II Year B.E/B.Tech

ELECTRONICS & COMMUNICATION ENGINEERING (ECE)

MODEL QUESTION PAPERS

(Effective from 2005 admitted batch)

SCHOOL OF DISTANCE EDUCATION

ANDHRA UNIVERSITY

VISAKHAPATNAM - 530 003

II Year B.E./B.Tech Degree Examinations
MATHEMATICS - III
(Common to Civil, Mechanical, EEE & ECE Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks

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1. a) Define scalar and vector point functions.

b) Write down the physical interpretation of curl.

c) Explain briefly the wave equation with reference to transverse vibration of a string.

d) Define Fourier transforms of the derivatives of a function.

e) State Parseval's identity for F - transforms.

2. a) What is the directional derivative of $\varnothing = xy^2 + yz^3$ at the point (2, -1, 1) in the direction of the normal to the surface x 1og z - y^2 = - 4 at (-1, 2, 1)?

b) Verify Stoke's theorem for the vector field $\overline{F} = (2X - y)\vec{i} - yz^2\ \vec{j} - y^2 z\ \vec{k}$ over the upper half surface of $x^2 + y^2 + z^2 = 1$ bounded by its projection on the xy plane.

3. a) If r and $\vec{R}$ have their usual meaning and $\vec{A}$ is a constant vector prove that $\nabla x \left\{ \frac{\vec{A} x \vec{R}}{r^n} \right\} = \frac{2-n}{r^n}\vec{A} + \frac{n\left(\vec{A}.\vec{R}\right)}{r^{n+2}}\vec{R}.$

b) Prove that the spherical polar coordinate system is orthogonal.

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4. a) If (z) is a regular function of z prove that

$$\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]\left|f(z)\right|^2=4\left|f(2)\right|^2$$

b) Evaluate $\int_{-\infty}^{\infty}\frac{x^2dx}{(x^2+1)\left(x^2+4\right)}$

5. a) Find the Fourier transform of $e^{-x^2/2}$

b) Find the Fourier sine transform of $f(x)=\begin{Bmatrix}1, & O\le x\le a\\ 0, & x\ge a\end{Bmatrix}$

6. a) Find a solution of the equaion $\frac{\partial^2 u}{\partial x^2}=\frac{\partial u}{\partial y}+2u$ in the form u = f (x) g (y). Solve the equation subject to the conditions u = 0 and $\frac{\partial u}{\partial x}=1+e^3 y$ when x = 0 for all values of y.

b) A tightly stretched flexible string has its ends fixed at x = 0 and x = *l*. At time t = 0 the string is given a shape given by f (x) = $\mu\, x(l-x)$ where μ is a constant and then release. Find the displacement of any point x of the string at any time t > 0.

7. a) A continuous distribution of a variable x in the range (-3, 3) is defined as

$$f(x)=\frac{1}{16}(3+x)^2,\ -3\le x\le -1.$$

$$= \frac{1}{16}(2+6x)^2, \ -1 \le x \le 1.$$

$$= \frac{1}{16}(3+x)^2, \ -1 \le x \le -3.$$

Verify that the area under the curve is unity. Show that the mean is zero.

b) Fit a Poisson distribution to the following.

x	:	0	1	2	3	4
f	:	46	38	22	9	1

8. a) Find the correlation coefficient from the following data :

x	:	1	2	3	4	5
y	:	2	5	3	8	7

b) The following results were obtained in Applied Mechanics and Engineering Mathematics in an examiniation. Given $r = 0.95$, Find both the regression equations.

	Applied Mech. (x)	Engg. Maths (y)
Mean	47.5	10.5
Standard deviation	16.8	10.8

II Year B.E./B.Tech Degree Examination

ELEMENTS OF ELECTRICAL MACHINES

Electronics & Communication Engineering

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks

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1. a) What is Armature Reaction in a DC Machine.

b) Explain the term Synchronous Impedance of an Alternator.

c) Define 'All Day Efficiency' in a Transformer and explain how can it be improved.

d) Describe a starter suitable for a 3-phase slip-ring Induction Motor.

e) What is a split-phase Induction Motor.

2. a) Explain the various types of excitations used in D.C. generators.

b) A 230 volts, D.C. shunt motor has an armature resistance of 275 ohms. It runs at 1000rpm while drawing an armature current of 75 Amps. Cauculate the additional resistance to be inserted in the field circuit to raise the speed to 1200 rpm at an armature current of 125 Amps. Assume linear characteristics.

3. a) With usual notation, derive an expression for the torque developed by D.C. motor and hence discuss the characteristics (torque Vs speed) of D.C.shunt and series motors.

b) A 4 pole, wave wound, 750 rpm D.C. shunt generator has an armature and field resistance of 0.04 ohm and 200 respectively. The armature has 720 conductors and the flux per pole is 28.95 mwb. If the load resistance is 10 ohms, determine the terminal voltage of the machine.

4. a) Explain the operation of 3-phase synchronous motor with help of phasor diagram when the excitation is varied with constant output power.

b) If a field excitation of 10 Amps in a certain 3-phase, star connected alternator gives a current of 150 Amps on short circuit and a terminal voltage of 900 volts on open circuit, find the internal voltage drop with a load current of 60 Amps.

5. a) Explain the development of the equivalent circuit of single-phase transformer.

b) The O.C.and S.C test results on a single-phase, 50Hz, 250/500 volts transformer are as:

O.C test (L.V.side): 250 volts, 1 Amp, 70 watts

S.C. test (H.V.side): 20 volts, 11 Amp, 120 watts.

Calculate the efficiency and approximate regulation while supplying 10 Amps at 500 volts at 0.7 power factor lagging.

6. a) Derive an expression for the gross torque of a 3-phase induction motor in terms of rotor standstill reactance and resistance.

b) A 30 HP, 3-phase, 50 Hz, 6 pole induction motor has a full load slip of 0.04, the Mechanical losses are 250 watts. Calculate the rotor speed and the motor copper losses.

7. a) A 3-phase induction motor is self starting motor. Explain, why it is necessary to have starter. Name the different types of starters used on the stator side. Give the internal connections of one type of starter.

b) A 3-phase induction motor has rotor resistance and stanstill leakage reaqctance of 1 ohm and 4 ohms respectively per phase. The torque developed is 50 N-m at a slip of 5% with rated voltage. Calculate the maximum torque developed and the slip at which it occurs assuming the rated voltage applied to the stator.

8. a) Explain, how is rotating magnetic field produced in 1-phase induction motor?

b) Explain the principle of operation, construction and give the applications of capacitor start induction motor.

II Year B.E./B.Tech Degree Examinations

ELECTRONICS-II

(Common to EEE & ECE Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory

Answer any four from Questions 2 to 8

All questions carry equal marks

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1. a) What do you understand by feedback in amplifiers? Explain the terms feedback factor and open loop gain.

b) What are the characteristics of an ideal operational amplier?

c) In class A power amplifier circuit, $V_{cc} = 20v$, the load resistance is 12Ω. Find out power, input power and efficiency.

d) Explain lower and upper triggering voltages in a Schmitt trigger.

e) Give the simple Miller Sweep circuit using NPN transister and explain.

2. a) Draw the circuit of Wien Bridge oscillator and explain the principle of operation.

b) Derive the expression for its frequence of oscillations. What is the condition on β for getting sustained oscillations.

c) State Barkansen Criterion for oscillation.

3. a) Obtain the response of an RC high-pass filter to a step input.

b) Obtain the condition of RC high-pass filter to behave as a good differentitatior.

c) Obtain the response of an RC high-pass filter and to a pulse Input for Rc/tp>>1 and Rc/tp<<1.

4. a) Draw the circuit of class B Power amplifier using BJT and explain its working principle. Derive the expression for its efficiency.

b) What are the advantages of push pull amplifiers

5. a) Draw the circuit diagram of a single tuned FET Amplifier and explain its operation.

b) What are the advantages of doubled tuned amplifiers over single tuned amplifiers.

6. a) Draw the circuit diagram of an emittercoupled binary and explain its operation. State its advantages over collector-coupled binary circuit.

b) Design an astable Multivator to produce the squate wave at 10KHZ. With 30% duty cycle. Use transistors having (h_{fe})min=60, V_{BE} (sat)=0.7V. V_{BE} (cut off)=0V and V_{CE} (sat)=0.2V. Assume I_c(sat)=1mA and V_{CC}=10V. Show the circuit diagram with all-----------------------------

7. a) Draw the circuit diagram of a linear current time base generator and explain its operation with waveforms.

b) Explain the following with relevant sketches

i) Diode clipper at two independent levels

ii) Diode Clamping circuits

8. a) Explain the concepts of Miller and Bootstrap time base generators with neat circuits.

b) Write short notes on the following

i) Simple current sweep generator

ii) Transistor as a switch

iii) Comprator Circuit.

II Year B.E./B.Tech Degree Examination

NETWORK THEORY

(Common to EEE & ECE Branches)

1. a) State and explain duality theorem. (5 x 3 = 15)

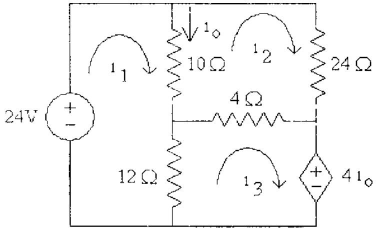
b) What is source free response? Explain in detail different cases of natural response of an RLC circuit.

c) State and explain Superposition theorem.

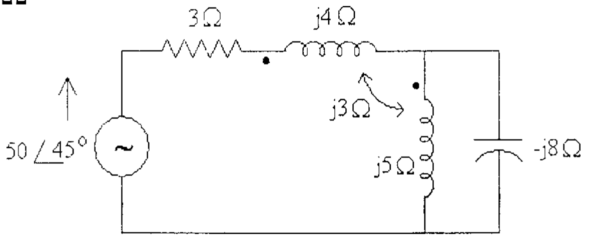
d) Give the restrictions on pole and zero locations for driving point functions.

e) Using R-H criterion, check the stability of the network having the denominator polynomial of the network function given as $Q(s) = 2s^4 + s^3 + 3s^2 + 5s + 10$

2) a) Use mesh analysis to obtain i_0 in the circuit given below.

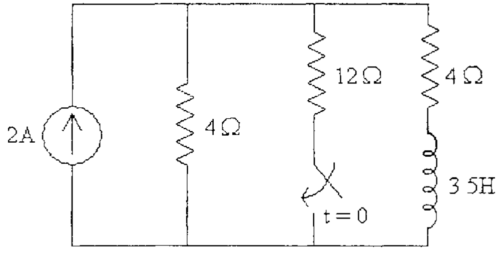


b) For the circuit shown in the figure, find the voltage across j5 Ω

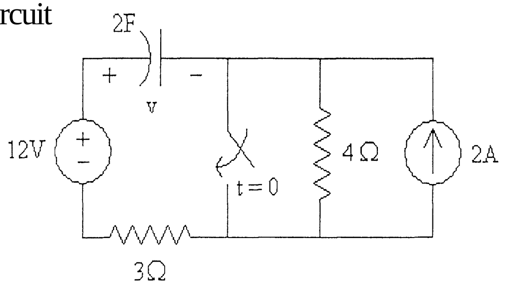


3) a) Explain in detail different cases of natural response of an RLC circuit.

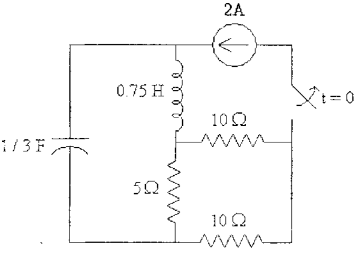
b) Obtain the inductor current for both t<0 and t>0 in the circuit given below.



4) a) Find the capacitor voltage 'v' for t < 0 and t > 0 for the given circuit

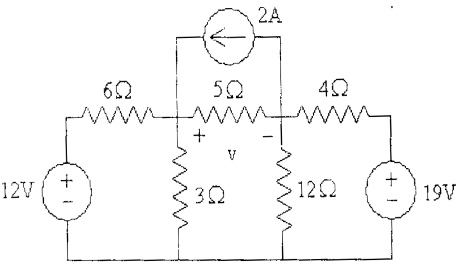


b) Calculate i(t) for t > 0 in the circuit given below using Laplace transform method.

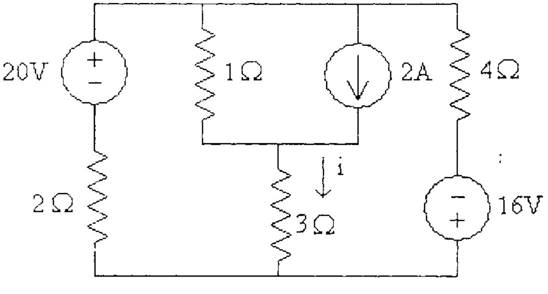


5) a) State and prove initial and final value theorems.

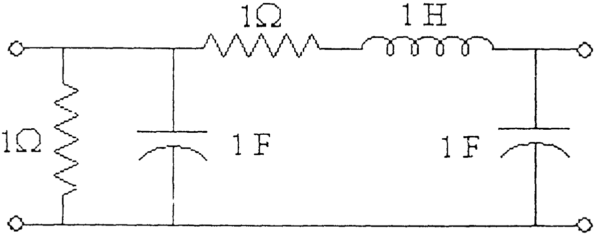
b) Use Thevenin's theorem to find 'v' in the circuit.



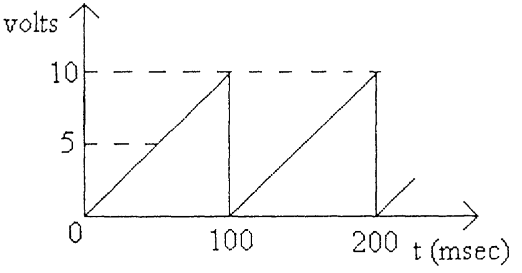
6) a) Use Norton's theorem to find current 'i' in the circuit.



b) Determine the 'z' parameters of two-port network given in the figure.



7) a) A periodic voltage waveform has been shown. Determine rms value, average value, form factor.



b) A four wire Y–Y circuit has $V_{an} = 120\angle 120^0\,V,\ V_{bn} = 120\angle 0^0\,V$ and $V_{cn} = 120\angle -120^0\,V$. If the impedances are

$Z_{AN} = 20\angle 60^0\,\Omega,\ Z_{BN} = 30\angle 0^0\,\Omega$ and $Z_{CN} = 40\angle 30^0\,\Omega$ find the current in the neural line.

8) a) Design a series RLC circuit, which will have an impedance of 10 Ω at the resonant frequency of $\omega_0 = 50\,rad/\sec$ and a quality factor of 80. Find also the bandwidth.

b) Determine the line current in a $3-\phi$ system with a line voltage of 300V that supplies 1200 Watts to Delta connected balanced load at a lagging power factor of 0.8. Find also the impedance of each phase.

II Year B.E./B.Tech Degree Examination

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

Common to EEE & ECE Branches

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks
Assume any missing data if necessary

Q.1 a) Determine the moment of Inertia of a square with a side of 300mm about its diagnol.

b) The motion of a particle is described by $x = 10\,\text{Cos}3$ Find the auplitude, time period and velocity at t =2 sec.

c) The curvilinear motion is given by its normal acceleration equal to 3m/sec^2; tangential acceleration being zero. If the radius of curvature is 60cm. Finlinear velocity and angular velocity.

d) At a point in a body the stresses are given by

$\sigma_x = 10;\ \sigma_y = 6\ and\ \tau_{xy} = 3N/mm^2$. Find the principal stresses and the maximum shear stress.

e) A cantilever having a span of 6m is subjected to a concentrated load of 20KN. Draw SFD and BMD indicating their maximum values.

2. a) Determine the magnitude and direction of the resultant of four forces acting on a rectangle where the reconstant cuts the line AB. see Fig.1.

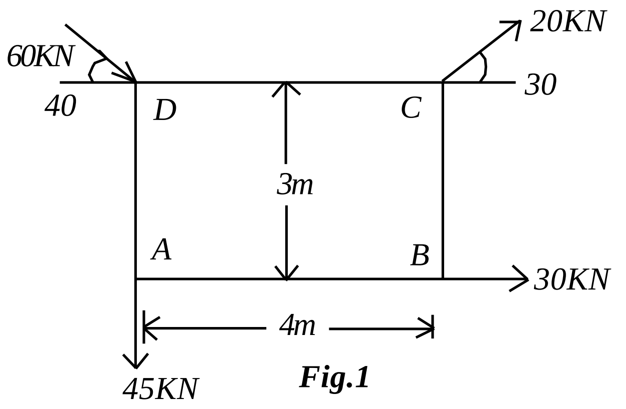


Fig.1

b) Two smooth spheres each of weight 1200 N and of radius 250mm rest in a channel as shown in Fig 2. Find the reactions at A,B,C, if $\mu = 0.2$.

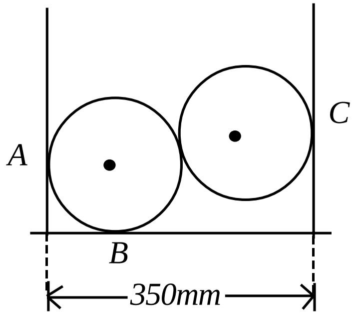


Fig.2

3. a) Determine the forces in all the members of a warren trass loaded as shown in Fig 3.

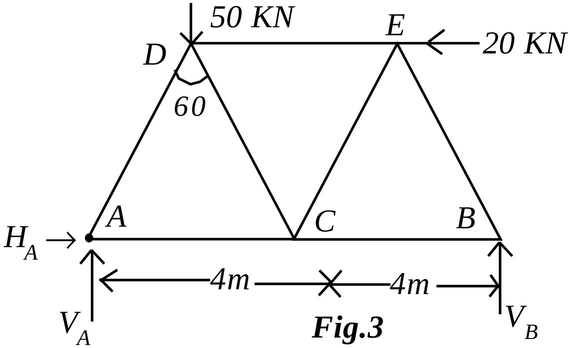


Fig.3

4. a) Derive the equation for time period in simple harmonic motion.

b) A body of mass 40kg. moving with a velocity of 6m/s collides directly with a body of mass 25kg. Find their common velocity if they move together after impact.

5. a) Define angular momentum and what is its relation with the torque causing rotation.

b) A motor cyclist wants to jump over a ditch from A to B. Find the minimum velocity at A and the velocity when he reaches B. See Fig.4.

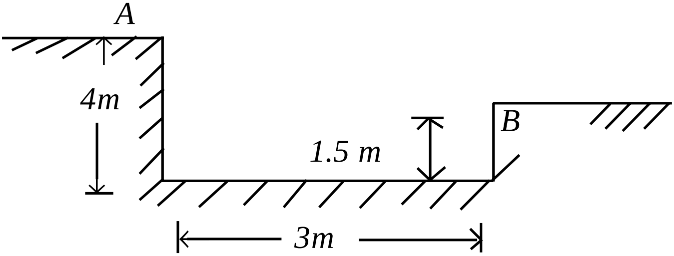


Fig.4

6. a) Derive the equations for principal stresses when σ_x, σ_y *and* τ_{xy} are acting at a point.

b) In a stressed body the maximum normal stress is 15 N/mm^2. A plane inclined at 45c to the principal plane carrys a shear stress of 3N/mm^2. Find the normal stress on a plane making an angle of 30^0 with the principal plane.

7. a) Derive an equation for calculating the bending stress in pure bending.

b) A simply supported beam of span 9m is subjected to a U.D.L of 25kN/m. Find the normal stress at the bottom of mid span if b=300mm and D=700mm.

8. a) A twisting moment of 40knm. acts on a shaft of diam 300mm. Find the maximum shear stress and angle of twist per unit length if $G = 0.8 \times 10^5\ N/mm^2$

b) Determine the deflection at the free end of a cantilever having a span of 6m and subjected to a U.D.L of 15 K.N.M throughout along with a concentrated load of 40 KN. at the free end. Assume EI is constant and calculate deflection in terms of EI.

II Year B.E./B.Tech Degree Examinations
ELECTRO MAGNETIC FIELD THEORY
Electronics & Communication Engineering

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks

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1. a) Write Coulomb's law in mathematical form

b) Define electric flux density in terms of electric flux and also electric field

c) State Lorentz force equation

d) Write Maxwell's equations in free space

e) State the conditions for lossless line and also for distortion less line

2. a) Derive an expression for electric field due to a surface charge.

b) A sphere of volume $0.1m^3$ has a charge density of 8.0 pC/m^3. Find out electric field at a point (2,0,0) if the centre of the sphere is at (0,0,0).

3. a) Give the boundary conditions and prove the boundary conditions on E and D.

b) The region y < 0 contains a dielectric material for which $\in_{r1}=2.0$ and the region y > 0 contains a dielectric material for which $\in_{r2}= 4.0$. If $E_1 = -3.0\ a_x + 5.0\, a_y + 7.0\, a_z$ *V/m*. Find the electric field, E_2 and D_2 in medium 2.

4. a) Derive an expression of energy stored in an electrostatic field.

b) A parallel plate capacitor has conducting plates of area equal to 0.04 m^2. The plates are separated by a dielectric material whose $\in_r = 2$ with the plate separation of 1cm. Find (a) its capacitance value (b) the charge on the plates when a potential difference of 10 V is applied (c) the energy stored.

5. a) Derive the expressions for Maxwell's equations in time varying fields and explain their meaning.

b) In free space, the magnetic field of an EM wave is given by $H = 0.4\omega \in_o \cos(\omega t - 50x)a_z$ A/m. Find the electric field, E and displacement current density, D.

6. a) What is an Ampere's circuit law and derive an expression for differential form of ampere's circuit law.

b) The radii of the inner and outer conductors of a coaxial cable are 2 mm and 6 mm respectively and $\mu = \mu_0$. Find the inductance of a 10m long cable.

7. a) Give a general solution of uniform place wave equation and also derive an expression of relation between E and H in uniform plane wave.

b) The wavelength of an x-directed plane wave in a lossless medium is 0.25m and the velocity of propagation is $1.5 \times 10^{10}\ cm/\sec$. The wave has z-directed electric field with an amplitude equal to 10 V/m. Find the frequency and permittivity of the medium. The medium has $\mu = \mu_0$.

8. a) Derive an expression of guide wavelength in circular waveguides.

b) A transmission line is lossless and is 25 m long. It is terminated in a load of $Z_L = 40 + j30\,\Omega$ at a frequency of 10 MHz. The inductance and capacitance of the like are $L = 300\,nH/m$, C=40 pF/m. Find out input impedance at the source and at midpoint of the line.

II Year B.E./B.Tech Degree Examination

SIGNALS AND SYSTEMS

Electronics & Communication Engineering

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory

Answer any four from Questions 2 to 8

All questions carry equal marks

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1. a. What is meant by signal? Contrast the differences between energy and power signal. 3

b) Explain operations on signals 3

c) How can we represent a signal by orthogonal set of functions in time? 3

d) Explain different types of signals 3

e) How many different types of signal transformations are there and explain with example. 3

2. a) Define Z-transform and its properties. 8

b) Find the Z-Transform of $x(n) = -a^n u(-n-1)$. And give the region of convergence. 7

3. a) Define Fourier transform and its properties 10

b) Find the Fourier tranform of $x(n) = e^{-at}\cos(\omega t + \Phi)$. 5

4. a) State and Prove Sampling Theorem. 8

b) What is the effect of aliasing explain with example. 7

5. a) How do you represent a discrete time signal as sum of infinite impulses? 8

b) Define inverse Z-transform and methods of deducing it. 7

6. a) Explain auto-correlation and cross-correlation of signals by taking necessary examples 6

b) Explain Basic operation that can be performed on the signals 9

7. a) Explain discrete Time Decimation and Interpolation 5

b) Define trigonometric Fourier Series and give the formulae for the Fourier coefficients. 10

8. Write a note on 15

a) Causality

b) Stability

c) Linearity

II Year B.E./B.Tech Degree Examination

ELECTRONIC MEASUREMENTS AND INSTRUMENTS

Electronics & Communication Engineering

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory

Answer any four from Questions 2 to 8

All questions carry equal marks

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1. a) Define Accuracy and Precision. (3M)

b) What are the three general classes of errors? (3M)

c) What are frequency standards? (3M)

d) What is a lissajous pattern and its significance? (3M)

e) State the applications of a Spectrum analyzer. (3M)

2. a) Give the importance of Statistical analysis in measurements and explain different types of statistical methods. (5M)

b) Explain Probability of errors and limiting errors (5M)

c) A set of independent current measurements was taken by six observers and recorded as 12.8 mA, 12.2 mA, 12.5mA, 13.1 mA, 12.9 mA, 12.4 mA. Calculate Arithmetic Mean and Average deviation. (5M)

3. a) Explain the principle of Suspension Galvanometer. (3M)

b) Describe Torque and deflection of the Galvanometer. (6M)

b) Explain shunt type DC Ammeter. (6M)

4. a) Explain the frequency monitors for AM wave with neat sketch (7M)

b) Derive the expression for frequency in terms of Wein Bridge parameters. (8M)

5. a) Briefly Explain the working principle of Wheatstone Bridge. (7M)

b) Explain Shearing Bridge and derive the necessary expressions. (8M)

6. a) Explain the Maxwell's Bridge and derive the expressions. (8M)

b) The ac bridge is in balance with the following constants. Arm AB; R=450 Ω, arm BC; R=300 Ω in series with C=0.265 μF, arm CD unknown; arm DA; R=200 Ω in series with L=15.9mH. The oscillator frequency is 1 KHz. Find the constants of arm CD. (7M)

7. Explain the phase and time interval measurements using oscillorgaphic representation of wave shape. (15M)

8. Write short notes on

a) Shunt type ohmmeter (5M)

b) Cavity wave meter (5M)

c) Spectrum analyses (5M)