AJAY KUMAR GARG ENGINEERING COLLEGE

(Affiliated to Dr. APJ Abdul Kalam Technical University, Lucknow, UP, College Code - 027)

ADDITIONAL DOCUMENTS

2.5.1 Mechanism of internal assessment is transparent and robust in terms of frequency and mode

Reforms in Continuous Internal Evaluation (CIE) System at the Institutional level (15)
2023-24

Reforms in Continuous Internal Evaluation (CIE) System at the Institutional level

1. Outline of Internal Evaluation Process

2. Academic Calendar

3. Guidelines for preparation of internal question papers

4. Sample question paper format

5. Sample Rubrics for Evaluation of Project, Seminar, Industrial Training Courses

6. Sample Model Solution

7. Exam Assessment report

Director
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Ghaziabad

INTERNAL EXAMS

1	Academic Calendar for ST1/ ST2/ PUT.
2	Collection of data from departments regarding the subjects taught to their students
3	Call for QP. as per format
4	Preparation and publishing of schedule
5	Collection of students list from registrar office
6	Planning and preparation of seating plan & attendance sheet
7	Planning and arranging printing and Xeroxing facility
8	Xeroxing and room wise segregate of QP as per schedule.
9	Planning of invigilators duty
10	Receipt of Debarred and provisionally cleared
11	Student feed back during PUT through ERP
12	Collection of answer sheets
13	Handing over the answer booklet to concerned faculty members
14	Conducting Exam briefing to all faculty and staff by CS.
15	Preparing summary of attendance and absentees
16	Evaluation of answer booklets
17	Showing of evaluated ABs students and removal of grievances if any

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AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD

27th Km Stone, Delhi-Meerut Expressway, Adhyatmik Nagar, Ghaziabad - 201009

AKGEC/D.A./Notices/2023-24/010
24th January 2024

TENTATIVE ACADEMIC CALENDAR FOR III/IV YEAR, EVEN SEMESTER, 2023-24

S. No.	Activity	Date	Day
1	Registration and Commencement of classes for III/IV Year Students	26th February 2024	Monday
2	III/IV Year Sessional Test (2 Unit, 2 Hour)	28th March – 3rd April 2024	Thursday-Wednesday
3	Mid Term Lab Assessment for III Year	4th – 10th April 2024	Thursday-Wednesday
4	Last Date of Distribution of corrected answer scripts of ST	9th April 2024	Tuesday
5	End Term Lab Assessment for III Year and final Project Evaluation IV Year	6th - 10th May 2024	Monday-Friday
6	Last day of Teaching for III/IV Year	10th May 2024	Friday
7	Pre University Test for III/IV Year	13th – 24th May 2024	Monday – Friday
8	Last date of submitting III/IV Year Pre University Test Marks	30th May 2024	Thursday
9	End Semester Theory Examination (External) for III/IV Year	As per University Academic Calendar (Awaited)	
10	End Semester Practical Examination (External) for III/IV Year	As per University Academic Calendar (Awaited)	

Note: The Holi Break for students will be from 22nd March to 26th March 2024.
Attendance in classes on 27th March 2024 is compulsory for all III/IV year students.
Failure to attend will result in penalties.
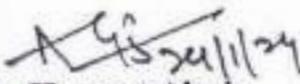
Dr. Hemant Ahuja
Director
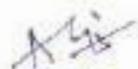
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AKGEC

Guidelines of Preparation of Internal Question Papers (STs/PUT)

Subject: Guidelines of Preparation of Internal Question Papers (STs/PUT)

Dear HoDs,

As we approach the upcoming internal semester examinations, it is crucial to uphold the highest standards in question paper preparation to ensure a fair and comprehensive evaluation of our students. In alignment with the guidelines provided by the university, each department is required to strictly adhere to the following procedures:

- The question papers must include Memory-based, Evaluation-based, and Application-based questions, in accordance with the university's guidelines.
- Subject faculty member(s) bear the responsibility of developing two sets of internal semester examination question papers. Throughout this process, it is essential to review the format of the last 5 years of University question papers and consider the question paper template issued by the **IQAC**.
- To ensure accurate assessment and evaluation of students' performance, questions should vary in difficulty, accommodating high, average, and low achievers, in accordance with **Bloom's Taxonomy**.
- The development of question papers should take into account the importance of topics concerning learning/course outcomes. Every question should be mapped with the course outcomes to ensure equal coverage of all COs as mentioned in the question paper format shared by the **IQAC**.
- Subsequently, the question papers should be submitted to the Head of the Department for feedback, analysis, and moderation. **The HOD is required to form an internal moderation committee**, which may include senior faculty members with prior experience in teaching the subject.
- Finally, the question papers **(two sets of each question paper)** should be forwarded to the Examination Cell for the final selection of the question paper.

Thanks and Regards
Prof. (Dr.) Anu Chaudhary
HOD-CSE & Dean-Examinations
Ajay Kumar Garg Engineering College, Ghaziabad (College Code-027)
Mobile: 8527976204 ext: 2161
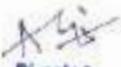
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Ghaziabad

AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD
EXAMINATION CELL
PUT Schedule
B.Tech 3rd Year (VI Semester)
(EVEN SEM 2023 - 24)

DATE	13-May-14	15-May-24	17-May-24	21-May-24	23-May-24	24-May-24
Day	Monday	Wednesday	Friday	Tuesday	Thursday	Friday
TIME	9 AM - 12 Noon	9 AM - 12 Noon	9 AM - 12 Noon	9 AM - 12 Noon	9 AM - 12 Noon	12.45 PM - 3.45 PM
CSE	KCS602	KNC602	KCS601	KCS603	KCS062	KOE060-KOE069
CS	KCS602	KNC602	KCS601	KCS603	KCS061	KOE060-KOE069
CSE-DS	KCS602	KNC602	KDS063	KCS603	KDS601	KOE060-KOE069
CSE-AIML	KCS602	KNC602	KDS063	KCS603	KAI601	KOE060-KOE069
AIML	KCS602	KNC602	KDS063	KCS603	KAI601	KOE060-KOE069
IT	KIT601	KNC602	KCS601	KCS603	KIT061	KOE060-KOE069
CS-IT	KIT601	KNC602	KCS601	KCS603	KIT061	KOE060-KOE069
EN	KEE602	KNC602	KEE601	KEE603	KEE061	KOE060-KOE069
ECE	KEC602	KNC602	KEC601	KEC603	KEC063	KOE060-KOE069
ME	KME602	KNC602	KME601	KME603	KME064	KOE060-KOE069
CIVIL	KCE602	KNC602	KCE601	KCE603	KCE064	KOE060-KOE069

Chaudhary 8/5/2024.

Dr. Anu Chaudhary
Exam Controller
Cc: All HoDs (CSE, ECE, EN, ME, IT, CE, AS&H, TIFAC-CORE)

Director
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Ghaziabad

EXAMINATION CELL
PUT Schedule
B.Tech 4th Year (VIII Semester)
(EVEN SEM 2023 - 24)

DATE	20-May-24	22-May-24	24-May-24
DAY	Monday	Wednesday	Friday
TIME	9 AM - 12 Noon	9 AM - 12 Noon	9 AM - 12 Noon
CSE	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CS	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CSE-AIML	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CSE-DS	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
IT	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CS-IT	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
ECE	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
EN	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
ME	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CIVIL	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094

8/5/2024

Dr. Anu Chaudhary
Exam Controller
All HoDs (CSE, ECE, EN, ME, IT, CE, AS&H, TIFAC-CORE)

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Ghaziabad

AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD
EXAMINATION CELL
SESSIONAL TEST - 1 SCHEDULE

Updated

SEMESTER: MCA 4th Semester
(EVEN SEM 2023 - 24)

DATE	07-May-24	08-May-24	11-May-24
Day	Tuesday	Wednesday	Saturday
TIME	8:45AM-10:45AM	8:45AM-10:45AM	1:30PM-3:30PM
MCA 4th Sem	KCA031 / KCA 034 (Privacy & Security in online social media / Data Analytics)	KCS043 (Internet of Things)	KCS051 / KCS054 (Mobile Computing / Machine Learning)

Chaudhary
7/5/2024
Dr. Anu Chaudhary
Dean Examinations

Cc: HoD (MCA)

Director
Ajay Kumar Garg Engg. College
Ghaziabad

Exam cell Record
Chaudhary
7/5/2024

(EVEN SEM 2023 - 24)

DATE	01-Apr-24	02-Apr-24	03-Apr-24
DAY	Monday	Tuesday	Wednesday
TIME	8:45AM-10:45AM	8:45AM-10:45AM	8:45AM-10:45AM
CSE	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CS	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CSE-AIML	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CSE-DS	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
IT	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CS-IT	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
ECE	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
EN	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
ME	KHU802	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094
CIVIL	KHU801	KOE080/KOE083/KOE085/KOE089	KOE090/KOE091/KOE094

Chaudhary 27/3/2024.

Dr. Anu Chaudhary
Exam Controller

Director
Ajay Kumar Garg Engg. College
Ghaziabad

AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD
Department of Electronics and Communication Engineering
Pre-University Test

Course:	B. Tech.	Semester: VII	
Session:	2024-25	Section: EC1, EC2 & EC3	
Subject:	Wireless and Mobile Communication	Sub. Code: KEC076	
Max Marks: 100		Time: 3 hrs.	

OBE Remarks:

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CO No.	1	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5
Bloom's Level	L1	L2	L2	L1	L2	L2	L1	L1	L2	L2	L2	L2	L3	L3	L2	L2	L2	L2
Weightage CO4: 20									Weightage CO5: 20									

Note: Answer **all** the sections.

Section-A

A. Attempt **all** the parts. $(8 \times 2 = 16)$

1. Illustrate the need of 3G technology.
2. Differentiate fixed and dynamic channel assignment strategies.
3. How Multiple access is different from multiplexing technique.
4. Define the orthogonality principle.
5. What are the two important components in GPRS technology.
6. Illustrate the functions of RNC and Node B in UMTS.
7. Describe the applications of Ultra-Wideband Communication.
8. Define 4th generation technology in 3GPP.

Section-B

B. Attempt **Any three**. $(3 \times 8 = 24)$

9. Explain Frequency Reuse concept with the help of proper cellular diagram. Also draw a cellular system with 19-cell reuse and locate the co-channel cells for this system.
10. Write and draw the probability density function (PDF) of Rayleigh, Rician Fading Channel and Nakagami Fading Channel and explain all the parameters.
11. Explain DSSS with neat block diagram and briefly define the term THSS.
12. Explain time-frequency-space and polarization diversity techniques.
13. Discuss Transversal Filters and its working using its block diagram. How is its response generated?

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Section-C

C. Attempt **all** the parts.   **(5 X 8 = 40)** ˙

14. **Attempt any one.**

a) Illustrate CSMA and CSMA/CA with the help of proper diagram.
b) Explain RAKE receiver. Demonstrate how it works with an explanation of each stage. What is the main advantage of a RAKE receiver?

15. **Attempt any one.**

a) Explain GSM network architecture and various interface standards.
b) Explain Long Term Evolution architecture in detail with diagram.

16. **Attempt any one.**

a) Explain UTRAN architecture and various interface standards.
b) Discuss Wireless Local Loop. How it operates?

17. **Attempt any one.**

a) Draw the architecture of Li-Fi with proper diagram.
b) Write short notes on Next Generation networks and its services. What are the fundamental characteristics for defining NGN.

18. **Attempt any one.**

a) Write short Notes on- (i) MANET   (ii) IMT2000.
b) Discuss Wi-Fi Standards and Wi-Max Technology.

Section-D

D. Attempt **all** the parts.   **(10X 2 =20)**

1. What is time hopping, and how does it relate to hybrid spread systems?
2. What is Zero Inter Symbol Interference (ZISI), and why is it important?
3. How do spatial diversity and multiplexing enhance MIMO systems?
4. How do adaptive equalizers work in communication systems?
5. What are the advantages of OFDMA and SCFDMA in wireless communication?
6. How do Pure ALOHA, Slotted ALOHA, and CSMA differ in packet radio systems?
7. What are the types of channels used in GSM systems?
8. What is EDGE technology and how does it improve GPRS?
9. What is CDMA 2000, and how does it differ from IS-95?
10. What is a Wireless Local Loop (WLL), and how is it used?

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Faculty Sign   **HoD Sign**

STUDENT SEMINAR EVALUATION RUBRIC

	Inadequate	Average	Admirable	Outstanding	
Knowledge and Content	**1**	**2**	**3**	**4**	**Score**
Organization of presentation	Hard to follow; sequence of information jumpy	Most of information presented in sequence	Information presented in logical sequence; easy to follow	Information presented as interesting story in logical, easy to follow sequence	
Background content	Material not clearly related to topic **OR** background dominated seminar	Material sufficient for clear understanding **but** not clearly presented	Material sufficient for clear understanding **AND** effectively presented	Material sufficient for clear understanding **AND** exceptionally presented	
Methods	Methods too brief or insufficient for adequate understanding **OR** too detailed	Sufficient for understanding **but** not clearly presented	Sufficient for understanding **AND** effectively presented	Sufficient for understanding **AND** exceptionally presented	
Results (figures, graphs, tables, etc.)	Some figures hard to read	Majority of figures clear	Most figures clear	All figures clear	
	Some in inappropriate format	Majority appropriately formatted	Most appropriately formatted	All appropriately formatted	
	Some explanations lacking	Reasonably explained	Well explained	Exceptionally explained	
Contribution of work	Significance not mentioned or just hinted	Significance mentioned	Significance explained	Significance exceptionally well explained	
Knowledge of subject	Does not have grasp of information; answered only rudimentary questions	At ease with information; answered most questions	At ease; answered all questions **but** failed to elaborate	Demonstrated full knowledge; answered all questions with elaboration	
Presentation Skills					
Graphics (use of Powerpoint)	Uses graphics that rarely support text and presentation	Uses graphics that relate to text and presentation	Uses graphics that explain text and presentation	Uses graphics that explain and reinforce text and presentation	

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	Inadequate	Average	Admirable	Outstanding	
	1	2	3	4	Score
Mechanics	Presentation has more than 10 misspellings and/or grammatical errors	Presentation has no more than 5 misspellings and/or grammatical errors	Presentation has no more than 2 misspellings and/or grammatical errors	Presentation has no misspellings or grammatical errors	
Eye Contact	Reads most slides; no or just occasional eye contact	Refers to slides to make points; occasional eye contact	Refers to slides to make points; eye contact majority of time	Refers to slides to make points; engaged with audience	
Elocution –not ability to speak English language	Mumbles and/or Incorrectly pronounces some terms	Incorrectly pronounces some terms	Incorrectly pronounces few terms	Correct, precise pronunciation of all terms	
	Voice is low; difficult to hear	Voice fluctuates from low to clear; difficult to hear at times	Voice is clear with few fluctuations; audience can hear well most of the time	Voice is clear and steady; audience can hear well at all times	
Length and Pace	Short; less than 30 min	Short 40 min **OR** long >50	Adequate 40-45 min	Appropriate (45-50 min)	
	Rushed **OR** dragging throughout	Rushed **OR** dragging in parts	Most of the seminar well paced	Well-paced throughout	
				Total Score	
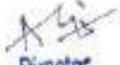
Lab Participation Rubric

Proficient (3)	Adequate (2)	Substandard (1)	Unacceptable (0)
Student demonstrates an accurate understanding of the lab objectives and concepts. The student can correctly answer questions and if appropriate, can explain concepts to fellow classmates. Student is eager to participate and assists when needed.	Student arrives on time to lab, but may be unprepared. Answers to questions are basic and superficial suggesting that concepts are not fully grasped.	Student tardiness or unpreparedness makes it impossible to fully participate. If able to participate, student has difficulty explaining key lab concepts.	Student was absent from lab or did not participate. There was no attempt to make prior arrangements to make up the lab.

Lab Report Rubric

Proficient (3)	Adequate (2)	Substandard (1)	Unacceptable (0)
Student demonstrates an accurate understanding of the lab objectives and concepts. Questions are answered completely and correctly. Graphs are neat, creative and include complete titles and accurate units. Errors, if any are minimal	Student has a basic knowledge of content, but may lack some understanding of some concepts. Questions are answered fairly well and/or graphs could have been done more neatly, accurately or with more complete information.	Student has problems with both the graphs and the answers. Student appears to have not fully grasped the lab content and the graph(s) possess multiple errors.	Student turns in lab report late or the report is so incomplete and/or so inaccurate that it is unacceptable.

Rubrics Evaluation form for Project Presentation Evaluation

S.No	Specification	Very Weak 1	Weak 2	Moderate 3	Strong 4	Very Strong 5
1	**Engagement**	Not dressed formally, no facial expression or eye contact	Not dressed formally, satisfactory facial expression and eye contact	Dressed formally, no facial expression and eye contact	dressed formally, regular facial expression and eye contact	dressed formally, consistent facial expression/eye contact
2	**Presentation Skills**	No element is fulfilled	Only 1 element is fulfilled	Only 2 elements are fulfilled	Only 3 elements are fulfilled	All elements are fulfilled
3	**Content**	No element is fulfilled	Only 1 element is fulfilled	Only 2 elements are fulfilled	Only 3 elements are fulfilled	All elements are fulfilled
4	**Questions and Answers**	No Answers	Answers not related to questions	Answers related to questions with poor points	Answers related to questions with good points	Good expression of ideas, very convincing

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Roll No.

AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD
Department of Electronics and Communication Engineering
Model Solution Pre-University Test

Course: B. Tech. **Semester:** VII
Session: 2024-25 **Section:** EC1, EC2 & EC3
Subject: Wireless and Mobile Communication **Sub. Code:** KEC076
Max Marks: 100 **Time:** 3 hrs.

OBE Remarks:

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CO No.	1	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5
Bloom's Level	L1	L1	L2	L2	L1	L1	L2	L2	L2	L2	L2	L2	L2	L3	L3	L2	L2	L2
Weightage CO4: 20									Weightage CO5: 20								

Note: Answer **all** the sections.

Section-A
A. Attempt **all** the parts. (8 X 2 =16)

Q1 Illustrate the need of 3G technologies.

Solⁿ 3G technologies was introduced to meet growing demand for faster data rates, better voice quality & enhanced multimedia services. It supports high speed internet, Global connectivity, increased capacity & enhanced video-streaming.

$\longrightarrow$
(1)
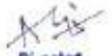
Q(2) Differentiate between fixed and dynamic channel assignment strategies.

Sol^n

Fixed Channel Assignment	Dynamic Channel Assignment
1. Assumes channel characteristics remains constant	Adapts to changes in channel conditions.
2. Accuracy is low for varying environments.	Accuracy high in dynamic scenarios.
3. Simple to implement	Complex to implement.

Q(3) How Multiple Access is different from multiplexing technique?

Sol^n

Multiple Access	Multiplexing.
1. It allows users to share the same communication medium.	Combines multiple signals into one for transmission.
2. It focuses on user access to medium.	Focuses on signal transmission efficiency.
3. Eg -: FDMA, TDMA, CDMA.	FDM, TDM, WDM.

Q(4) Define the orthogonality principle.

Sol^n The orthogonality principle states that two signals are orthogonal if their cross-correlation is zero, i.e. they do not interfere with each other.

This is commonly used in signal processing, such as in OFDM, to ensure efficient communication by preventing interference b/w subcarriers.

(2)

Ques-5) What are the two important components in GPRS technology.

Ans- Two important components in GPRS technology.

a) Mobile Station (MS)

b) Base Station Controller (BSC)

c) GPRS Support Node → SGSN (Serving GPRS Support Node)
GGSN (Gateway GPRS Support Node)

Ques-6) Illustrate the functions of RNC and Node B in UMTS.

RNC (Radio Network Controller): It manges the Radio access Network by controlling the allocation and management of radio resources, handover between calls, and the connection between the core network & the radio access Network. It is responsible for maintaining the quality of service, security and overall system Coordination.

Node B: It is equivalent of the base station in UMTS. Node B provides the radio interface with mobile device (UE-user equipment) & is responsible for Transmitting and receiving radio signals.

Ques-7) Describe the application of Ultra-wideband Communication.

a) High-speed Data Transmission: UWB allows for the transmission of large amounts of data over short distances with high-speed rates.

(3)

b) Precision location Tracking : UWB is also used for precise indoor positioning systems (IPS) and asset tracking.

Ques-8) Define 4th generation technology in 3GPP.

- 4G technology in 3GPP refers to LTE (Long-term Evolution) and its advanced version LTE - Advanced.

a) High data speed - 4G provides significantly faster data rates compared to 3G, supporting peak download speeds of up to 1Gbps and upload speeds of up to 100 Mbps, enabling high -definition video streaming, online gaming & faster web browsing.

b) Improved Efficiency and Lower latency - 4G use advanced techniques such as OFDM and MIMO to enhance spectral efficiency, reduce network latency, and support a more reliable & efficient communication experience.

Section - B

Ques-9) Explain Frequency Reuse Concept with the help of proper cellular diagram. Also draw a cellular system with 19 - cell reuse and locate the co-channel cells for this system.

Frequency Reuse - It is the scheme in which allocation and reuse of channels throughout a coverage region is done. Each cellular base station is allocated a group of radio

(4)

Channels an frequency sub-ab bands to be used within a small geographic area known as a cell. The shape of the cell is flexagonal. The process of selecting & allocating the frequency sub-bands for all the cellular base stations within a system is called frequency reuse.
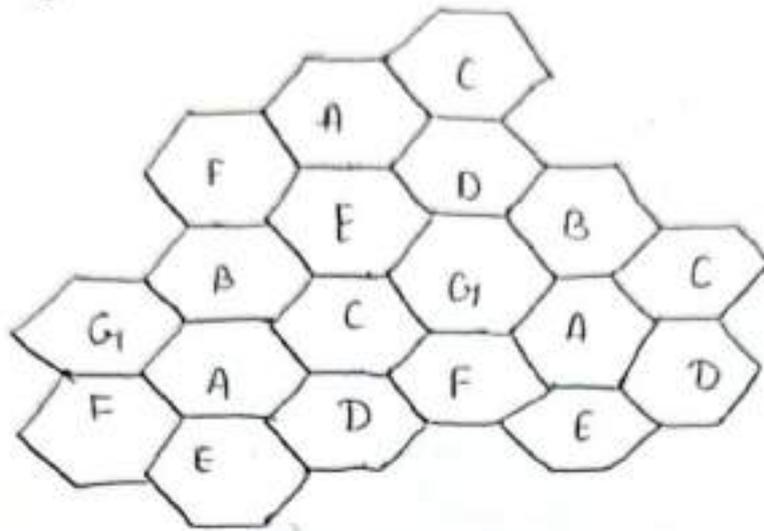
Total no. of channel allocated to a cell, $S = kN$

$$\text{Frequency reuse factor} = \frac{1}{N}$$

where, $N = \text{No. of cells}$

and, $N = i^2 + j^2 + ij$

given: $N = 19$
i.e., $i = 3, j = 2$

(S)
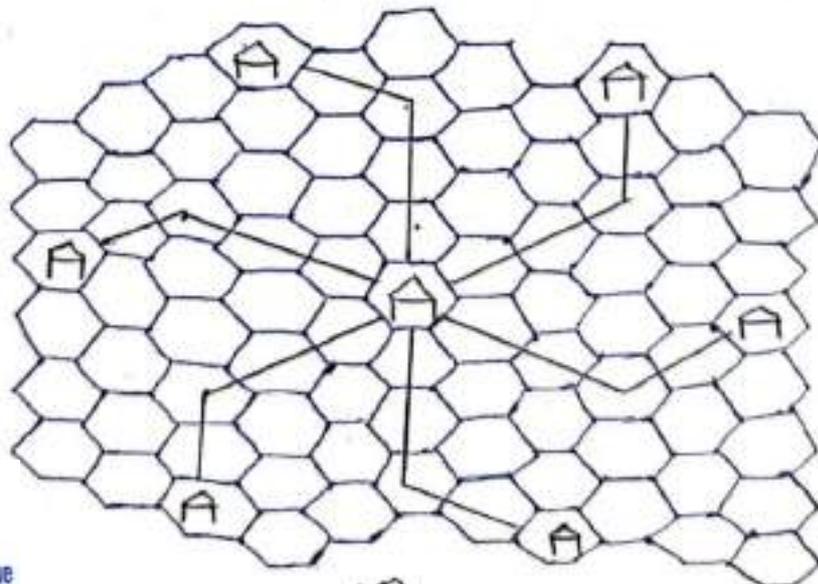
Ques-10) Write and draw the probability density function (PDF) of Rayleigh, Rician Fading Channel and Nakagami Fading Channel and explain all the parameters.

* **Rayleigh fading channel —**

It occurs when there is no line of sight (LOS) between the Tx & the Rx, and the Received signal is due to multiple reflections from surrounding objects. The amplitude of Rayleigh distribution.

PDF of Rayleigh Fading —

$$f(\mu) = \frac{\mu}{\sigma^2} e^{-\frac{\mu^2}{2\sigma^2}} , \mu \geqslant 0$$

where, μ is the amplitude of the received signal and σ^2 is the variance of the signal's envelope.

→ σ^2 (Variance): This determine the spread or "width" of the signal's amplitude distribution. The larger the value of σ^2, the wider the distribution.

→ Rayleigh fading is typically observed in scenarios where there is no direct LOS b/w the Tx & Rx & only scattered multipath signals contribute to the received signal.

* **Rician Fading Channel —**

It occurs when there is a dominant LOS path b/w the Tx & Rx; In addition to multiple scattered paths. The received signal has both a strong LOS component & weaker multipath components, making Rician fading useful in environments where LOS is present.

PDF of Rician Fading —

$$f(\mu) = \frac{\mu}{\sigma^2} e^{-\frac{\mu^2 + A^2}{2\sigma^2}} I_0\left(\frac{A\mu}{\sigma^2}\right), \mu \geqslant 0$$

(6)

where Io is the modified Bessel function of the first kind and zero order.

Parameters —

→ u is the magnitude of the received signal.
→ σ^2 is the variance of the multipath components.
→ A is the amplitude of the dominant line-of-sight (LOS) component.
→ Io is the modified Bessel function of the first kind and zero order, which appears due to the presence of the LOS signal.

The Rician fading model generalize the Rayleigh model of by introducing a LOS component. When A=0, the Rician distribution reduces to the Rayleigh distribution.

*) Nakagami Fading Channel —

The Nakagami model is a more flexible model, capable of capturing a wide range of fading behaviours, from weak to strong fading. It can represent both Rayleigh and Rician fading as special cases.

PDF of Nakagami Fading —

$$f_R(u) = \frac{2m^m u^{2m-1}}{\Gamma(m)\Omega^m} \exp\left(-\frac{mu^2}{\Omega}\right), \quad u \geq 0$$

Parameters —

→ u is the magnitude of the received signal.
→ m is the Nakagami fading parameter ($m \geq 1/2$), which control the severity of fading. When m=1, the Nakagami reduces to the Rayleigh distribution.

→ Ω is the average power of the received signal.

→ $\Gamma(m)$ is the Gamma function, which ensures the norm-
    alisation of the PDF.

Ques-11) Explain DSSS with neat block diagram and
briefly define the term THSS.

DSSS is a method to used in communication systems
to spread data signal over a wide bandwidth.
It works by multiplying the data signal with a
high-rate pseudo-random noise (PN) code, also
known as a spread spectrum or chip sequence,
which increases the signal's BW. DSSS is commonly
used in wireless communication systems, such as
Wi-fi and GPS.
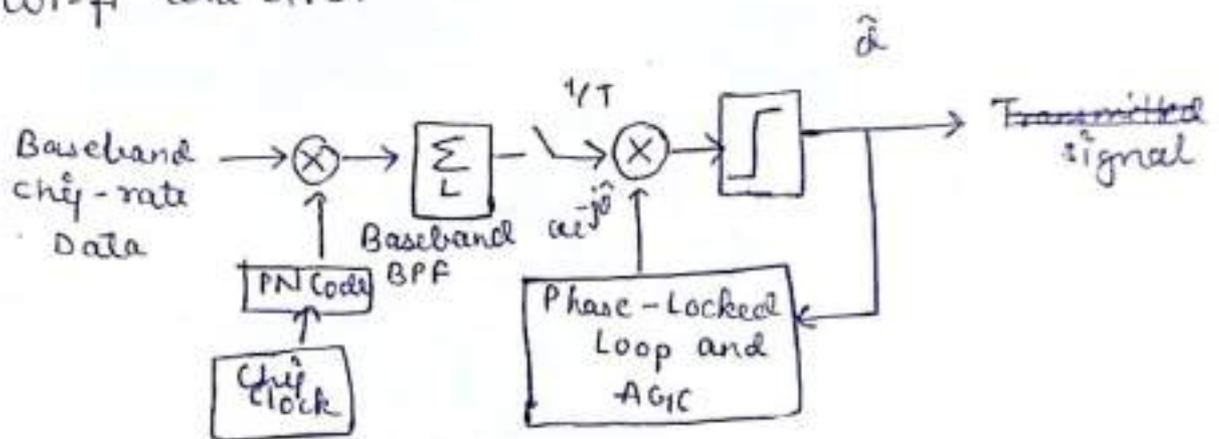
Aduantage –
→ Resistance to Interference.
→ Multipath Fading Resilience.
→ Security.
→ Low Power

Disadvantage –
→ Bandwidth Efficiency.
        :xity

THSS (Time Hopping Spread Spectrum) —
It is a spread spectrum communication technique where the transmission of data spread over a wide frequency band by varying the transmission times according to a Pseudo-random sequence. In THSS, the basic idea is to change (or 'hop') the transmission time of the signal according to a pre-defined code or sequence, rather than spreading the signal across freq.

Ques-12) Explain time - frequency - space and polarization diversity techniques.

Time Diversity — It is obtained by re-transmitting the same information signal at separate interval of time. The re-transmission interval should be less than the coherence time. Time diversity also does not require any increase in the transmission power.

Frequency Diversity — It is obtained by transmitting the same information on more than one carrier frequency or transmitting the same signal over different carrier frequency. In frequency diversity only antenna is needed.

Space Diversity — Replica of same signal is transmitted through different antenna. Space should be between adjacent antenna so that channel gain will be independent of signal path.

Polarisation Diversity — It require two Tx & two antennas with different polarization. The

(9)

transmission wave with two different polarization constitute two different path. This provides only two different diversity branches.

Ques-13) Discuss Transversal Filters and its working using its block diagram. How is its response generated?

A linear equalizer can be implemented as an FIR filter otherwise known as Transversal filter. This type of equalizer is the simplest type available. In such equalizer, the current and past values of the received signal are linearly weighted by the filter coefficient and summed to produce the output as shown in fig. If the delays and the tap gain are analog the continue output of the Rx equalizer is sampled at the symbol rate and the sample are applied to the decision device. The implementation is, however usually carried out in the digital domain where the samples of the received signal are stored in a shift register. The output of this transversal filter before a decision mode is —

$$\hat{d}_k = \sum_{n=-N_1}^{N_2} (C_n^*) y_{k-n}$$

where, $C_k^* =$ Complex filter coefficient or tap weight

$\hat{d}_k =$ output at time index k

$y_i =$ input received at to +iT

$t_0 =$ equalizer starting time

$N = N_1 + N_2 + 1$

(10)

Input signals

structure of a linear transversal equalizer/filter.
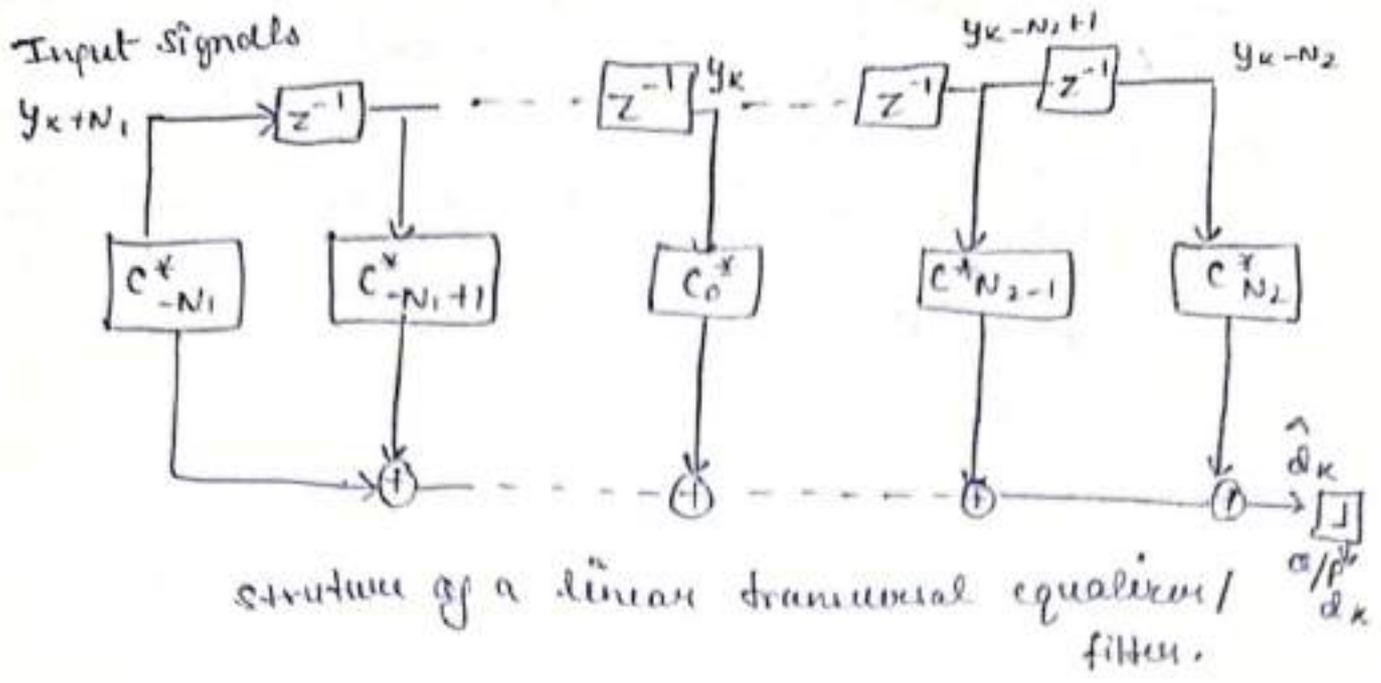
The min. mean squared error $E[|e(n)|^2]$ that a linear eq transversal equalizer can achieve is

$$E[|e(n)|^2] = \frac{T}{2\pi} \int_{-\pi/T}^{\pi/2} \frac{N_0}{|F(e^{j\omega T})|^2 + N_0} \, d\omega$$

where $F(e^{j\omega T})$ is the frequency response of the channel
N_0 is the noise power spectral density.

Section - c

C Attempt all the parts.

14. Attempt any one.

a. Illustrate CSMA and CSMA/CD with the help of proper diagram.

Ans. CSMA is a protocol used in network comm to reduce the likelihood of data collisions in a shared comm medium

How CSMA Works:

1 Carrier Sensing. Before transmitting data, a device listens channel to check if it is idle.

(11)

2. Transmission: If the channel is idle, the device transmit data. If the channel is busy, the device waits until it becomes free.

3. Collisions: If two devices sense the channel as idle and transmit simultaneously, a collision occurs. Collisions leads to data corruption.

4. Collision Detection / Handling:
   - In CSMA/CD, the devices detect collisions and stop transmitting, rescheduling their transmission after a random backoff time.
   - In pure CSMA, collisions are not detected immediately, which may result in wasted band width.

Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)

CSMA/CA is a refinement of CSMA designed to avoid collisions before they occure. It is widely used in wireless n/w (IEEE 802.11).

How CSMA/CA works:

1. Carrier Sensing: Like CSMA, a device first senses the channel to check if it is idle.

2. Collision Avoidance.
   - If the channel is idle, the device does not transmit immediately. It wait for a random backoff time before lsn to reduce the chance of simultaneous transmissions,

(12)

- If the channel is busy, the device defers its transmission and retries after a random interval.

3. Acknowledge:

the sender waits for an acknowledge (ACK) from the receiver to confirm successfully transmission. If no ACK is received, it assumes a collision occured and retries.

b. Explain RAKE receiver. ~~Determine~~ Demonstrate how it works with an explanation of each stage. What is the main advantage of a RAKE receiver?

Ans. RAKE receiver collects the time shifted versions of the original signal by providing a seperate correlation receiver for each of the multipath signals.

- The main function of the RAKE receiver at both ends is to aggregate the diversity received signals.

- The direct signal at the RAKE receiver is the strongest signal that is combined with multipath reflected signal from the other two or three RAKE receiver to form the composite signal that are used to process the mobile call

- The multipath signals are additives to the direct signals to obtain the cleanest, strongest signal possible

- Signal to noise ratio gets improved by using RAKE receivers.
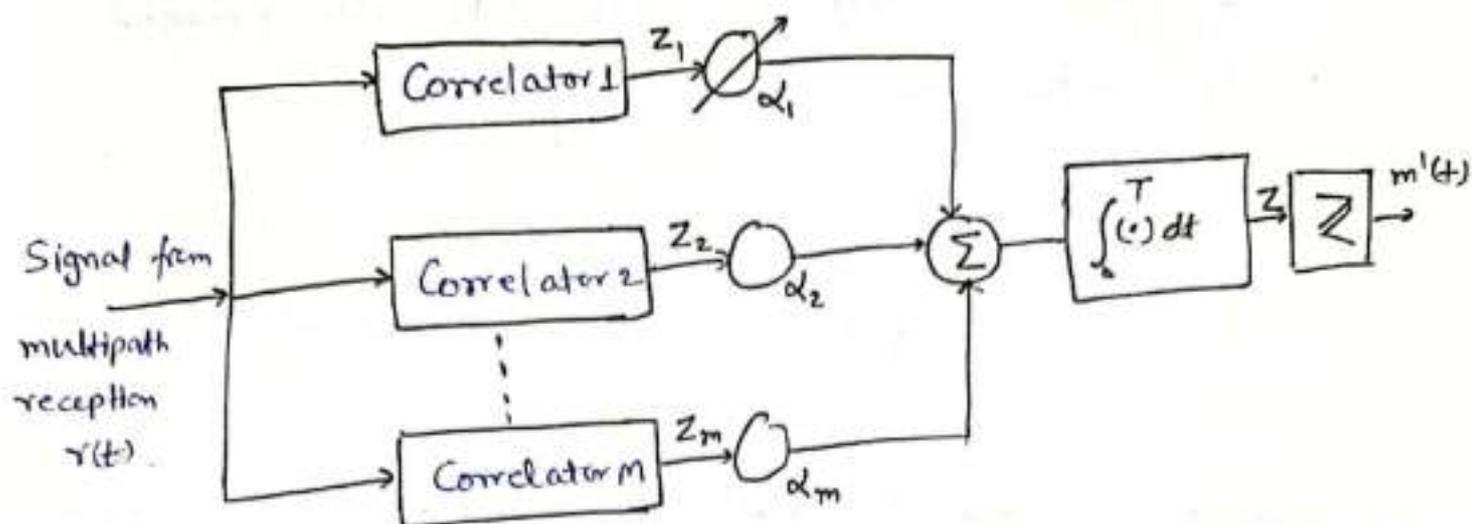
Working: A m branch RAKE receiver is shown, $r(t)$ is the i/p signal after multipath reception which is given to 'm' collerators. the o/p of m correlators are denoted by $Z_1, Z_2 -- Z_m$.

- those outputs are weighted by $\alpha_1, \alpha_2 -- \alpha_m$ respt

- the weighting coefficients are based on the power of the SNR from each correlator output

- If SNR is small then it will be assigned a small weighting factor, the overall signal Z' is given as

$$Z' = \sum_{m=1}^{M} \alpha_m Z_m$$

where $\alpha_m = \dfrac{Z_m^2}{\sum\limits_{m=1}^{M} Z_m^2}$

Advantages:
1. Utilization of RAKE receiver
2. Improved Signal to Noise Ratio
3. Mitigation of Multipath Fading
4. Support for CDMA
   Robust performance in Mobile Enviornment,
   Adaptive weighting

7. Reduced BER
8. Scalability for High Data Rates.

Q-15 (a) Explain GSM network architecture and various interface standards.

Ans GSM (Global System for Mobile communication) is a standard developed to describe the Protocols for 2G mobile network. It Provide multiple voice and data services over cellular networks and is the foundation of mobile communication system.
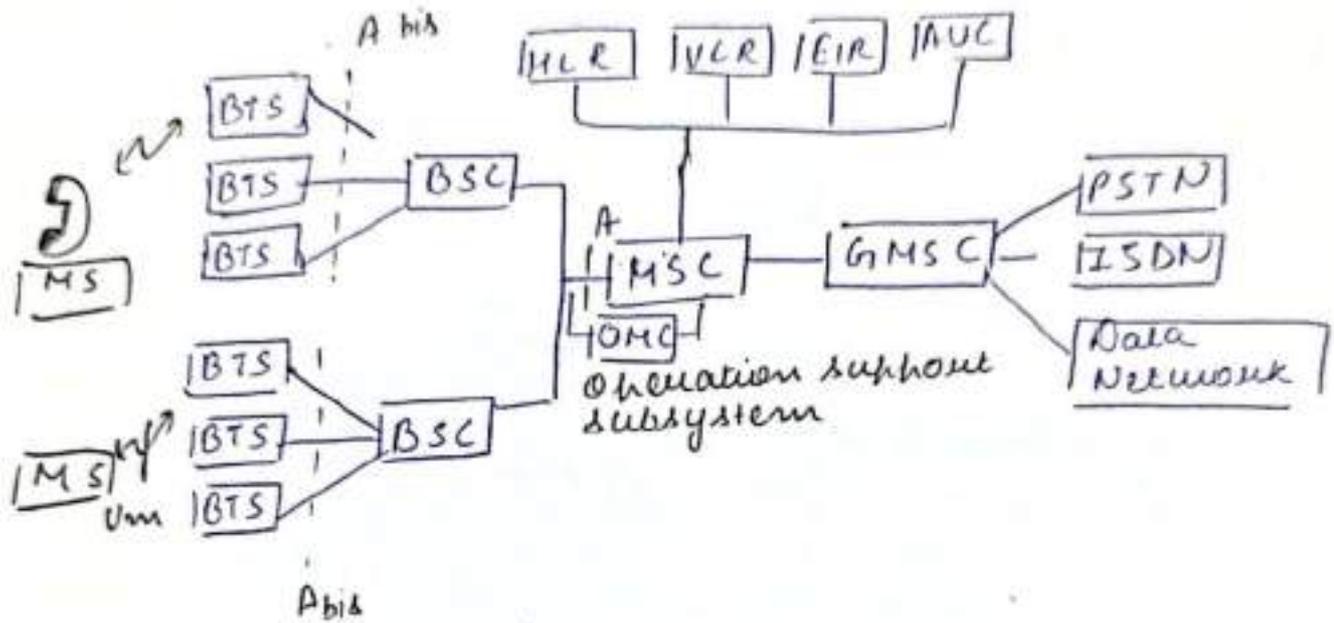
- Mobile station (MS) consist of a SIM (Subscriber Identity Module) which stores all user specific data & Mobile Equipment is also part of cellular system.
- MS can be identify via the IMEI (International Mobile Equipment Identity)
- without SIM only Emergency calls are Possible.

Function of MSC (Mobile Service switching centre)
1) call control
2) Initiation of Paging
3) changing Data collection

Function of BTS (Base Transceiver Station)
1) ciphering
   Processing
   ation & Demodulation

(15)

Function Of BSC (Base Station controller)

1) call Establishment   2) Mobility Management
3) Statistical Raw data collection

HLR (Home Location Register): It is a data based which maintains

1) Permanent Register of the subscriber
2) Subscriber identity number
3) Subscriber Services
4) current location

VLR (visitor location Register): It is a data base which maintains

1) Security information for authentication of SIM card & for ciphering.
2) Subscriber identification number
3) Services that subscriber can use.

AUC (Authentication Centre): Special Protected Part further

1) Provide security information to the network, so that we can verify the SIM cards
2) To protect user identity & Data transmission

EIR (Equipment Identity Register)

Responsible for IMEI checking
checking to validity of the Mobile equipment. we have three list of mobiles.

① White list (List of Valid IMEI's)
② Grey list (List of malfunctioning devices)
③ Black list (List of Stolen mobiles)

OSS has functional unit called OMC.

function of OMC:

monitors & controls all other network entities

① Traffic Monitoring
② Status reports of n/w entities
③ subscriber & security management
   ting & Billing

(16)

various GSM Interface and standards

① Um Interface → Between Mobile Station (MS) ⟷ Base trans-
ceiver station (BTS)
- The aim interface used for communication over radio
frequency between the mobile Phone and the base
station
- uses TDMA for channel allocation and GMSK Modulat-
ion.

② Abis interface → Between BTS and BSC for transmitting
traffic Choice and data and control signals

③ A Interface → Between BSC and MSC Handles call setup
routing and mobility management.

④ B Interface → Between two Mobile switching centers.
- Facilitates call handovers between different MSCs.

⑤ C Interface → Between MSC and HLR

⑥ D Interface → Between MSC and VLR

⑦ E Interface → between two MSC's signaling
components.

⑧ F Interface → b/w MSC and ELR

(7)

Q-15 (b) Explain Long Term Evolution architecture in detail with diagram.

Ans
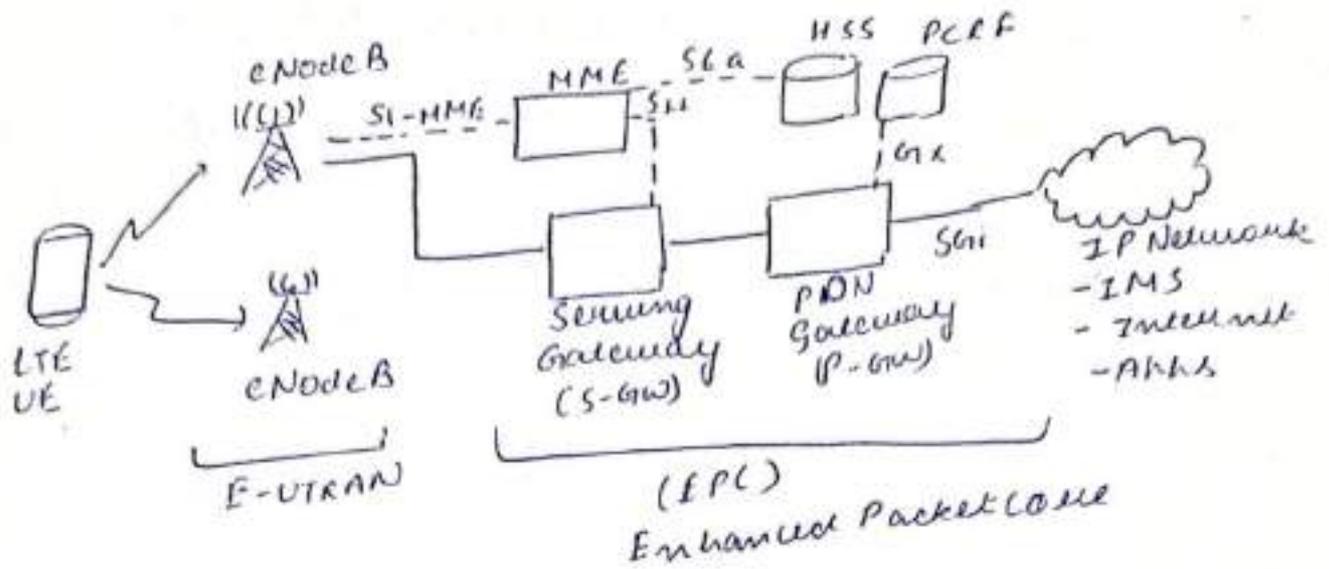
LTE (Long-Term Evolution): Ans

LTE is a 4th Generation wireless communication standard developed by the 3 Generation Partnership Project (3GPP) to Provide high-speed data and voice communication over a full IP-based Network.

LTE Architecture consists of three Prim

16. (a) Explain UTRAN architecture and various interface standardes.

Ans:

(19)
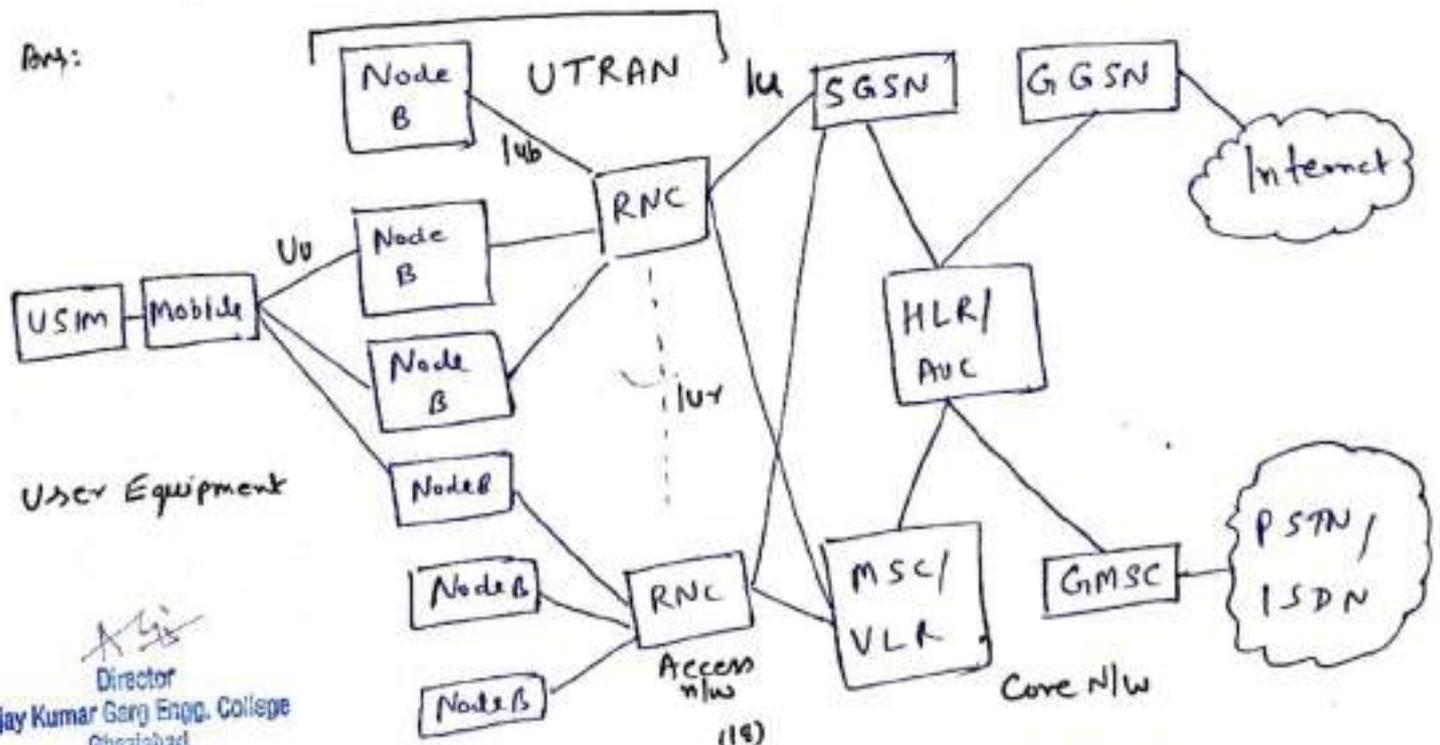
RNC . The RNC enables autonomous radio resource managment (RRM) by UTRAN.

. the RNC handles protocol exchange b/w Iu, Iur and Iub interface

. The RNC uses the Iur interface for eliminating the burden from CN

. Provide air Interface b/w UE's and Core n/w.

Node B: Node B is the physical unit for radio Tx/Rx with cells

. A single node B can support both FDD and TDD modes.

. The main task of Node B is the conversion of data to and from Uu radio interface, including FEC.

. Node B also participate in power control

Interfaces: There are 4 major new interfaces

. Iu - b/w UTRAN & CN

. Iur - b/w RNC's

. Iub - b/w Node B & RNC

. UU - air Interface

(b). Discuss Wireless Local Loop. How it operates?

Ans: - WLL connect subscribers to the PSTN using radio signals as a substitute for copper for all or part of the connect b/w the subsber and the switch.

- WLL architecture replaces traditional Copper wires with wireless links, connecting subscriba to the local office. It consists of several components, including PSTN, switch fn. WANU (Wireless Access Network Unit), and WASU (Wireless Access Subscriba Unit)

- PSTN serves as a circuit-switched n/w, while the switch function manages connection b/w WANU's.

(19)
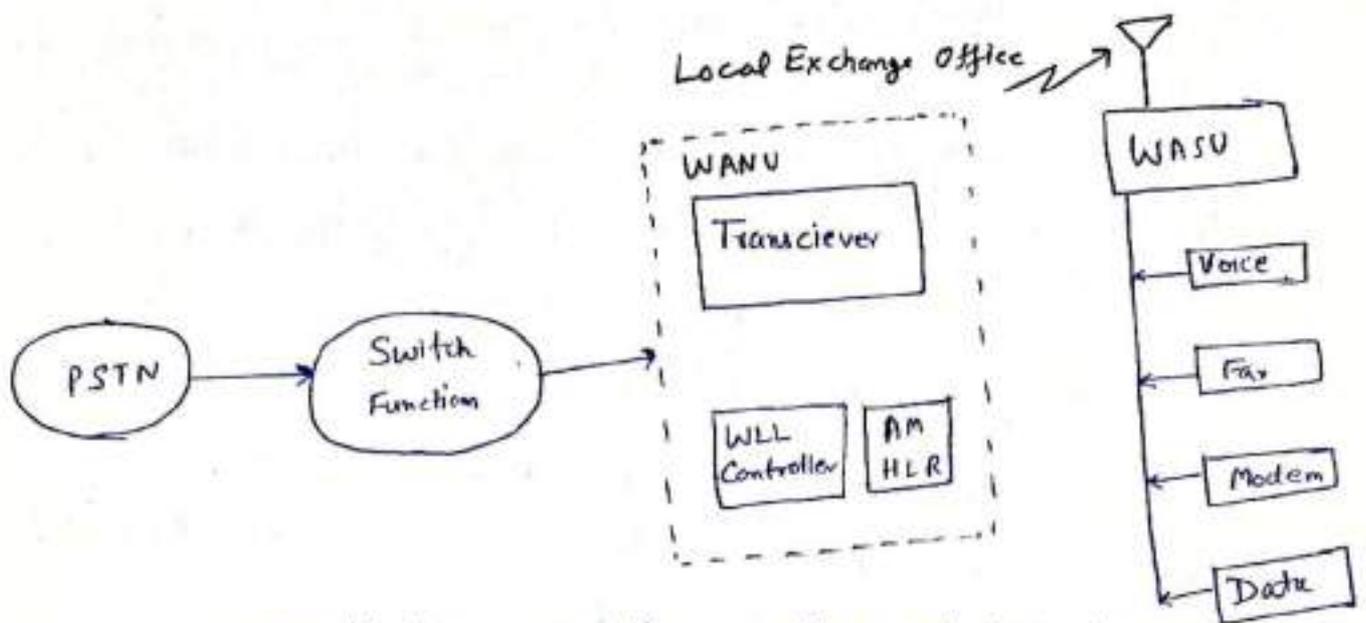
WANU → authentication, operation, routing, and data transmission

WASU → installed at the subscriber's location.

WANU is short for Wireless Access N/w Unit.

It consists of following sub-components.

. Transceiver: It transmit / receive data.

. WLL Controller: It controls the wireless local local loop component with WASU.

. AM : It is short for Access Manager. It is responsible for authentication

. HLR- It stores the detail of all local WASUs

Advantages: . Low cast
. More secure due to digital encryption techniques
. Highly scalable

Features: . Internet connection via modem
. Data service
. Voice service
. Fax service

(20)

Q(A) (a) Define Draw the architecture of Li-fi with proper diagram.

soln

Li-fi Architecture.

Transmitter Section

Reciever Section
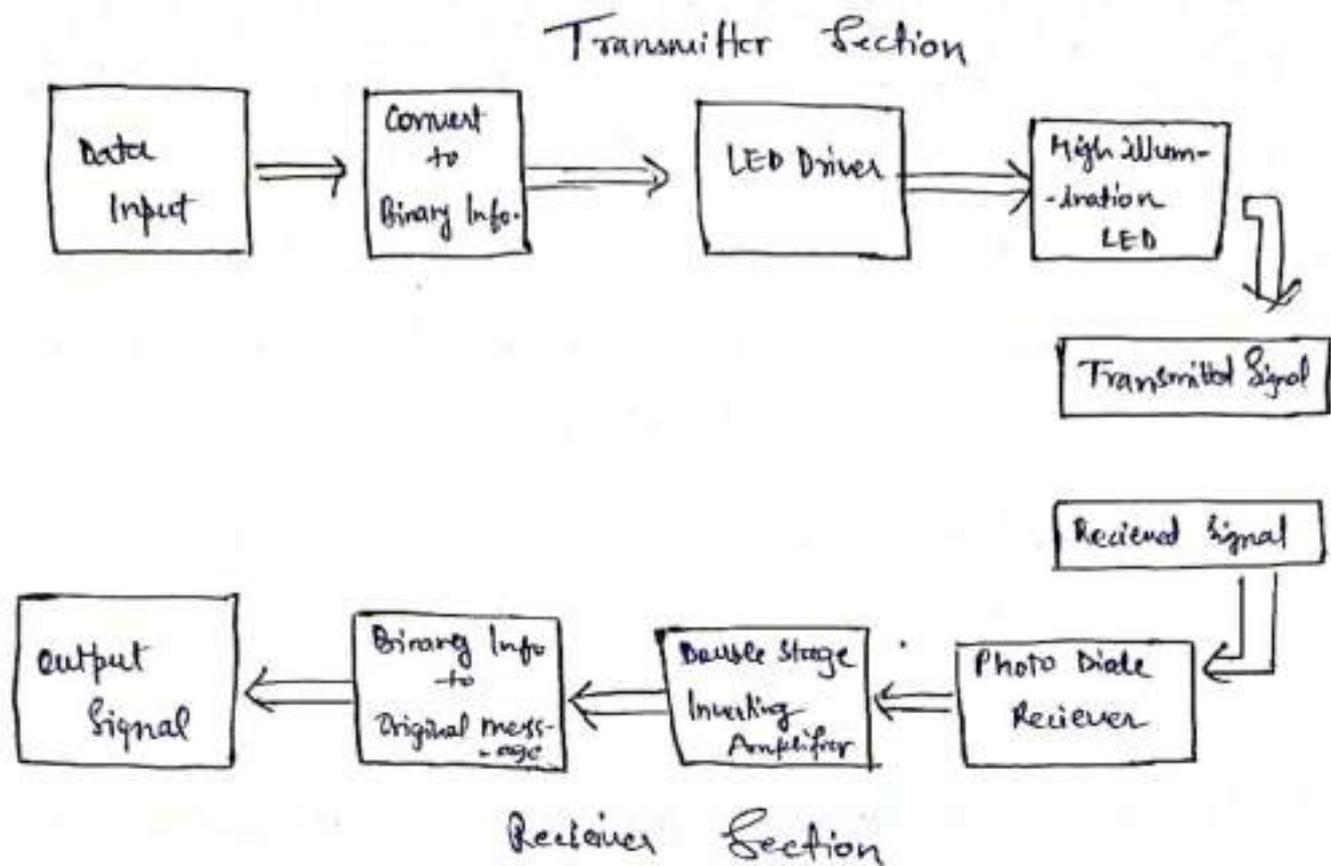
1. LED light Source -:

• Transmission -. The LED acts as both a source of light and a medium for data transmission.

• Modulation -: LED is modulated at a high frequency to encode data. The modulation is done at so fast speed that it is undetectable to human eye, allowing LED to appear as a constant light source

2. Photodetector /Receiver -:

• At recieving end, a photodetector is dised to detect the modulated light signals emitted by LED source.

tectors converts light signals back to electrical signal.

als are then processed to extract transmitted data.

(21)

3. Modulation / DeModulation -:

• Modulation - Data from a device is converted into a signal that modulates LED Light. This involves rapid variations in light intensity that encodes data in light signals.

• DeModulation - Photodetector converts the changes in light intensity back into electrical signals.

4. Data Processing Unit -: A central processing unit handles encoding & decoding of data. The system is often connected to internet through a wired Ethernet connectn or wi-Fi.

5. Controller Unit - It manages the operation of LED. It ensures proper modulation of light source. It also helps in signal processing.

Q(17)
=   (b) Write short notes on NGN (Next Generation Networks) & its services. What are the fundamental characteristics of NGN.

Soln   Next Generation Network (NGN) refers to a packet-based
=   network & it can be used for both telecommunication services as well as data & it supports mobility. It is able to make use of multiple broadband capabilities, especially quality of services (QoS) enabled transport technologies where the service - related functions are independent of underlying transport - related techniques. The main goal of NGN is to serve as an replacement of Public Switched Telephone Network (PSTN) & Integrated Digital Network (ISDN).

NGN layer :

- In Access layer, different types of media gateways that support connection to & from access network with core-networks are included.

- Core Network layer is network handling converged services based on internet Protocol (IP). It works as call server.

- Service Layer is an IT platform that creates a service creation environment extending its functionality in order to cover a new network scenarios as intelligent network.

NGN area
{
```
  ┌─────────┐
  │ Service │
  │  Layer  │
  └────┬────┘
       ↓
  ┌─────────┐
  │ Control │        }  Core Network
  │  Layer  │        }
  └────┬────┘
       ↓
  ┌──────────┐
  │ Transport│
  │  Layer   │
  └────┬─────┘
       ↓
  ┌──────────┐
  │ Multiple │
  │  Access  │   }  Related to NGN
  │ Network  │   }
  └────┬─────┘
       ↓
  ┌──────────┐
  │ Terminals│
  └──────────┘
```
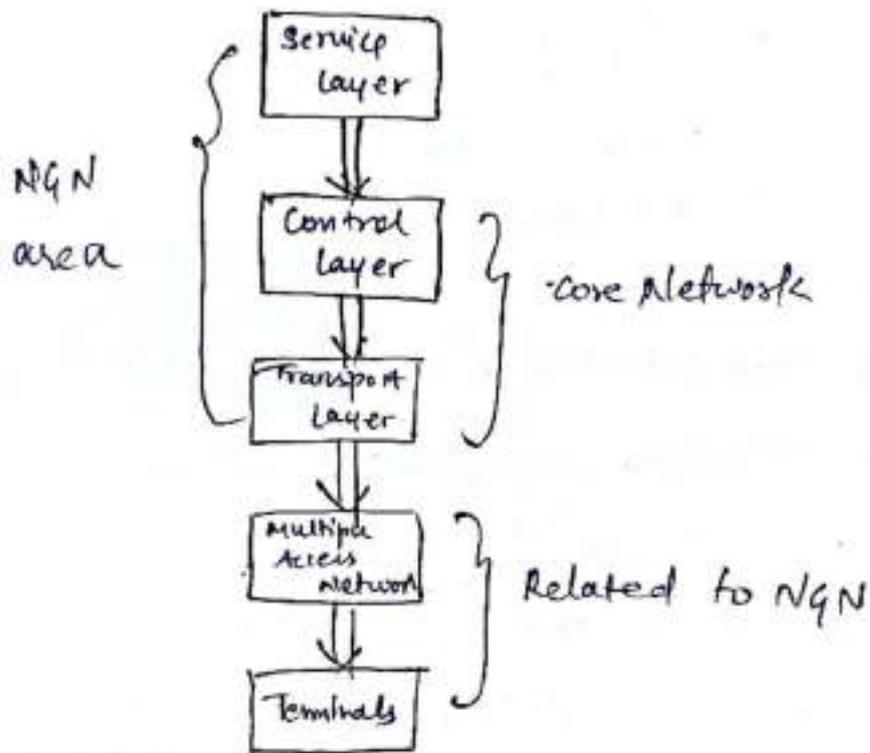
Key Services of NGN

1. Voice Over IP (VoIP) : NGN enables voice over communication internet.

2. High speed Internet Access : Faster & more reliable broadband.

3. Video Conferencing -: Real time video communication for businesses, education & personal use.

b. Video on Demand (VoD) -: NGN enables high quality video services for ON-DEMAND content.

(23)

Q(18)(a) Write short notes on (i) MANET (ii) IMT 2000.

soln (i) **MANET** -: A mobile Ad-Hoc Network is a collection of mobile devices that dynamically form a temporary wireless network without relying on any fixed infrastructure or centralised administration.

Key characteristics

(*) Decentralised operation -: Devices act as both hosts & routers, forwarding data to other devices.

(*) Dynamic Topology -: Network structure changes as device's move in & out of range.

(*) Autonomous System -: No need for pre existing infrastructure

(*) Scalability -: Can grow or shrink as devices join / leave.

Applications

(*) Military communication → emergency response & sensor network.

(*) IoT & vehicular communication system (VANETs).

Challenges -

(*) limited BW & energy constraints

(*) Security vulnerabilities and routing complexity.

(ii) **IMT-2000** (International Mobile Telecommunication -2000).

IMT-2000 set by the ITU, defines a global standard for third generation (3G) mobile communication systems to ensure seamless connectivity & interoperability worldwide.

→

(24)

Key features of IMT2000

- Data speed - upto 2Mbps for stationary users & 384 kbps for mobile users
- Global Roaming -: Universal access to network across diff countries.
- Multimedia support -: High speed internet, video calls & mobile TV.
- Spectrum efficiency -: Effective use of available spectrum bands.

Technologies under IMT-2000

- CDMA 2000 - Based on code Division Multiple Access.
- WCDMA -: Used in WMTs network.
- TD-SC DMA -: Time-Division Synchronous CDMA used in China.

Significance

- Unified Global mobile standards
- laid the foundation for advanced tech. like 4G & 5G.
- Enhanced user experience with better data services.

Q(18) (b) Discuss Wi-Fi Standards & wi-Max Technologies.

Wi fi is a wireless communication technology based on IEEE 802.11n standards, enabling devices to connect internet easily.

Key Wi-Fi Standards.

1. IEEE 802.11a (1999) - ?
   - It operates at 5GHz frequency.
   - Maximum speed - 54 mbps.
   - Shorter range due to higher frequency.

2. IEEE 802.11b (1999) -
   - Operates at 2.4GHz frequency
   - Maximum speed - 11 mbps
   - wider range but more prone to interferences.

3. IEEE 802.11g (2003) -
   - 2.4 GHz.
   - 54 mbps
   - compatible with 802.11 b.

4. IEEE 802.11n (2009) -

- operates at 2.4 GHz & 5 GHz
- Max speed - 600 Mbps using MIMO technology.
- Enhanced range & reliability.

5. IEEE 802.11 ac (2013)

- operates at 5 GHz.
- Max speed -: upto 1GBps.
- Used In advance modulation techniques & wider channel.

6. IEEE 802.11 ax (Wi-Fi 6, 2019)

- operates on 2.4 GHz & 5 GHz.
- Max speed -: 9.6 Gbps.
- Enhanced capacity, lower latency & better performance over congested area.

WI-MAX -: Wi-Max is a wireless comm. std. based on IEEE 802.16 designe for high-speed broadband over long distances.

Key features -: ① **High Data Rates** -: Supports speeds upto 1Gbps for fixed stations & 100 Mbps for mobile stations. ② **Broad Coverage** -: Range of 50km for fixed stations and 5-15 kms for mobile stations ③ **Frequency Bands** -: Operates in licensed (2.3GHz, 2.5GHz) & unlicensed (5GHz) Bands. ④ **Scalability** -: Supports multiple users with varying BW needs. ⑤ **Quality of services** -: Ensures consistent peformance for real-time Application like VoIP and video streaming.

Standards

- IEEE 802.16 -: It defines the fixed wiMax standards.

- IEEE 802.16a -: It defines the mobile Wi-Max standard, supporting mobility & higher data rate.

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AKGEC

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Exam Wise Report

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STUDENT FEEDBACK FORM

Batch Name

| B.TECH (3RD YEAR ECE-1 [2022-26]_ODD) ⌄ |

| Theory Subject (Part-A (Question 1 to 5)) (Part-B (Question 6 to 9)) |

(Please indicate your assessment on a scale of 1 to 5. Five being the best)		Integrated Circuits BEC-501 UMA SHARMA	Microprocessor & Microcontroller BEC-502 NEETI BANSAL	Digital Signal Processing BEC-503 DUSHYANT CHAUHAN	VLSI Technology BEC-054 HOD ECE	Optical Communication BEC-057 POOJA MISHRA	Cons of In(BNC- ABH TIWA
1	Coverage of the subject material specified in the syllabus	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
2	Preparation and organization of lecture.	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
3	Preparation and communication skills.	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
4	Quality of tutorial assignments	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
5	Uniformity of pace in teacher during the semester.	⌄	-Se ⌄	⌄	⌄	-Se ⌄	

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(Please indicate your assessment on a scale of 1 to 5. Five being the best)		Integrated Circuits BEC-501 UMA SHARMA	Microprocessor & Microcontroller BEC-502 NEETI BANSAL	Digital Signal Processing BEC-503 DUSHYANT CHAUHAN	VLSI Technology BEC-054 HOD ECE	Optical Communication BEC-057 POOJA MISHRA	Cons of Ind BNC- ABHI TIWA
6	Were the illustrations and waiting legible	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
7	Was the voice clear and audible	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
8	Was the faculty accessible for clarification of doubts.	⌄	-Se ⌄	⌄	⌄	-Se ⌄	
9	Were the correct answer sheets of class tests/ sessional tests shown and discussed	⌄	-Se ⌄	⌄	⌄	-Se ⌄	

Lab Subject(Faculty)

(Please indicate your assessment on a scale of 1 to 5. Five being the best)		Integrated Circuit Lab BEC-551 UMA SHARMA	Microprocessor & Microcontroller Lab BEC-552 NEETI BANSAL	Digital Signal Processing Lab BEC-553 DUSHYANT CHAUHAN
1	Coverage of experiments specified in the list of experiments.	⌄	-Se ⌄	⌄
2	Preparation and conduction of experiments	⌄	-Se ⌄	⌄
3	Solving queries of experiments.	⌄	-Se ⌄	⌄
4	Quality of experiments.	⌄	-Se ⌄	⌄
5	Uniformity to cover the experiments during the semester.	⌄	-Se ⌄	⌄

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Lab Subject (Lab Assistant)

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(Please indicate your assessment on a scale of 1 to 5. Five being the best)	Integrated Circuit Lab BEC-551 RAJ KUMAR	Microprocessor & Microcontroller Lab BEC-552 AWADH KUMAR	Digital Signal Processing Lab BEC-553 DEEPIKA
1	Availability of lab staff for technical problems in experiments.	⌄	-Se ⌄	⌄
2	Assistance in conduct of experiments.	⌄	-Se ⌄	⌄
3	Involvement in up-keeping of experiments	⌄	-Se ⌄	⌄
4	Assistance in solving queries of experiments.	⌄	-Se ⌄	⌄
5	Rate the lab in terms of facilities.	⌄	-Se ⌄	⌄

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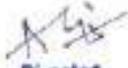
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Student Progress Tracker

PDP Attendance Report

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Student Diary

Placements Report & Schedule

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