Code No.: **50208** | MR15

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2019

Subject: **CONTROL SYSTEMS**

Branch: **EEE**

Time: 3 hours **Max. Marks: 60**

PART – A

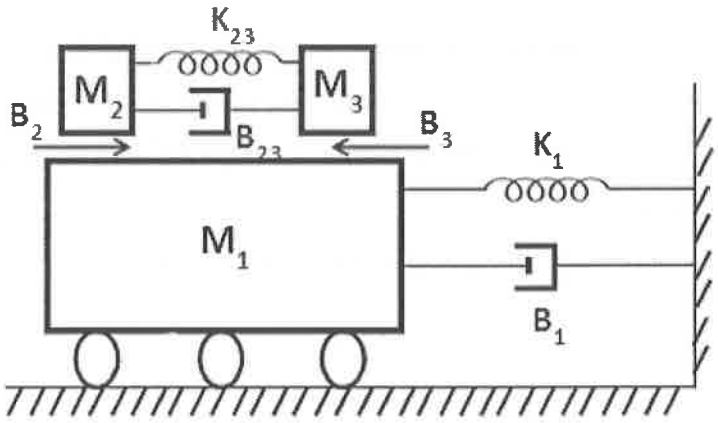
Answer ALL questions of the following **5x2M=10 M**

1. Define transmittance, sink and source.
2. For unity feedback system whose open loop transfer function is **G(s)=** $\frac{50}{(1+0.1s)(1+2s)}$ .Find the position and velocity error constants.
3. What are asymptotes? How will you find the angle of asymptotes?
4. Discuss the frequency response? What are the advantages of frequency response analysis?
5. Define controllability and observability.

PART-B

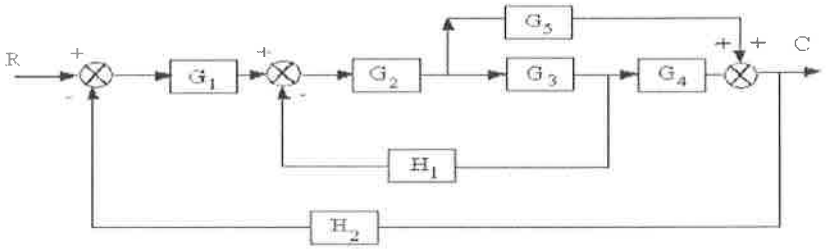
Answer any FIVE questions of the following **5x10 M= 50M**

1. Write the differential equations governing the mechanical system shown in below figure; draw the force - voltage and force – current electrical analogous circuits



2. a) Discuss the effect of feedback on Gain and Stability. [4M]

   b) Determine the overall transfer function C(s)/R(s) for the system shown in Fig. [6M]



3. a) Define steady state error constant K_p, K_v and K_a. Give the values of these error constants for type–0, type–1, and type–2 systems?

   b) A unity feedback system has G(s) =1/s (1+s), the input to the system is described by $r(t)=4+6t+2t^3$.Find the generalized error coefficients and steady state error.

4. a) Explain the effect of PI controller? [3M]

   b) For unity feedback system the open loop transfer function is $G(s)=\frac{10(s+2)}{s^2(s+1)}$. Find the positional, velocity and acceleration error constants. Also find steady state error when the input is $R(S)=\frac{3}{S}-\frac{2}{S^2}+\frac{1}{S^3}$ [7M]

5. a) State Routh's stability criterion. State their advantages. What are the limitations of Routh-Hurwitz criteria? [7M]

   b) What are the effects adding open loop poles and zero on the nature of the root locus and on system [3M]

6. a) The open loop transfer function of aunity feedback system is given by G(s) = $\frac{k}{s(1+0.25s)(1+0.4s)}$. Find the restriction on k so that the closed loop system is absolutely stable.

   b) How many roots does the following polynomial have in the right half of s-plane.

   $$s^4+2s^3+4s^2+8s+15.$$

7. a) Define Resonant peak M_r, Resonant Frequency w_r, gain margin and phase margin

   b) Design a lead compensator such that the system having following open-loop transfer Function $G(s)H(s)=5/(1+s)(1+0.5s)^2$. Will have a phase margin of about 40^0 and the steady State error for ramp input is less than or equal to 0.2.

8. Determine controllability and observability of the system described by

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$$

$$Y=\begin{bmatrix}4 & 5 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

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II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2019

Subject: **DC MACHINES & TRANSFORMERS**

Branch: **EEE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer ALL questions of the following **5x2M=10 M**

1. What is the Expression for lifting force of an Electromagnet?
2. What are the two functions of brushes in dc machines?
3. Why OC test is conducted on LV side and SC test is conducted on HV side in a Transformer?
4. Mention the type of enf induced in atransformer.
5. Why tapping are provided in the high voltage side of the transformer?

PART-B

Answer ANY FIVE questions of the following **5x10 M= 50M**

1. a) Explain the single excited system with neat circuit and derive the necessary equations.
   b) Explain the applications of doubly excited system.

2. a) What are the special applications where the electric field is used as acoupling medium for electromechanical energy conversion?
   b) Explain the distribution of mmf of the distributed windings.

3. Explain armature reaction in D.C Machines with neat diagrams? Methods of decreasing the effects of armature reaction.

4. a) Derive the expression of emf generated in case of generator from the first principles.
   b) Explain about different excitation methods of DC generators with diagrams.

5. a) What is the need of a starter in D.C motors?
   b) Derive the condition for the maximum efficiency of D.C Motors.

6. a) Explain the separation of core losses test in a single phase transformer.
   b) The following test results are obtained from a transformer whose ratings are:
   100kVA, 3300/440 V, 50Hz, single-phase
   OC test: 440V, 8A, 800W on the low voltage side
   SC test: 100V, 12A, 1200W, with low voltage winding short circuited .Calculate the equivalent circuit parameters.

7. A 500-kVA, 3-phase, 50-Hz, transformer has a voltage ratio (line voltages) of 33/11 – kV and is delta/star connected. The resistance per phase are: high voltage 35 ohm, low voltage 0.876 ohm and the iron loss is 3050 W. calculate the value of efficiency at full load and one-half of full –load respectively (a) at unity p.f and (b) 0.8 p.f.

8. A 2000/1000/500 V single phase, three winding transformer is to be used as an auto-transformer, with supply voltage of 3000V. Two loads, one of 1050 KVA at 3500 V and the other of 180 KVA at 1000 V, are to be energised from this auto-transformer output. Draw a suitable diagram of connections and find the currents in various parts of the circuit. Assume the loads to have same power factor.

Code No.: 50B10 **MR15**

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II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2019

Subject: **SPECIAL FUNCTIONS & COMPLEX ANALYSIS**

Branch: **COMMON TO EEE,ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer ALL questions of the following **5x2M=10 M**

1. Evaluate $\int_0^1 x^3\sqrt{1-x}\,dx$ using $\beta - \Gamma$ functions.
2. Show that $J_{\frac{3}{2}}(x)=\sqrt{\frac{2}{\pi x}}\left(\frac{1}{x}\sin x-\cos x\right)$
3. Evaluate $\int_C \frac{z^2-z+1}{z-1}dz$ where C is the circle $|z|=\frac{1}{2}$.
4. Find the Taylor's expansion of $f(z)=\frac{z-1}{z+1}$ about the point z = 1.
5. Find the invariant points of the transformation $\omega=\frac{1+z}{1-z}$.

PART-B

Answer ANY FIVE questions of the following **5x10 M= 50M**

1. a)Prove that $\Gamma(\frac{1}{2})=\sqrt{\pi}$

   b)Prove that $\int_0^{\frac{\pi}{2}} Sin^2(\theta)Cos^4(\theta)d\theta=\frac{\pi}{32}$
2. Solve in series the equation $\frac{d^2y}{dx^2}+xy=0$
3. State and prove Rodrigue's formula.
4. a) Find the orthogonal trajectories of the family of curves $r^2\cos(2\theta)=c$

   b) Evaluate $\int_C \frac{dz}{z-a}$ where c is $|z-a|=r$.
5. a) Evaluate $\int_C \frac{e^{-z}}{z^2}dz$, C: $|z|=1$.

   b) State and prove Cauchy-Residue theorem.
6. a) Find the Laurent series expansion of the function $\frac{z^2-1}{(z+2)(z+3)}$ if $2<|z|<3$.

   b) Expand $\frac{z}{(z^2-1)(z^2+4)}$ in laurent's series for $1<|z|<2$.
7. Find and plot the image of the triangular region with vertices $(0,0)$, $(1,0)$, $(0,1)$ under the transformation $W=(1-i)z+3$.
8. Find the bilinear transformation which maps the points z = 1, i, -1 onto the points w = i, 0, - i.

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II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2019

Subject: **PULSE & DIGITAL CIRCUITS**

Branch: **COMMON TO EEE,ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer ALL questions of the following **5x2M=10 M**

1. Draw the circuit diagram of a one shot multivibrator?
2. Explain the criteria for a good differentiating circuit?
3. Sketch the circuit of a positive clamper.
4. Explain how the logic families are the entity of the logic gates?
5. What is practical clamping?

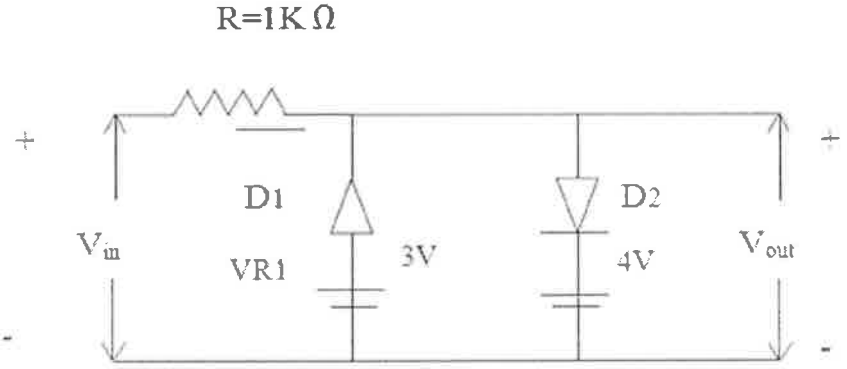
PART-B

Answer ANY FIVE questions of the following **5x10 M= 50M**

1. A 1kHz symmetrical square wave of ±12V is applied to RC circuit having 1ms time constant. Calculate and plot the output for the RC configuration as
   (i) High pass circuit (ii) Low pass circuit.

2. Discuss the response of RC high-pass circuit to different types of input voltages along with input and output waveforms.

3. Draw the circuit diagram of a DC restorer circuit with and without reference voltage and explain its operation for a sinusoidal input signal.
   b) Explain the operation of the following double diode clipper and sketch the output wave form for a sinusoidal input with piece rise linear transistor curve shown below



4. a) Explain the working of a diode clamper explain its square wave response what is the effect of source resistance?
   b) Explain the phenomenon of latching in a transistor switch?

5. Explain the operation of Monostable Multivibrator with the asymmetrical triggering circuit with a neat sketch.

6. Design an Astable multi-vibrator to produce an un-symmetrical wave T_1=0.5ms and T_2=0.4ms. The amplitude of square wave is 15V. Assume $h_{fe(min)} = 20$, $I_{c(sat)} = 5mA$ and $V_{CE(sat)} = 0V$.

7. Discuss with necessary circuits,how basic gates AND,OR & NOT are obtained using universal NAND gates.

8. a) For a mono stable vibrato calculate the input pulse width for the design values of
   R_C= 2k Ω R_B = 10K Ω c= 0.1 μ F V_{CC} = 10V V_{BE} Sat = 0.8V
   b) Explain the operation of a stable relaxation circuit with necessary wave form.

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II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2019

Subject: **HUMAN VALUES & PROFESSIONAL ETHICS**

Branch: **COMMON TO EEE,ECE,CSE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer ALL questions of the following **5x2M=10 M**

1. What is self-confidence and how it drives an individual towards his/her goal?
2. List out few variety of Moral Issues.
3. 'Sense of humor plays an important role in mental wellbeing and maintaining good human relations of an individual'. Substantiate the statement.
4. What is meant by Humanistic Universal Order?
5. Discuss briefly about respect for authority.

PART-B

Answer ANY FIVE questions of the following **5x10 M= 50M**

1. Discuss in detail of the following. a) Integrity b) Work Ethics.
2. a) What happens if an individual loses his integrity?
   b) Define moral character.
3. Explain Kohlberg's theory of moral development.
4. In our behavior, we generally observe our intention and others lack of competence. Does it lead to mutual happiness? What is the alternative? Explain with the help of an example.
5. Most precious thing in the world is 'Time'. Substantiate the statement with suitable examples.
6. Discuss the following briefly.
   a) Sense of Humour
   b) Commitment.
7. Right understanding in the individuals in the individuals is the basis for harmony in the family, and is the building block for harmony in the society. Give your comments.
8. What are the general procedures for implementing the right to due process, differentiate human rights and professional rights?