



**II YEAR III SEMESTER BSc MPCs SYLLABUS**

**SRI RAMAKRISHNA DEGREE COLLEGE (AUTONOMOUS)**

**NANDYAL**



102-A

Sri Ramakrishna Degree College(Autonomous), Nandyal.

B.A/B.Com/B.SC ( Three years ) Degree Examinations

IIInd Year IIIrd Semester Examination

Title of the paper: English Praxis Course-III

Time: 3 hours

Max. Marks: 70

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Section-A

- A. Read the following passage and answer the questions given below: 5x1=5M  
Happy is the man who acquires the habit of reading when he is young. He has secured a life long source of pleasure , instruction and inspiration. So long as he has his beloved books, he need never feel lonely. He always has pleasant occupation of leisure moments, so that he need never feel bored. He is the possessor of wealth more precious than gold. Ruskin calls books “kings Treasures” treasuries filled not with gold and silver and precious stones but with riches much more valuable than these: knowledge,noble thoughts and high ideals. Poor indeed is the man who does not read and empty in his life.
1. Who can secure life long source of pleasure and inspiration?
  2. Who is a lonely person?
  3. What are called “kings treasures”?
  4. “He is the possessor of wealth” \_ what is the wealth that the speaker is referring to?
  5. What is the synonym to “valuable”?
- B. Answer any one of the following questions in about 100 words : 1x5=5M
1. According to Nehru what does freedom and power bring?
  2. Who is Ann Nixon Cooper? What does Obama say about her?
  3. Why did Steve Job become interested in Calligraphy?
- C. Answer any one of the following in about 200 words: 1x10=10M
1. Summarise Nehru’s speech ‘A Tryst with Destiny’.
  2. Analyse Barack Obama’s speech ‘Yes, We Can?’
  3. What was the message of Steve Job’s speech ‘You’ve got to find what you love?’
- D. Answer any one of the following in about 100 words: 1x5= 5 M
1. What is common between Mother Theresa and Nelson Mandela?
  2. What are the six leadership traits that Kalam talks about?
  3. How does JRD Tata defend the Voltas?
- E. Answer any one of the following in about 200 words : 1x10=10 M
1. What was the message given by Nelson Mandela as seen in the interview with Larry King?
  2. How does Dr. .A .P .J. Abdul Kalam share his ideas on managing failure with Knowledge@Whart?
  3. Summarise JRD Tata’s interview with T.N.Ninan

Section-B

F. Fill in the blanks with suitable expressions: 1x5=5M

Ranjith: \_\_\_\_\_, Mr Rao.

Rao: Good afternoon, Mr Ranjith. How are you?

Ranjith: \_\_\_\_\_, thank you. How are you Mr Rao?

Rao: I'm fine, thanks. I came to buy some shirts and trousers.

Ranjith: Ok. I came here to buy a nice watch for my friend.

\_\_\_\_\_, Mr Rao.

Rao: Thanks, and you too. Bye!

Ranjith: \_\_\_\_\_ !

G. Turn the following statements into Polite Requests: 1x5=5M

1. Give me your notes. ( To your classmate )
2. Clear my doubts. ( To your teacher )
3. Carry my luggage. ( To your friend )
4. Close the door. ( To a stranger )
5. Send the documents. ( Manager to a clerk )

H. Match the following with suitable expressions : 1x5=5M

- |                                 |     |                                       |
|---------------------------------|-----|---------------------------------------|
| 1) Can I have a glass of water? | ( ) | a) I'm sorry, I need some fresh air.  |
| 2) Please, shut the door        | ( ) | b) Of course, there is a bottle.      |
| 3) Can I take your printer?     | ( ) | c) Why not, you can read and return.  |
| 4) Do you mind my singing?      | ( ) | d) I'm sorry I have some work now.    |
| 5) Can I take your news paper   | ( ) | e) By all means. I want to study now. |

I. Construct a dialogue between two friends on the choice of their career: 1x10=10M

J. Describe your favourite city: 1x5=5M

k. Write an instructions on how to prepare tea 1x5=5M

# General Telugu

## నమస్కర్-3

### పాఠ్య ప్రణాళిక

యూనిట్-1: వ్యక్తీకరణ నైపుణ్యాలు

1. భాష-ప్రాథమికాంశాలు: భాష-నిర్వచనం, లక్షణాలు, ఆవశ్యకత, ప్రయోజనాలు
2. వర్ణం-పదం-వాక్యం', వాక్య లక్షణాలు, సామాన్య-సంయుక్త-సంశ్లిష్టవాక్యాలు
3. భాషా నిర్మాణంలో 'వర్ణం-పదం-వాక్యం' ప్రాధాన్యత

యూనిట్-II సృజనాత్మక రచన

4. కవితా రచన : ఉత్తమ కవిత - లక్షణాలు
5. కథారచన : ఉత్తమ కథ - లక్షణాలు
6. వ్యాస రచన : ఉత్తమ వ్యాసం-లక్షణాలు

యూనిట్-III: అనువాద రచన

7. అనువాదం-నిర్వచనం, అనువాద పద్ధతులు,
8. అనువాద సమస్యలు-భౌగోళిక,భాషా,సాంస్కృతిక సమస్యలు, పరిష్కారాలు
9. అభ్యాసము : ఆంగ్లం నుండి తెలుగుకు,తెలుగు నుండి ఆంగ్లానికి ఒక పేరానుఅనువదించడం

యూనిట్ IV మాధ్యమాలకు రచన-1 (ముద్రణామాధ్యమం/ప్రింట్ మీడియా)

10. ముద్రణామాధ్యమం (అచ్చుమాధ్యమం) : పరిచయం, పరిధి, వికాసం
11. వివిధ రకాల పత్రికలు-పరిశీలన, పత్రికాభాష, శైలి, వైవిధ్యం
12. పత్రికా రచన : వార్తా రచన, సంపాదకీయాలు, సమీక్షలు-అవగాహన

యూనిట్ V మాధ్యమాలకు రచన-2 (ప్రసార మాధ్యమం/ఎలక్ట్రానిక్ మీడియా)

13. ప్రసారమాధ్యమాలు : నిర్వచనం, రకాలు, విస్తృతి, ప్రయోజనాలు
14. శ్రవణ మాధ్యమాలు - రచన: రేడియో రచన, ప్రసంగాలు, నాటికలు, ప్రసార సమాచారం
15. దృశ్యమాధ్యమాలు - రచన: వ్యాఖ్యానం (యాంకరింగ్), టెలివిజన్ రచన

**Sri Ramakrishna Degree College, Nandyal**  
**BA/B.com/B.sc/BBA - 2nd year - 3rd Semester**  
**Sanskrit Syllabus(2021-22)**

**प्रथमविभाग:(Unit-I)**

प्राचीन रूपक विभाग:

1. मध्यमव्यायोग: -महाकवि भासः

**द्वितीय विभाग:(Unit-II)**

आधुनिक रूपक विभाग:

2. संकल्पबलम्- आचार्य जि.यस्.आर्. कृष्णमूर्तिः

**तृतीय विभाग:(Unit-III)**

उपनिषद् विभागः, भगवद्गीता

3. उपनिषद् — दकार कथा  
शिष्यानुशासनम्

4. भगवद्गीता — श्रद्धात्रयविभागयोगः

**चतुर्थविभाग: (Unit-IV)**

अलङ्कारः, महाकवि शास्त्रकारः विभागः

5. अलङ्कारः

6. महाकवि शास्त्रकारः

- |            |             |                  |            |
|------------|-------------|------------------|------------|
| 1. पाणिनि, | 2.कौटिल्यः, | 3. भरतमुनिः,     | 4. भारविः, |
| 5. माघः,   | 6. भवभूतिः, | 7. शङ्कराचार्यः, | 8. दण्डी   |

**पञ्चमविभाग:(Unit-V)**

हलन्त शब्दाः

7. व्याकरणविभागः- जलमुच्, मरुत्, भगवत्, भवत्, पचत्, राजन्, गुणिन्, नामन्, विद्वस्, मनस्, अस्मद्, युष्मद्।

**Sri Ramakrishna Degree College, Nandyal**  
**BA/B.com/B.sc/BBA - 2nd year - 3rd Semester**

**Sub: Sanskrit**  
**Model Question paper (2021-22)**

**Time : 3 hours.**

**Marks=70**

**प्रथमोभागः(50 marks)**

- I. द्वौश्लोकोपूरयित्वाभावंलिखत ! **2 x 4=08**  
अ) आयुः-----सात्विकप्रियाः!!  
आ)देवव्दिज-----उच्यते !!  
इ) मनःप्रसाद-----मुच्यते !!  
ई) औत्सदिति-----विहिताःपुरा !!
- II. चतुर्णांससन्दर्भभावंचलिखत ! **4 x 3=12**  
अ) व्दिजोत्तमाःपूज्यतमा-पृथिव्याम् !  
आ) पतिमात्रधर्मिणीपतिव्रतेतिनाम !  
इ) जात्याराक्षसी। नसमुदाचारेण !  
ई) दण्डंयथार्थमिहधारयितुंसमर्थाः !  
उ) मातृदेवोभव !  
ऊ) श्रद्धायःदेयम् ! अश्रद्धयाःदेयम्!  
ए) एषआदेशः!एषः उपदेशः!एतदनुशासनम् !  
ऐ)दमंदानंदयामिति!
- III. एकस्यसम्पूर्णतयासमाधानंलिखत ! **1 x 8=8**  
अ) भीमधटोत्कचयोःशीलंलिखत !  
आ)मध्यमव्यायोगरूपकस्यकथासारंलिखत!
- IV. एकस्य सम्पूर्णतया समाधानंलिखत ! **1 x 8=8**  
अ) गान्धिमहाशयस्यआदर्शः गुणान् पाठ्यभागानुसारंविशदयत !  
आ) संकल्पबलरूपकस्यकथासारं लिखत !
- V. एकस्य सम्पूर्णतया समाधानंलिखत! **1 x 8=8**  
अ) गुरुःशिष्यन्किम्अनुशास्ति?  
आ)बृहदारण्यकोपनिषदिवर्णितानुसारंदकारकथस्य वैशिष्ट्यंविचारयत !
- VI. षण्णालघुसमाधानानिलिखत! **1 x 6=6**  
अ) मध्यमव्यायोगस्यकर्ताकः?

- आ) पाण्डवाःकीर्दशाः ?  
 इ) मांसभक्षणेकिंमलिनंभवति ?  
 ई) शर्तुतिवचनंकिम् ?  
 उ) प्रजापतेःकतिपुत्राःसन्ति?  
 ऊ) प्रजापतिःदेवान्उद्दिश्य किंउपदिदेश ?  
 ए) उपनिषद्इतिशब्दस्यअर्थःकः?  
 ऐ) कस्यांनप्रमदितव्यम् ?  
 क) त्रिविधश्रद्धाका ?  
 ख) त्रयःआहाराःके ?

द्वितीयभागः(20Marks)

VII. व्दयोःशब्दरूपानिसम्पूर्णतयालिखित !

2 x 3=6

अ) जलमुच् आ) भगवत् इ) राजन् ई) विव्दस्

VIII. व्दयोःलक्षलक्षणंसमन्वयंलिखित !

2 x 3=6

अ) उपमा। आ) दीपकम् इ) द्रुष्टान्तः। ई) उल्लेखः

IX. व्दयोःलघुविवरणंकुरुत !

2x 4=8

अ) भारविः। आ)माघः। इ) पाणिनि ई) भवभूतिः



**SRI RAMAKRISHNA DEGREE(AUTONOMOUS) COLLEGE: NANDYAL**  
**B.Sc. SECOND YEAR MATHEMATICS SYLLABUS (2021-2022)**  
**SEMESTER-III PAPER-3**  
**ABSTRACT ALGEBRA-PAPER-3**

**Course Outcomes:**

After successful completion of this course, the student will be able to;

1. acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
2. get the significance of the notation of a normal subgroups.
3. get the behavior of permutations and operations on them.
4. study the homomorphisms and isomorphisms with applications.
5. understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
6. understand the applications of ring theory in various fields.

**Course Syllabus:**

**UNIT – I (12 Hours)**

**GROUPS :**

Binary Operation – Algebraic structure – semi group- monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

**UNIT – II (12 Hours)**

**SUB - GROUPS :**

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition- examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

**Co-sets and Lagrange's Theorem :**

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

**UNIT –III (12 Hours)**

**NORMAL SUBGROUPS :**

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

**HOMOMORPHISM :**

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–

kernel of a homomorphism – fundamental theorem on Homomorphism and applications

#### **UNIT – IV (12 Hours)**

##### **PERMUTATIONS AND CYCLIC GROUPS :**

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

**Cyclic Groups :-** Definition of cyclic group – elementary properties – classification of cyclic groups.

#### **UNIT V (12 Hours)**

##### **RINGS :**

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

##### **Co-Curricular Activities(15 Hours)**

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

##### **Text Book :**

A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.

##### **Reference Books :**

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna.

**SRI RAMAKRISHNA DEGREE (AUTONOMOUS) COLLEGE: NANDYAL**

**II B.Sc MATHEMATICS PAPER-3**

**MODEL PAPER- (For the Academic Year 2020 onwards)**

**III SEMESTER- ABSTRACT ALGEBRA**

**Max.MARKS:70M**

**PART-A**

**Answer Any FIVE of the following**

**5x4=20M**

1. Prove that in a group  $G$ , If  $a \in G$  then  $O(a) = O(a^{-1})$ .
2. Show that in a Group  $G$  for  $a, b \in G$ ,  $(ab)^2 = a^2b^2$  if and only if  $G$  is abelian.
3. Prove that the intersection of two Sub groups is again Sub group
4. Prove that any two right or left Co-sets of Subgroup are either identical or disjoint
5. Prove that a subgroup  $H$  of a group  $G$  is Normal, If  $xHx^{-1} = H$  for all  $x \in G$
6. Find the regular permutation group Isomorphic to the multiplication group  $G = \{1, -1, i, -i\}$
7. Show that every cyclic group is an abelian
8. Prove that every Boolean ring is Commutative under multiplication.

**PART-B**

**Answer Any FIVE of the following**

**5x10=50M**

- 9a). Prove that the set  $-Z$  of all integers form an abelian group with respect to the Operation defined by  $a * b = a + b + 2$  for all  $a, b \in Z$

**OR**

- b). Let  $G$  to be a group and  $H$  is a complex of  $G$ . The necessary and Sufficient condition for  $H$  to be a sub group of  $G$  is  $a, b \in H \Rightarrow ab^{-1} \in H$

- 10 a). State and prove Lagrange's theorem on finite groups

**OR**

- B . Prove that a subgroup  $H$  of a group  $G$  is a normal subgroup of  $G$  If and only if the product of two right(left) co sets of  $H$  in  $G$  is again a right(left) co-set of  $H$  in  $G$

- 11a). State and Prove Fundamental theorem of Homomorphism on Groups

**OR**

- b). State and prove Cayley's theorem on finite groups

- 12 a). Show that every Isomorphic images of a Cyclic group is Cyclic

**OR**

b) Every Sub group of Cyclic Group is Cyclic.

13a) .Prove that a ring has  $R$  has no zero divisors If and only if the Cancellation laws hold in  $R$

**OR**

Prove that  $Q[\sqrt{2}] = \{a + b\sqrt{2} \mid a, b \in Q\}$  is a Field with respect to addition and multiplication of numbers.

**SRI RAMAKRISHNA DEGREE (AUTONOMOUS) COLLEGE: NANDYAL**  
**II B.Sc PHYSICS PAPER-3**  
**MODEL PAPER- (For the Academic Year 2020 onwards)**  
**III SEMESTER- HEAT AND THERMODYNAMICS**  
**Max.MARKS:70**

**SECTION – A**

Answer any **FIVE** of the following questions. **5×4=20M**

1. Derive equation for the diffusion of gases on the basis of kinetic theory of gases.
2. State and explain carnot's theorem.
3. State and explain joule- kelvin effect.
4. Write a short note on refrigerator.
5. Describe Fery's black body.
6. Derive clausius – clayperon equation.
7. Explain joule – Thomson cooling and derive it's equation.
8. What is solar constant? How it is determined?

**SECTION – B**

Answer **ALL** the following questions. **5x10=50 M**

9. A) on the basis of kinetic theory of gases derive expression for viscosity and thermal conductivity of gases.  
(Or)  
B) Explain the thermal conductivity of gas on the basis of kinetic theory of gases.
10. A) what are isothermal and adiabatic processes? Derive an expression for the work done in isothermal and adiabatic process.  
(Or)  
B) calculate the work done in carnot cycle and derive an expression for it's efficiency.
11. A) write Maxwell's thermodynamic relation. Explain two specific heats of a gas and obtain an expression for the difference between two molar specific heats.  
(Or)  
B) Define the four thermodynamic potentials. Using these thermodynamic potentials obtain Maxwell's thermodynamic equations.
12. A) Describe joule – Thomson porous plug experiment and indicate the results.  
(Or)  
B) Explain with theory the adiabatic demagnetisation for producing a very low temperature.
13. A) Deduce wien's displacement law and Rayleigh – jeans law from plank's radiation law.  
(Or)  
B) what is a pyrometer ? Describe the construction and working of disappearing filament optical pyrometer.

**B.Sc. PHYSICS SYLLABUS UNDER CBCS**  
**For Mathematics Combinations**  
II Year B.Sc.-Physics: III Semester  
Course-III: HEAT AND THERMODYNAMICS

**UNIT-I: Kinetic Theory of gases:**

Kinetic Theory of gases-Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification, Mean free path, Degrees of freedom, Principle of equipartition of energy (Qualitative ideas only), Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

**UNIT-II: Thermodynamics:**

Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Thermodynamic scale of temperature

and its identity with perfect gas scale, Second law of thermodynamics: Kelvin's and Clausius statements,  $\Delta S$ , Entropy, Physical significance, Change in entropy in reversible and irreversible processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses ; change of entropy when ice changes into steam.

**UNIT-III: Thermodynamic Potentials and Maxwell's equations:**

Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Applications to (i) Clausius-Clayperon's equation (ii) Value of  $C_p - C_v$  (iii) Value of  $C_p/C_v$  (iv) Joule-Kelvin coefficient for ideal and Van der Waals' gases

**UNIT-IV: Low temperature Physics:**

Methods for producing very low temperatures, Joule Kelvin effect, Porous plug experiment ,Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Liquefaction of air by Linde's method, Production of low temperatures by adiabatic demagnetization (qualitative), Principle of refrigeration, vapour compression type refrigerator, working of refrigerator. Practical applications of substances at low temperatures.

**UNIT-V: Quantum theory of radiation:**

Blackbody and its spectral energy distribution of black body radiation, Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh-Jean's law from Planck's law, Measurement of radiation-types of pyrometers-Disappearing filament optical pyrometer-Experimental determination-Angstrom pyroheliometer- Solar constant and its determination using Angstrom pyroheliometer, Estimation of surface temperature of Sun.

**SRI RAMAKRISHNA DEGREE COLLEGE (AUTONOMOUS)**

**II B.Sc; ELECTRONICS (SEMESTER-III)**

**(2021-2022 Regulation)**

**PAPER:III- ANALOG CIRCUITS AND COMMUNICATIONS**

**UNIT-I:**

**12 Hours**

**Operational Amplifiers (Op-Amp):** Introduction, Block diagram – Schematic representation- Pin configuration. Ideal characteristics of Op-Amp, Op-amp parameters- Offset Voltage, Bias currents, CMRR, Slew rate. Concept of virtual ground Inverting amplifier, Non-inverting amplifier, Differential amplifier, closed loop frequency response.

**UNIT:II:**

**12 Hours**

**Op-Amp Applications:** Inverter, Adder, Subtractor, Current follower, Voltage follower, Comparator, Integrator, Differentiator, **Sine wave generator (Wien Bridge Oscillator, Phase shift Oscillator)** Square wave generator, Triangular wave generator, voltage regulator Schmitt trigger. IC-555 functional block diagram and mention its applications.

**UNIT:III:**

**12Hours**

**Amplitude Modulation:** Need for modulation, modulation index, Analysis of AM wave, frequency spectrum, power relations in the AM wave. Generation of AM- Transistor modulator. Detection of AM signals -Diode detector. Limitations of AM.

**UNIT-IV:**

**12 Hours**

**Frequency Modulation:** Theory of FM, Frequency deviation and carrier swing, modulation index, deviation ratio, percent modulation. Mathematical representation of FM, frequency spectrum and bandwidth of FM waves, Generation of FM signals: Reactance modulator. Detection of FM waves: Double tuned discriminator.

**UNIT-V:**

**12 Hours**

**Radio broadcasting and reception and Digital Communication:**

**Electromagnetic spectrum – relation between frequency and wavelength** -Block diagram of radio transmission and reception-Block diagram of Super heterodyne Receiver. Advantages of digital over analog communications, Sampling Theorem, TDM, FDM. PAM- Generation & Detection PWM- Generation & Detection, PPM- Generation &Detection.

**Text Books:**

1. Op-Amp Linear Integrated circuits By Ramesh Gaykwad
2. Linear Integrated Circuits by Roy and Choudary
3. Unified electronics vol II by JP Agarwal and Amit Agarwal
4. Electronics communications – George Kennedy
5. Antennas and Wave Propagation by G.S.N.Raju
6. Principles of communication system by Herbert Taub & e.L. Schilling

**SRI RAMAKRISHNA (AUTONOMOUS) DEGREE COLLEGE**  
**II B.Sc; ELECTRONICS (SEMESTER-III)**  
**(2021-2022 Regulation)**  
**PAPER:III- ANALOG CIRCUITS AND COMMUNICATIONS**

MODEL PAPER

**Section -A**

Answer the following any **Four** questions:

**4X5M=20M**

1. What are the characteristics of an ideal op-amp?
2. Write a short note on op-amp as a voltage follower.
3. Explain the op-amp parameters.
4. What is the need for modulation?
5. What is the modulation index in AM?
6. Draw the frequency spectrum and bandwidth of FM waves.
7. Write about sampling theorem.
8. Draw and explain the spectrum of electromagnetic waves.

**Section - B**

Answer the following **ALL** Questions:

**5X10M=50M**

9. Explain the block diagram of op-amp.  
Or  
Derive an expression for the output voltage in both inverting and non-inverting configuration.
10. What is an op-amp integrator? Explain its functioning.  
Or  
Draw the functional block diagram of IC-555 timer. Explain each block.
11. What is Demodulation? Explain the working of diode detector.  
Or  
Explain the mathematical analysis of AM and give its power relations.
12. Discuss the working of reactance modulator.  
Or  
Explain the mathematical analysis of FM.
13. Explain about block diagram of super heterodyne receiver.  
Or  
Explain about Frequency division multiplexing.