Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Semester: Odd Sem. 2019-20

Course Code: EEE 220

Course Name: NETWORK THEORY

Program & Sem: B.TECH EEE & V

Date: 30.09.2019

Time: 11:00AM to 12:00PM

Max Marks: 40

Weightage: 20%

Instructions:

i. *Read the question properly and answer accordingly.*
ii. *Question paper consists of 3 parts.*
iii. Scientific and Non-programmable calculators are permitted

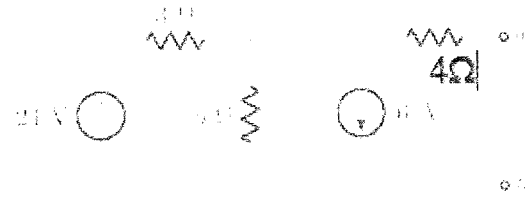
Part A [Memory Recall Questions]

Answer All the Questions. Each Question carries four marks. **(3Qx4M=12M)**

1. Define the following terms with examples. (C.O.NO.1) [Knowledge]

   a. Linear and non-linear elements b. Passive and active circuits

2. Reduce the following circuit into a single voltage source with a resistance at terminals a and b using source transformation technique. (C.O.NO.1) [Comprehension]

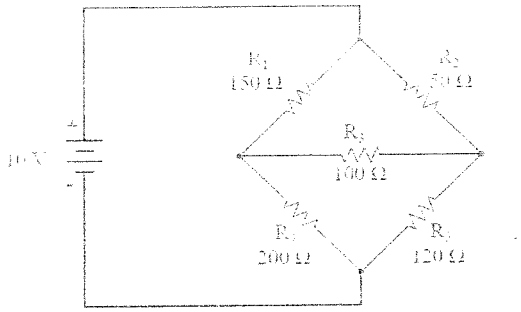


3. Consider a star connection of resistors and its equivalent delta connections. If all elements of the star connection are scaled by a factor k, k> 0, then by what factor the elements of the corresponding delta equivalent will be scaled. Justify your answer. (C.O.NO.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer All the Questions. Each Question carries eight marks. **(2Qx8M=16M)**

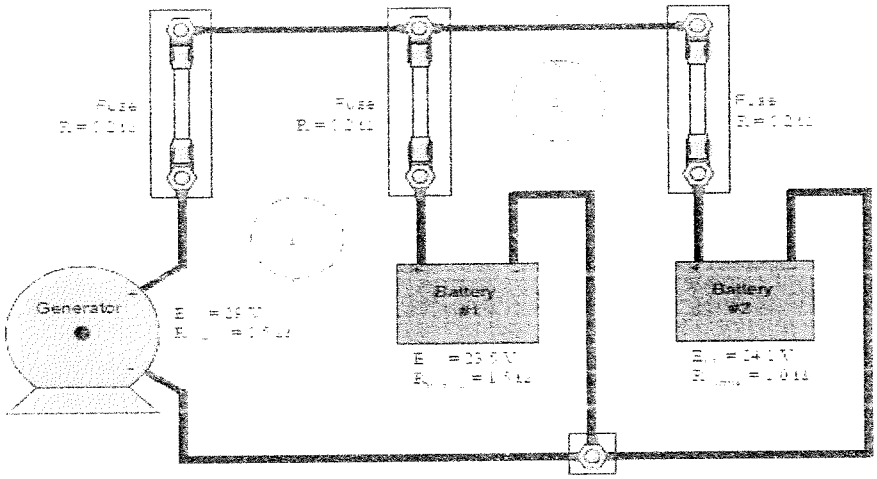
4. The node voltage method of analysis solves for unknown voltages at circuit nodes in terms of a system of KCL equations. Take this circuit, for example:



a. List the unknown node voltages.
b. Write the node voltage equations using KCL.

(C.O.NO.1) [Comprehension]

5. The "Mesh Current" method of network analysis works well to calculate currents in any branch of the circuits. Take this circuit, for example:

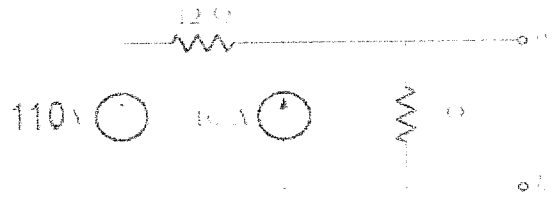


Write the KVL equations for this circuit, given the following mesh current directions, and then solve for the charging current through battery #1. (C.O.NO.1) [Comprehension]

Part C [Problem Solving Questions]

Answer the Questions. The Question carries twelve marks. (1Qx12M=12M)

6. The following circuit is used in household applications by connecting different types of loads fan, bulb, trimmer etc. (having different load resistances) across the terminals a and b.



Draw an equivalent simplified circuit to find the currents in different types of loads.
State how the equivalent circuit can be used to find the currents in different loads.

(C.O.NO.2) [Comprehension]

Roll No.													

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST – 2

Semester: V
Course Code: EEE 220
Course Name: NETWORK THEORY
Program & Sem: B.TECH EEE & V

Date: 18-11-2019
Time: 1 hr.
Max Marks: 40
Weightage: 20%

Instructions:

(i) *Read the question properly and answer accordingly.*
(ii) *Question paper consists of 3 parts.*
(iii) Scientific and Non-programmable calculators are permitted

Part A

Answer All the Questions. Each question carries four marks. **(3Qx4M=12)**

1. Write the network equations for current and voltage relationship of each circuit element in the time domain. [4M]

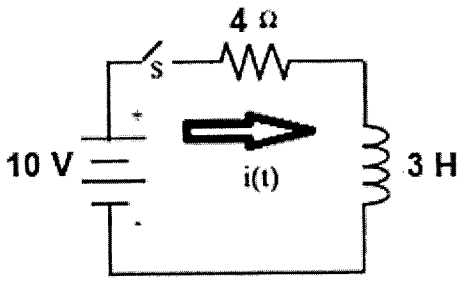
(C.O.NO: 4) [Bloom's level- Knowledge]

2. State the following theorems.

a. Millman's Theorem b. Reciprocity Theorem [4M]

(C.O.NO: 2) [Bloom's level-Knowledge]

3. The switch S closes at t = 0. Find the complete response of i(t) for t > 0. [4M]

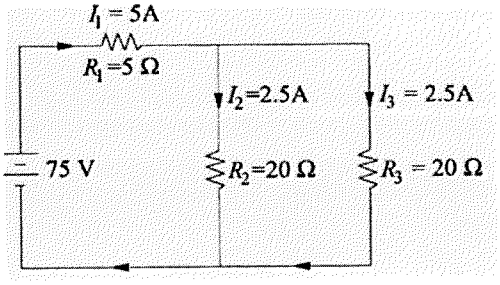


(C.O.NO: 4) [Bloom's level- Knowledge]

Part B

Answer All the Questions. Each question carries eight marks. (2Qx8M=16)

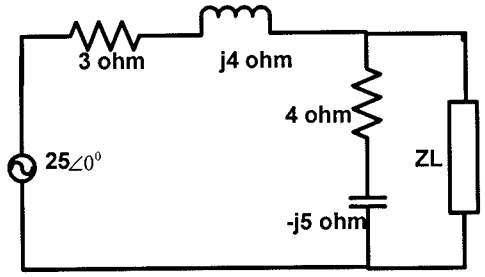
4. Compensation theorem is one of the important theorems in Network analysis, which finds its application mostly in calculating the sensitivity of electrical networks & bridges. Take this circuit, for example and find the values new currents when the R_3 is increased by 30%. [8M]



(C.O.NO:3) [Bloom's level-comprehension]

5. The maximum power transfer theorem states that the maximum power is delivered from a source to the load when the load resistance is equal to the source resistance. If the source impedance is complex then the maximum power transfer occurs when the load impedance is the complex conjugate of the source impedance. Find the impedance ZL so that maximum power can be transferred to it in the network. [8M]

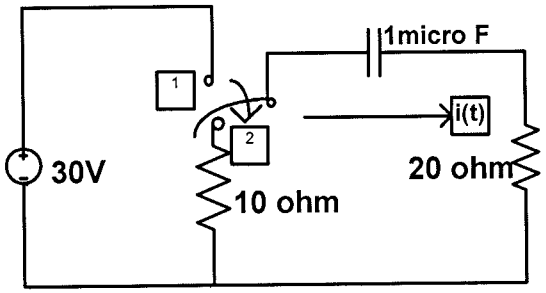
(C.O.NO:3) [Bloom's level-comprehension]



Part C

Answer the Question. Question carries twelve marks. (1Qx12M=12)

6. In the following network, the switch is changed from the position 1 to the position 2 at t = 0, steady condition reached before switching. Find the values of $i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$



(C.O.NO-4) [Bloom's level-comprehension]

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Semester: V

Course Code: EEE 220

Course Name:

Date: 18/11/2019

Time: 1 hr

Max Marks: 40

Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels	Thought provoking type [Marks allotted] Bloom's Levels	Problem Solving type [Marks allotted]	Total Marks
			K	C	C	
1	4	Unit-3	4			4
2	2	Unit-2	4			4
3	4	Unit-3	4			4
4	3	Unit-2		8		8
5	3	Unit-2		8		8
6	4	Unit-3			12	12
	Total Marks		12	16	12	40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I hereby certify that all the questions are set as per the above guidelines. [K Sreekanth Reddy]

Annexure- II: Format of Answer Scheme

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

SOLUTION

Semester: III
Course Code: EEE 219
Course Name:

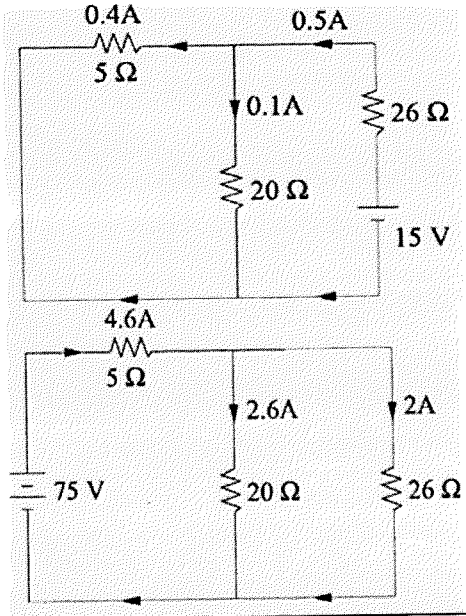
Date: 18/11/2019
Time: 1 hr
Max Marks: 40
Weightage: 20%

Part A (3Q x4 M =12 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	Resistor: v(t) = R i(t) Inductor: v(t) = L di/dt ; i(t) = 1/L($\int v(t)\,dt + I(o-)$ Capacitor: i(t) C dv/dt , v(t) = 1/C ($\int i(t)\,dt + V(o-)$	**Each Part:1 M** **Circuit:1M**	**5 min**
2	Let Vi (i=1,2,...,n) be the open-circuit voltages of n voltage sources having internal impedances Zi in series, respectively. Suppose these sources are connected in parallel, then they may be replaced by a single ideal voltage source V in series with an impedance Z. Consider two loops A and B of a network N where an ideal voltage source V in loop A produces a current I in loop B, then the network is said to be reciprocal if an identical source in loop B produces the same current I in loop A. In short, a linear network is said to be reciprocal if it remains invariant due to the interchange of position of cause (source) and effect (linear elements) in the network.	**Each Part: 2 M**	**5 min**
3	$i(t) = \frac{V}{R}(1 - e^{-\frac{t}{T}})$ T = L / R ; i(t) = 2.5(1-$e^{-1.33t}$)	**Formula: 2 M** **Time constant:1M** **Ans:1 M**	**5 min**

Part B (2Q x 8M = 16 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question

4	$R_3 = 20 + (0.03*20) = 26$ ohm $\Delta R = 6$ ohm $V = -I_3 \Delta R = -15$ V  	Equations:4 M Circuits:4 M	12 min
5	First Find the Current through 4-j5 Ie I = 25 / 7-j1 = 7.07 at angle of -8.130 A Vth = I * 4-j5 = 7.07*6.403 [-8.130-51.34] 45.26 at angle of -59.47 Zth = (3+j4)//(4-j5) = 4.462 + j0.78 So for maximum power transfer ZL = complex conjugate of source impedance = 4.462 – j 0.78 ohm	I: 2M V: 2 M Zth:2 M Condition and equation:2M	12 min

Part C (1Q x 12M =12 Marks)

Q No	**Solution**	**Scheme of Marking**	**Max. Time required for each Question**
6	At t=0-, network attains steady state Vc (0-) = 30 V I(0-) = 0 At t=0+, the capacitor acts as voltage source 30V I(0+) = -30/30 =-1A Writing KVL equation, for t > 0, di/dt = $0.33*10^5$A/s d/dt(di/dt) = -$1.1*10^9$A/s*s	Initial conditions: 4M KVL quation:2 M Remaining 2 parts:3 M each	20 min

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Semester: Odd Semester: 2019 - 20
Course Code: EEE 220
Course Name: NETWORK THEORY
Program & Sem: B.Tech (EEE) & V

Date: 24 December 2019
Time: 9:30 AM to 12:30 PM
Max Marks: 80
Weightage: 40%

Instructions:
(i) Read the all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

Part A [Memory Recall Questions]

Answer all the Questions.

1. **(10Qx1M=10M)**

a. In a 3 phase delta connected load the line current is equal to ---------- times of phase current. (C.O.No.5) [Knowledge]

b. Mesh is a loop which doesn't contain any ---------- (C.O.No.1) [Knowledge]

c. The independent sources are of ---------- types. (C.O.No.1) [Knowledge]

d. Kirchhoff's voltage law is based on principle of conservation of ------(C.O.No.1) [Knowledge]

e. In Superposition theorem, while considering a source, all other voltage sources are ----------
(C.O.No.2) [Knowledge]

f. The time constant in a series R-L circuit is ---------- (C.O.No.4) [Knowledge]

g. The condition for maximum power to be transferred to the load is in DC circuits is ----------
(C.O.No.3) [Knowledge]

h. Laplace transform changes the ---------- domain function to the ---------- domain function.
(C.O.No.4) [Knowledge]

i. In a series resonance circuit, series resonance occurs when ---------(C.O.No.4) [Knowledge]

j. Reciprocity Theorem is used to find the change in ------- when the resistance is changed in the circuit. (C.O.No.3) [Knowledge]

2. **(5Qx2M=10M)**

a. State the Norton's theorem. (C.O.No.2) [Knowledge]

b. Write the reciprocity and symmetry condition for h-parameters. (C.O.No.5) [Knowledge]

c. With the help of a table explain the behavior of R, L, C elements at the time of switching, at t = 0, at t = ∞ . (C.O.No.4) [Knowledge]

d. Write the conversion equations for delta from star connected load. (C.O.No.1) [Knowledge]

e. Define the frequency response. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries 10 marks. (3Qx10M=30M)

3. A major section of power system engineering deals in the transmission of electrical power from one particular place (eg. Generating station) to another like substations or distribution units with maximum efficiency. Thus the entire transmission system can be simplified to a two port network as shown in below Fig.1. Find the ABCD parameters for the given two port network. [10M] (C.O.No.5) [Comprehension]

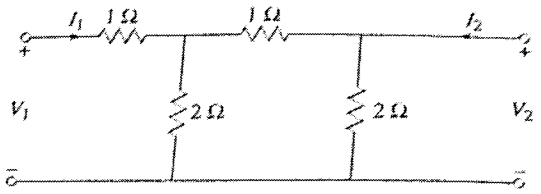

Fig.1

4. The current in any given branch of a multiple-source circuit can be found by determining the currents in that particular branch produced by each source acting alone, with all other sources replaced by their internal impedances. The total current in the given branch is the phasor sum of the individual source currents in that branch. Find the coil current in the following Fig.2. Assume all the sources are ideal. (C.O.No.3) [Comprehension]

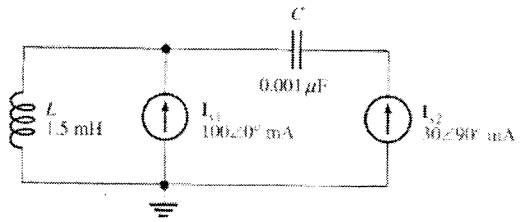

Fig.2

5. a. The frequency response H(jω) is a function that relates the output response to a sinusoidal input at frequency ω. we can separate H(jω) into its magnitude and its phase component. Find the frequency response of a system H(s) = $\frac{s+0.1}{s+5}$ then find magnitude and phase component response y(t) for x(t) = cos2t. [5M] (C.O.No.4) [Comprehension]

b. The nodal analysis method is used to find the node voltages by using KCL. For the following circuit shown in Fig.3, find the current through 100Ω resistor. [5M]
(C.O.No.1) [Comprehension]

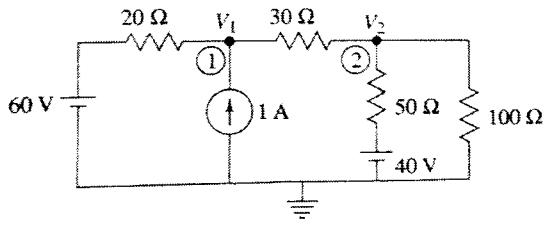

Fig.3

Part C [Problem Solving Questions]

Answer both the Questions. Each Question carries 15 marks. **(2Qx15M=30M)**

6. a. Obtain the Thevenin equivalent network for the given network in Fig.4 at terminals A and B. [7M] (C.O.No.3) [Comprehension]

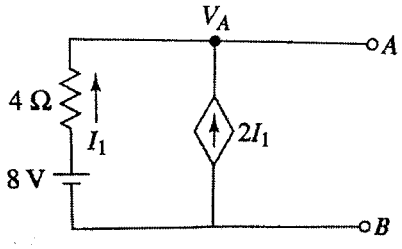

Fig.4

b. In the network shown in Fig.5, the switch is moved from the position 1 to 2 at t = 0, the steady state condition having been established in the position 1. Determine i(t) for t > 0. [8M]
(C.O.No.4) [Comprehension]

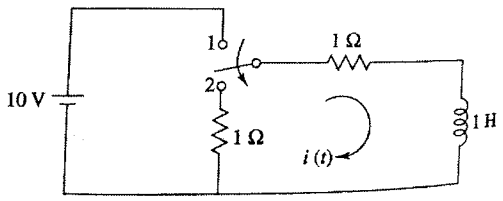

Fig.5

7. a. In a star-connected, 3-ø system, the line voltage is equal to 1.73 times the phase voltage and line voltages lead respective phase voltages by 30^0.Also the line current is equal to the phase current. In this type of system, three equal impedances, each of (8 + j 10) ohms are connected in star with a supply of 3 phase 440 V, 50 Hz. Calculate line current, phase current, active power, reactive power and apparent power. [9M](C.O.No.5) [Comprehension]

b. Voltages V_1 and V_2 across Port 1 and Port 2 respectively of a two port network are given by the following equations: $V_1 = 0.5\ I_1 - 0.2\ I_2$, $V_2 = -0.2\ I_1 + I_2$. Find open circuit impedance (Z) parameters and verify the symmetry condition. [6M] (C.O.No.5) [Comprehension]

SCHOOL OF ENGINEERING

SOLUTION

Semester: V

Course Code: EEE 220

Course Name:

Date: 24/12/2019

Time: 3 hr

Max Marks: 80

Weightage: 40%

Part A (Q x M =20 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	a. Root 3 times b. b. inner loop c. 4 d. Energy e. Short circuited f. L/R g. Rl= Rs h. Time , frequency i. Xl = Xc j. Voltage or current	**Each Part:1 M** **Circuit:1M**	**20 min**
2	a. Single current source in parallel with resistance (Entire n/w can be replaced). b. H11h12-h21h12 = 1, h21 = -h12 c. R as R, L as SC, C as OC d. Ra = R1R2+R2R3+R3R1/R1 e. Complex function consists of magnitude and phase.	**Each Part: 2 M**	**20 min**

Part B (3Q x 10M = 30 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
3	V1 = 3I1-2I3 V2 = 2I2+2I3 5I3 = 2I1-2I2 Solving three equations:11/4, 5/2, 5/4, 3/2	**Each Part: 2 M**	20 min
4	Is1 = 100 A Is2 = 30 at angle of 90 Total I = 130 at angle of 90	Each Part 5M	20 min
5	a. Substitute s= jw $y(t) = 0.372\cos(2t + 65.3^{\circ})$ b. V1-60/20 +(V1-V2)/30 =1 c. -10V1 + 19 V2 = 0 d. V1 = 67.2 V, V2 = 4.8 V e. I = 0.48 A	Each part 2.5M	20 min

Part C (2Q x 15M =30 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
6	a. Vth = 8 V Isc = 6A Rth = 1.33ohm b. I(0-) = 10A I(0+) = 10A Writing KVL equation and applying inverse LTi(t) = 10 e^-2t	a. Each part:2M and figure:1M b. Each step:1M	35 min
7	a. Vl = 440 V, Vph = 254.03V Zph= 12.81, phase angle =51.34 Iph = 19.83A=Il P = 1.73*Vl*Il cosø= 9.44 kW Q = 11.81KVAR b. 0.5, -0.2, -0.2, 1	a.Each PART:2M Simplification:4M Wiring ABCD parameters:5 b.Each part 1M	35 min

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

END TERM FINAL EXAMINATION

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO (% age of CO)	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels	Thought provoking type [Marks allotted] Bloom's Levels	Problem Solving type [Marks allotted]	Total Marks
			K	C	C	
PART A Q. NO1 Q.NO.2	CO 01 CO 02 CO 03 CO 04 CO 05	All the 4 modules	20 [5+3+2+7+3]			20
PART B Q.NO.3	CO 05	MODULE 04 Three phase circuits	-	10	-	10
PART B Q.NO.4	CO 03	MODULE 02 Superposition theorem	-	10	-	10
PART B Q.NO.5 b	CO 01	MODULE 01 Nodal Analysis	-	05	-	05
PART B Q.NO.5 a	CO 04	MODULE 03 Frequency response	-	05	-	05
PART C	CO 03	MODULE 03 Thevenin	-	-	07	07

Q.NO.6		Theorem				
PARTC Q.NO.6. b	CO 04	MODULE 03 RL circuit (LT)	-	-	08	10
PARTC Q.NO.7	CO 05	MODULE 04 ABCD parameters	-	-	15	15
	Total Marks		20	30	30	80

K =Knowledge Level C = Comprehension Level, A = Application Level

C.O WISE MARKS DISTRIBUTION:

CO 01: 10 MARKS, CO 02: 4 MARKS, CO 03: 17 MARKS, CO 04: 20 MARKS, CO 05:30 MARKS

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must

be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I hereby certify that all the questions are set as per the above guidelines.

Faculty Signature:

Reviewer Commend: The QP has been Set according to the guidelines and all CO's are tested

Annexure- II: Format of Answer Scheme