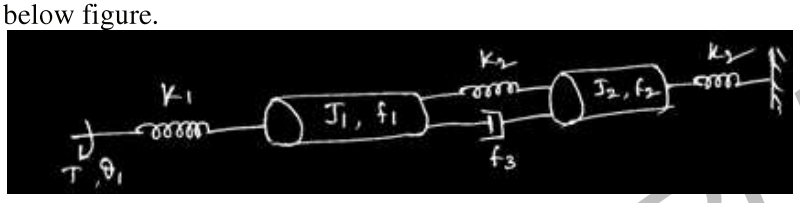
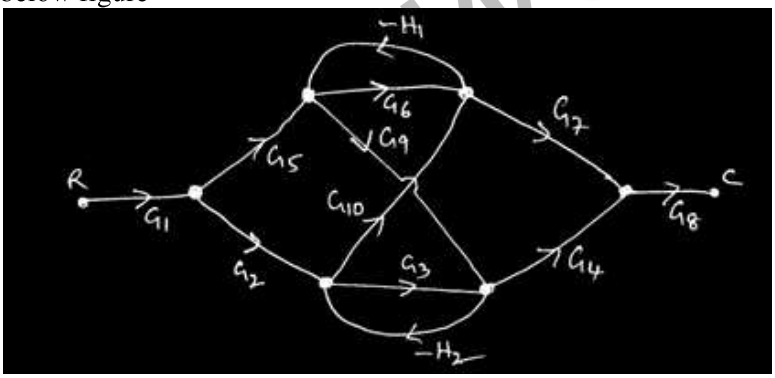
1. a) What are the differences between open loop and closed loop control systems

   b) Find the transfer function $\frac{\theta_1(s)}{T(s)}$, for the given rotational mechanical system as shown in below figure.



2. a) Describe the synchro pair as error detector with neat circuit diagram

   b) Using mason's gain formula, find the gain $\frac{C}{R}$ for the signal flow graph as shown in below figure



3. a) Define the steady state error and error constants of different types of inputs

   b) A unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$. Determine the gain K so that the system will have a damping factor of 0.5. For this value of K determine the natural frequency of the system. It is subjected to a unity step input. Obtain the closed loop response of the system in time domain.

4. a) Explain the special cases in Routh's stability criterion

   b) Sketch the root locus for the characteristic equation.

   $s(s+1)(s+2)+k(s+1.5)=0$

Code No: V0223 /R07

SET - 4

5. Given the open loop transfer function with unity feedback as G(s) = $\frac{Ke^{-10s}}{s(1+s)(1+10s)}$. Draw the bode plot and determine the gain K for the gain crossover frequency to be 5 rad/sec?

6. a) Discuss the calculation the G.M and P.M with respect to the polar plots
   b) A unity feedback control system has an open loop transfer function given by $G(s)H(s)=\frac{100}{s(s+5)(s+2)}$. Draw Nyquist diagram and determine stability.

7. a) Explain the design procedure for lag compensator in frequency domain
   b) What are the benefits of PID controllers?

8. a) What are the merits and demerits of state variable techniques
   b) The state equations of LTIV is represented by $\dot{x} = Ax + Bu$. Find the state transition matrix.

$$A=\begin{bmatrix} -2 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & -1 \end{bmatrix}, B=\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$