Code: 9ABS302

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MATHEMATICS-III

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering and Electronics & Computer Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.
   (b) Find the value of $\Gamma(1/2)$ and hence evaluate $\int_0^\infty e^{-x^2}dx$ using Γ funcition.
   (c) Prove that $P_{n+1}^1 + P_n^1 = P_0 + 3P_1 + 5P_2 \pm - - - - + (2n+1)P_n$.

2. (a) Define analyticity of a complex function at a point P and in a domain D. Prove that the real and imaginary parts of an analytic function satisfies C-R equations.
   (b) Show that the function defined by $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}$ at $z \neq 0$ and $f(0) = 0$ is continous and satisfies C-R equations at the origin but $f^1(0)$ does not exist.

3. (a) Find all values of z which satisfy $\sin z = 2$.
   (b) Find all principal values of $(1+i\sqrt{3})^{(1+i\sqrt{3})}$.

4. (a) Verify Cauchy's theorem for the function $f(z) = 3z^2 + iz - 4$ if C is the square with vertices at $1 \pm i$ and $-1 \pm i$.
   (b) Let c be the circle $z = \exp(i\theta)$described from $\theta = -\pi$ to π and K is any real constant. Show that $\int_c \frac{e^{kz}}{z}dz = 2\pi i$ then write the integral in terms of θ to derive the formula $\int_0^\pi e^{k\cos\theta}\cos(k\sin\theta)\,d\theta = \pi$.

5. (a) If $f(z)$ is analytic inside and on a simple closed circle if C with center at a, then prove that for z inside C
$$f(z) = f(a) + f^1(a)(z-a) + \frac{f^{11}(a)}{2!}f^1(z-a)^2 + \frac{f^{111}(a)}{3!}(z-a)^3 + \cdots \ldots \ldots$$
   (b) Obtain all the Laurent series of the function $\frac{7z-2}{(z+1)z(z-2)}$ about $z = -1$.

6. (a) Show that $\int_0^\pi \frac{a\,d\theta}{a^2+\sin^2\theta} = \pi/\sqrt{1+a^2}$, a>0.
   (b) Evaluate $\int_{-\pi}^{\pi} \frac{a\cos\theta\, d\theta}{a+\cos\theta}$, a>1 using residue theorem.

7. (a) Suppose $f(z)$ and $g(z)$ are analytic within and on a closed curve C and if $|g(z)| < |f(z)|$ on C then prove that $f(z)$ and $f(z) + g(z)$ both have the same number of zeros inside C.
   (b) If the real number $a > e$, prove, by Rouche's theorem, that the equation $e^z = az^n$ has n roots inside the unit circle.

8. (a) Prove that the transformation $w = \sin z$ maps the families of lines $x =$ constant and $y =$constant into two families of confocal central conies.
   (b) Find the image of the infinite strip between the lines $y = 2$ and $y = 4$ under the transformation $w = \sin z$.

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Code: 9ABS302

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MATHEMATICS-III

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering and Electronics & Computer Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Prove that $\frac{1}{\sqrt{1-2tx+t^2}} = P_0(x) + P_1(x)t + P_2(x)t^2 + \ldots..$
   (b) Using Jacobi series. Prove that $[J_0(x)]^2 + 2[J_1(x)]^2 + 2[J_2(x)]^2 + \ldots.. = 1$.

2. (a) Suppose $f(z) = u + iv$ is defined in some $n.b.d$ of z and first order partial derivatives $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial y}, \frac{\partial v}{\partial x}, \frac{\partial v}{\partial y}$ are continuous at z and satisfy C-R equations that is $u_x = v_y$ and $u_y = -v_x$ then show that $f^1(z)$ exists.
   (b) Show that $f(x,y) = x^3y - xy^3 + xy + x + y$ can be the imaginary part of an analytic function $z = x + iy$.

3. (a) Find all the roots of the equation (1) $\tan h\, z + 2 = 0$ (2) $\sin hz = i$.
   (b) If $\tan(\log(x + iy)) = a + ib$, then show that $\frac{2a}{1-a^2-b^2} = \tan(\log(x^2 + y^2))$.

4. (a) Prove that if $f(z)$ is analytic and $f^1(z)$ is continuous inside and on a simple closed curve C then $\int_C f(z)dz = 0$.
   (b) $\frac{1}{2\pi i}\int_C \frac{e^{3t}}{(z^2+1)^2} dz$ where t>0 and C is the circle $|z| = 3$.

5. (a) Find the Taylor's series for $f(z) = \log(1 + e^z)$.
   (b) Expand $f(z) = e^{2z}/(z-1)^2$ about $z = 1$ as a Laurent series. Also find the region of convergence.

6. (a) State and prove Cauchy's Residue Theorem.
   (b) Find the poles of the function $f(z) = z^2/(z^4 - 1)$ and the corresponding residues at each pole.
   (c) Find the residue at $z = 0$ for $f(z) = e^{-1/z} \sin 1/z$.

7. (a) If $f(z)$ is analytic and $|f(z)|$ is bounded for all z in the finite complex plane, then prove that $f(z)$ is a constant.
   (b) Show that the equation $z^4 + 4(1 + i)z + 1 = 0$ has one root in each quadrant.

8. (a) Find the image of the strip $a < y < b$ under the transformation $w = \cos z$.
   (b) Find the bilinear transformation which maps the points $(0,1,\infty)$ into points $(-1,-2,-i)$.

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Code: 9ABS302

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MATHEMATICS-III

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering and Electronics & Computer Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Prove that $\Gamma(1/n)\Gamma(2/n)\Gamma(3/n).\ldots\ldots\Gamma\left(\frac{n-1}{n}\right)=\frac{(2\pi)^{\frac{n-1}{2}}}{n^{1/2}}$.
   (b) Prove $P_n(x)=\frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2-1)^n$ satisfying the differential equation $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$.

2. (a) Find the analytic function $f(z)=u+iv$ if $u-v=e^x(\cos y-\sin y)$.
   (b) Prove that $u=e^{-x}[(x^2-y^2)\cos y+2xy\sin y]$ is harmonic and find the analytic function whose real part is u.

3. (a) If $\tan\left(\pi/6+i\alpha\right)=x+iy$ prove that $x^2+y^2+\frac{2x}{\sqrt{3}}=1$.
   (b) Find the real and imaginary parts of $\tan z$.

4. (a) Evaluate $\int_C (z^2+3z+2)dz$ where C is the arc of the cycloid $x=a(\theta+\sin\theta), y=a(1-\cos\theta)$ between the points (0,0) and $(\pi a, 2a)$.
   (b) State and prove Cauchy's theorem.

5. (a) If $f(z)$ is analytic in a ring R bounded by two concentric circles C_1 and C_2 of radii r_1 and r_2, $(r_1>r_2)$ with center at a then prove that for all z in R. $f(z)=a_0+a_1(z-a)+a_2(z-a)^2+\cdots+\frac{b_1}{(z-a)}+\frac{b_2}{(z-a)^2}+\cdots$ where $a_n=\frac{1}{2\pi i}\int_{c_1}\frac{f(w)dw}{(w-a)^{n+1}}$ and $b_n=\frac{1}{2\pi i}\int_{c_2}\frac{f(w)dw}{(w-a)^{-n+1}}$ where C^1 is any curve in R encircling C_2.
   (b) Obtain the Taylor's series expansion of $f(z)=\frac{e^z}{z(z+1)}$ about $z=2$.

6. (a) Use the method of contour integration to prove that $\int_0^{2\pi}\frac{d\theta}{(1+a^2-2a\cos\theta)}=\frac{2\pi}{1-a^2}(0<a<1)$.
   (b) Evaluate $\int_0^{2\pi}\frac{d\theta}{(5-3\cos\theta)^2}$

7. (a) Show that the polynomial z^5+z^3+2z+3 has just one zero in the first quadrant of the complex plane.
   (b) State and prove fundamental theorem of algebra.

8. (a) Find the image of the infinite strip bounded by $x=0$ and $x=\pi/4$ under the transformation $\cos z$.
   (b) Show that the transformation $w=z+1/z$ maps the circle $|z|=C$ into the ellipse $a=(c+1/c)$, $b=(c-1/c)$ where a and b are semi major and minor axes. Also discuss the case when $C=1$.

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Code: 9ABS302

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MATHEMATICS-III

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering and Electronics & Computer Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. (a) Evaluate $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^5}}$ in terms of β −function.
   (b) Prove that $\int_0^\infty \sqrt{x} e^{-x^2} dx = 2\int_0^\infty x^2 e^{-x^4} dx$ using $\beta - \Gamma$ functions.
   (c) Prove that $P_n(0) = 0$ for n odd and $P_n(0) = (-1)^{n\backslash 2}.n!/2^n \left(\frac{n!}{2}\right)^2$ if n is even.

2. (a) Show that $f(z) = xy^z \frac{(x+iy)}{x^2+y^4}$ for $z \neq 0$ and $f(x) = 0$ for $z = 0$ is not analytic at $z = 0$, although C-R equation are satisfied at the origin.
   (b) if $f(z)$ is an analytic function such that $u - v = \frac{e^y - \cos x + \sin x}{\cosh y - \cos x}$, find $f(z)$ if $\left(\pi/2\right) = \frac{3-i}{2}$.

3. (a) If $\sin(A+iB) = x+iy$ then prove that (1) $\frac{x^2}{\cos h^2 B} + \frac{y^2}{\sin h^2 B} = 1$ and (2) $\frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$.
   (b) Separate the real and imaginary parts of cosechz and sechz.

4. (a) If $f(z)$ is analytic within and on a simple closed C and a is any point inside C, then show that $f(a) = \frac{1}{2\pi i}\int_c \frac{f(z)dz}{(z-a)}$.
   (b) Evaluate $\int_c \frac{e^z dz}{(z^2+\pi^2)^2}$ where C is $|z| = 4$.

5. (a) Obtain the Taylor's series expansion of If $f(z) = \frac{e^z}{z(z+1)}$ about $z = 2$.
   (b) Prove that $\sin z^2 = z^2 + z^6/3! + z^{10}/5! - z^{14}/7! + \cdots, |z| < \infty$.

6. (a) Find the residues of $z^2/(z^4+1)$ at those poles which lie inside the circle $|z| = 2$.
   (b) Find the residue of $\sec^2 z$ at $z = \pi/2$.
   (c) Show that $\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta} = 2\pi/\sqrt{a^2-b^2}, a > b > 0$ using residue theorem.

7. (a) Show that every polynomial of degree n in the complex plane has n-zeros.
   (b) Prove that one root of the equation $z^4 + z^3 + 1 = 0$ lies in the first quadrant.

8. (a) In the transformation $W = \frac{i(1-z)}{1+z}$, show that the interior of the circle $|z| = 1$ is presented in the w-plane by the plane above the real axis, the upper semicircle into positive half of real axis and lower semicircle into negative half of the real axis.
   (b) Show that the transformation $W = \frac{5-4z}{4z-2}$ transforms the circle $|z| = 1$ into a circle of radius unity in w-plane and find the centre of the circle.

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Code: 9ABS303

1

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ENVIRONMENTAL SCIENCE

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering and Computer Science & Systems Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Discuss the impact of human beings on Environment.
   (b) Discuss the impact of Environment on human beings.

2. (a) Write the uses of atleast ten minerals and exploitation concerns of minerals.
   (b) Briefly discuss the effects of modern agricultural practices on Environment.

3. (a) What are ecological pyramids? And also describe various types?
   (b) State the chief features, of desert ecosystem. And describe their structure and function?

4. (a) What do you understand by 'conservation of biodiversity'? State and explain the two basic approaches for wildlife conservation.
   (b) Comment on biosphere reserves of India?

5. Write short notes on:
   (i) Bhopal gas disaster, 1984.
   (ii) Electrostatic precipitator.
   (iii) Radioactive waste.

6. (a) Briefly discuss the objectives of Resettlement and Rehabilitation policy.
   (b) What is rain water harvesting? Name and discuss in brief the types of rainwater harvesting.

7. What are the basic modes of transmission of HIV? Enumerate the symptoms methods to control, two tests for diagonosis of AIDS.

8. Give a detailed report on the study of a polluted site in urban and agriculture area.

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Code: 9ABS303

2

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ENVIRONMENTAL SCIENCE

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering and Computer Science & Systems Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1. (a) Human have a special environmental responsibility to themselves and to other fellow living beings. Discuss.
   (b) Write an explanatory note on the multidisciplinary nature of environmental science.

2. (a) Briefly discuss the causes of deforesation and ill-effects of deforestation on the quality of life on tribal people.
   (b) Discuss the environment effects of extracting and using minerals resources.

3. (a) Define food chain. Name and explain various types of food chains with examples.
   (b) Describe the characteristic features, structure and function of the grassland ecosystem.

4. Write short notes on:
   (i) Endangered species of India.
   (ii) Threatened species of the world.
   (iii) Endemic species of India.

5. What is solid waste? What are the causes, effects and disposal mechanism of solid waste pollution?

6. Discuss briefly the salient features of the water (prevention and control of pollution)Act 1984.

7. Briefly describe the various schemes launched for women and child welfare in India?

8. Write a report on studies on designing products with waste materials.

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Code: 9ABS303

3

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ENVIRONMENTAL SCIENCE

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering and Computer Science & Systems Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. Write an explanatory note on the three segment of the Environment viz atmophere, hydrosphere and lithosphere.

2. Write short notes on:
   (i) Conflicts over water in national context.
   (ii) Solar cellor photo-voltaic cell.
   (iii) Nuclear energy.

3. Write an explanatory notes on:
   (i) Pond ecosystem.
   (ii) Food chain and food web.
   (iii) Energy flow in trophic level.

4. Discuss the value of biodiversity. And what do you understand by hotspots of biodiversity?

5. What is an earthquake? Enumerate its effects? What measures should be taken to mitigate this disaster?

6. What are wastelands? How they are classified? Name and discuss the various methods of wasteland reclamation.

7. Discuss the variation of population among nations. Also state the factors encouraging and discouraging settlements.

8. Give a detailed report on documenting Environmental resources like river, forest, mountain in a specific area you have visited.

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Code: 9ABS303

4

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ENVIRONMENTAL SCIENCE

(Common to Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering and Computer Science & Systems Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. What is environmental? Enumerate and discuss the various segments of environment in detail.

2. (a) Discuss equitable use of resources for sustainable lifestyles.
   (b) Discuss the uses and effects of over utilization of surface and ground water resources.

3. (a) What is ecosystem? Give an account of structure and function of an ecosystem.
   (b) What is ecological succession? Give and account of general process of succession and types in nature.

4. (a) Discuss the concept of biodiversity at three hierarchical levels.
   (b) Explain In-Situ conversation along with their merits and lilmiations.

5. Name and discuss the various causes , effects of water pollution. Suggest the various control measures to curb water pollution.

6. Discuss the phenomenon of global warming, along with its effects and control measures.

7. Write short notes on:
   (i) Concept of value education.
   (ii) Population explosion.
   (iii) Role of IT in environment.

8. Give a detailed report in study of building designed using the ideas of ecological architecture/green buildings.

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Code: 9A02305

1

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRICAL CIRCUITS

(Common to EEE, EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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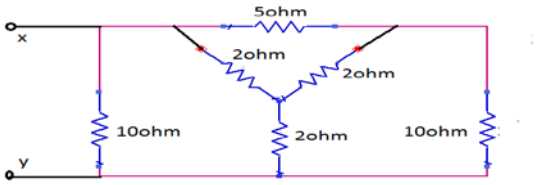
1 (a) What are the passive and active elements? Explain the volt-current relationship of passive elements with examples.

(b) Find the source current in figure below.



2 (a) The expressions for n resistances connected in parallel.

(b) A 20 V battery with an internal resistance of 5 ohms is connected to a resistor of x ohms. If an additional resistance of 6 ohms is connected across the battery, find the value of x so that the external power supplied by the battery remains the same.

3 (a) Show that current lags voltage in RL series circuit.

(b) A series circuit having pure resistance of 40 ohms, pure inductance of 50.07 mH and a capacitor is connected across a 400 V, 50 Hz ac supply. This RLC combination draws a current of 10 A. Calculate (i) Power factor of the circuit. (ii) Capacitor value.

4 (a) Derive the expression for figure of merit in terms of inductance and capacitance.

(b) A coil of inductance 0.1H and resistance 10 ohms is connected in series with a capacitor of 0.1 micro farads. Find frequency of resonance of the circuit, also find quality factor of the circuit at resonance.

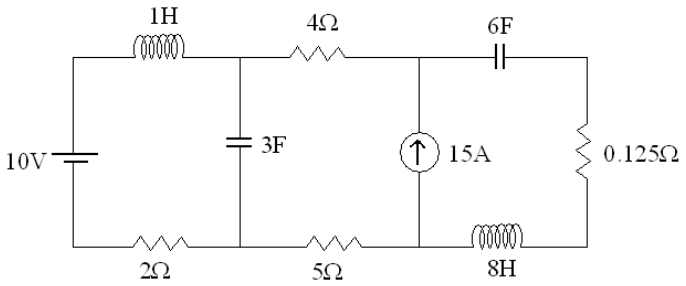
5 (a) Define: (i) Flux. (ii) mmf (iii) Reluctance. (iv) Magnetic field intensity.

(b) A coil is wound uniformly with 400 turns over an iron ring having a mean Circumference of 50 c.m and a cross section of 0.4 cm^2. If the coil has resistance of 10 Ω and is connected across a 50 V D.C supply, Calculate the mmf of the coil, magnetic field strength, magnetic field density, total flux and reluctance of the ring.

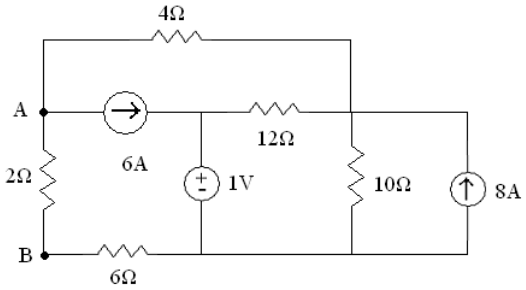
Contd. in Page 2

6 (a) Explain the procedure to draw a dual network.

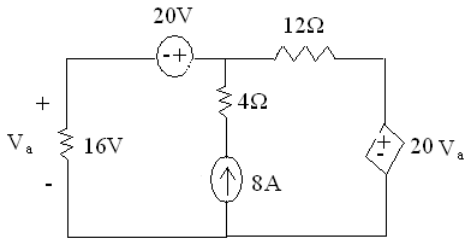
(b) Develop the fundamental tie-set matrix for the circuit shown.



7 Find the current through 2 Ω resistor using thevenins theorem.



8 Find the current through 12 Ω resistor using superposition theorem.



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Code: 9A02305

2

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRICAL CIRCUITS

(Common to EEE, EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

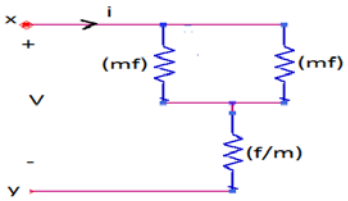
Answer any FIVE questions

All questions carry equal marks

*****

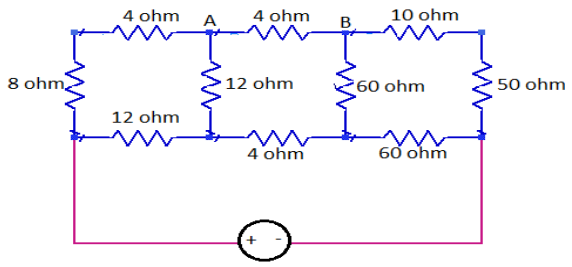
1 (a) Explain the difference between active elements and passive elements with suitable examples.

(b) Find the condition when the circuit current is maximum in figure below.



2 (a) Derive the expressions for n capacitors connected in series.

(b) Calculate the voltage across branch AB in circuit shown, by using loop analysis.



3 (a) Derive the basic equation of an alternating quantity. Hence state its various forms

(b) A 50 Hz sinusoidal voltage applied to a single phase circuit has its RMS value of 200 V its value at t = 0 is 28.3 volt positive. The current drawn by the circuit is 5A RMS and lags behind the voltage by one sixth of a cycle. Write the expressions for instantaneous values of voltage and current.

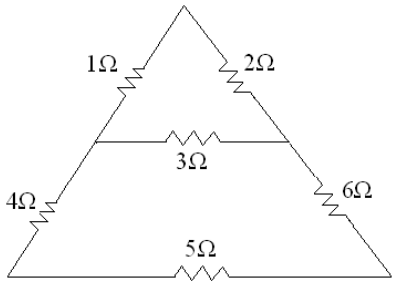
4 (a) Derive the expressions for selectivity and bandwidth of anti resonant circuit.

(b) A parallel circuit has a fixed capacitor and variable inductor having constant quality factor of 4. Find the value of inductance and capacitance for circuit impedance of 1000 ohms at resonating frequency 2.4 MHz What is the band width of the circuit?

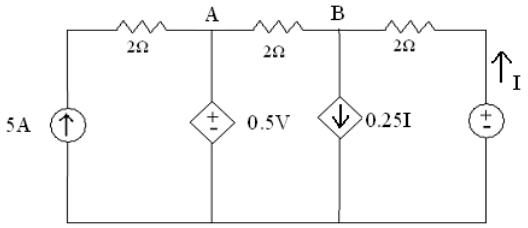
Contd. in page 2

5 (a) Explain ohms law for magnetic circuits.
(b) Explain Lenz's law.
(c) Two coils A&B are wound on same iron core and have 1000 turns on A and 3000 turns on B.A current of 8 A through A gives rise to 1.6 m wb flux in the core. If the current in the coils is reversed in 0.25 sec, find the average emf induced in A&B.

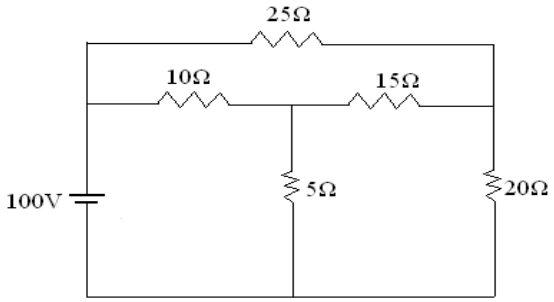
6 (a) Write the properties of tie-set matrix and cut-set matrix.
(b) For the network shown in figure, Obtain cut-set matrix.



7 In the circuit shown, find voltage across terminals A and B using Norton's theorem.



8 (a) State and explain reciprocity theorem.
(b) Verify Tellegen's theorem for the circuit shown in figure.



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Code: 9A02305

3

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRICAL CIRCUITS

(Common to EEE, EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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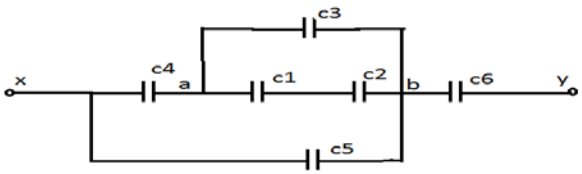
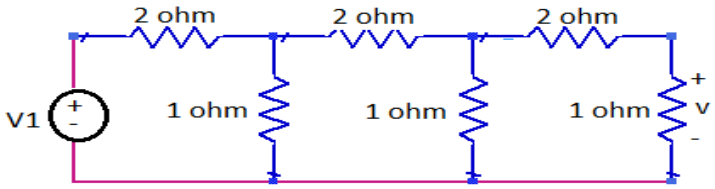
1 (a) Define the following: (i) Resistance. (ii) Inductance. (iii) Capacitance. Also give the V-I relationship For the above elements.

(b) Find the equivalent capacitance across x – y (M).



2 (a) Explain the voltage division in series circuit of the resistors.

(b) In the figure below, find Vs using Kirchoff's laws.



3 (a) Define the following terms: (i) Admittance. (ii) Conductance. (iii) Susceptence.

(b) In a particular circuit a voltage of 10 V at 25 Hz produces 100 mA while the same voltage at 75 Hz produces 60 mA draw the circuit diagram and insert the values of the constants. At what frequency will the value of impedance be twice as that 25 Hz.

4 (a) List the characteristics of RLC series resonant circuits?

(b) A coil with resistance of 10 ohm and inductance of 0.5 H is connected in parallel with a 400 micro Farads capacitor. Calculate the frequency at which the circuit will act as a non-inductive resistance. Find its value.

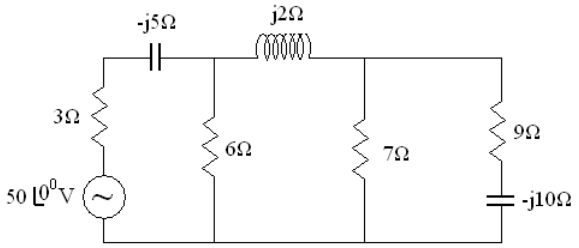
5 (a) Derive the expression for equivalent inductance of two coils connected in parallel opposing.

(b) Two coupled coils with respect to self inductances $L_1 = 0.6$ H, $L_2 = 0.4$ H having a k = 0.4.Coil 2 has 100 turns. The current in coil 1 is $I_1 = 10\sin 200t$ A. determine the voltage at coil 2 and maximum flux set up by coil 1.

Contd. in Page 2

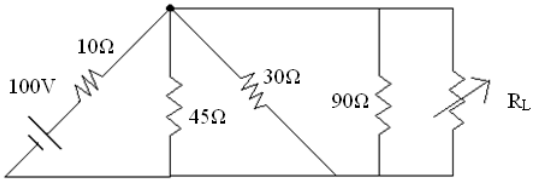
6 (a) Write the properties of tree with example.

(b) Determine power supplied by source using nodal analysis for the circuit shown.



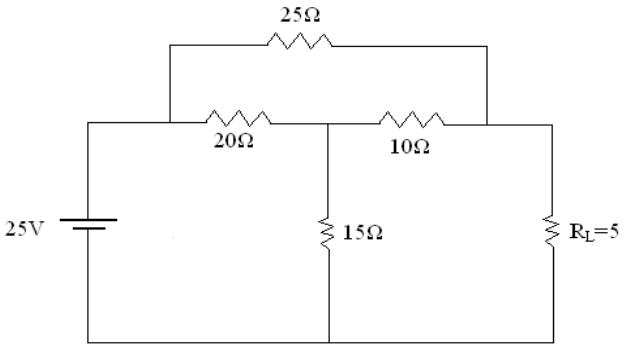
7 (a) State & explain Millman's theorem.

(b) For the circuit shown in fig: what will be the value of R_L to get the maximum power? What is the maximum power delivered to the load?



8 (a) Write limitations of reciprocity theorem.

(b) Calculate the change in current of the network given below using compensation theorem when the load resistor changes to 10 Ω.



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Code: 9A02305

4

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRICAL CIRCUITS

(Common to EEE, EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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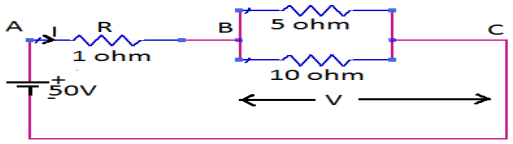
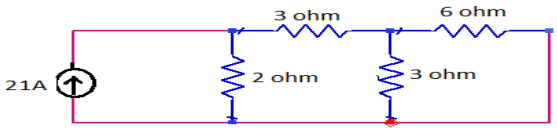
1 (a) Define ideal and practical voltage and current sources

(b) In the figure below find the value of R such that the power dissipated in the 5 ohm resistor is 100 W. Assume the internal resistance of the battery of 50 V to be 1 ohm.



2 (a) With three mesh general circuits explain the mesh analysis to find the loop currents.

(b) Determine the current through 6 ohm resistor and the power supplied by the current source for the circuit shown in the figure.



3 (a) Define and explain the following terms related to an alternating quantity:
(i) Instantaneous value. (ii) Time period. (iii) Frequency,
(iv) Amplitude. (v) Cycle. (vi) Angle of frequency.

(b) A 50 Hz sinusoidal current has peak factor 1.4 and form factor 1.1. Its average value is 20 A. The instantaneous value of current is 15 A at t = 0 sec. Write the equation of current and draw its wave form.

4 (a) Derive the expressions for bandwidth, resonant frequency, quality factor and half power frequency of RLC parallel circuits.

(b) A variable frequency constant voltage signal generator supplies a RLC circuit at sinusoidal mode. Find the frequency at which maximum voltage across the inductor should appear.

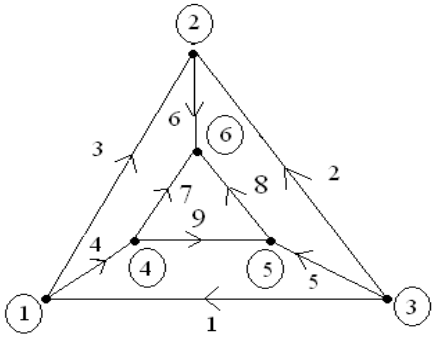
Contd. in Page 2

5 (a) Derive expression for coefficient of coupling.

(b) Explain statically induced emf and dynamically induced emf and also derive expression for self inductance and mutual inductance in terms of flux and current.

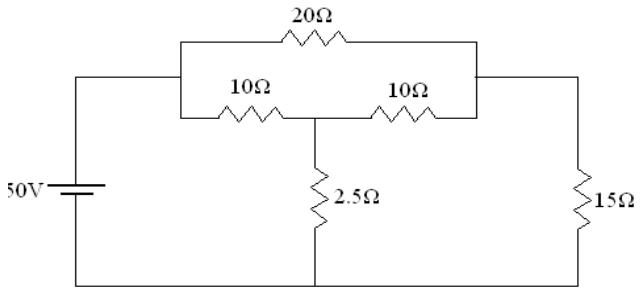
6 (a) Write the properties of a tree with an example.

(b) Write the cut set matrix for the graph shown below and also write the relation between branch voltages and tree branch voltages.



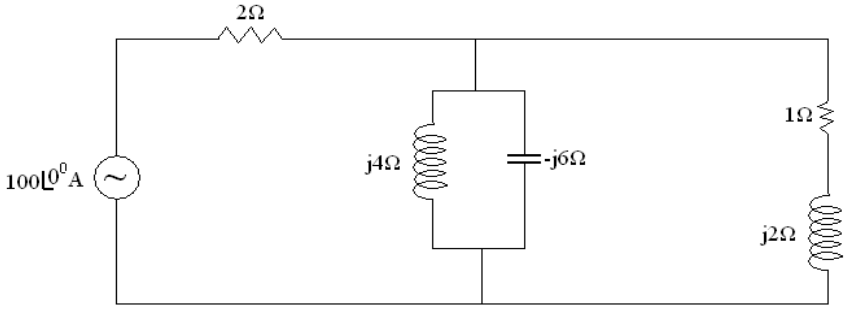
7 (a) State and explain Norton's theorem.

(b) Find Current through 15 Ω resistor using Thevenin's theorem.



8 (a) Write steps to apply Tellegen's theorem to the given network.

(b) Verify reciprocity theorem for the circuit shown below.



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1

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRONIC DEVICES & CIRCUITS

(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Write the diode equation and discuss the effect of temperature on diode current.

(b) Explain about avalanche and zener breakdown.

2 (a) For a full wave rectifier with shunt capacitance filter derive expression for ripple factor using approximate analysis.

(b) Why filter circuit is necessary with rectifiers. Give the list of different filters used in rectifier and their merits and demerits.

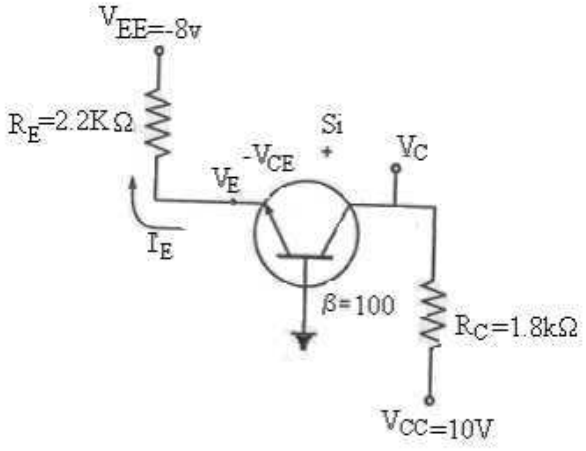
3 (a) Draw a diagram showing various currents in a PNP transistor in common collector mode.

(b) Explain the operation of a PNP bipolar junction transistor in CC configuration.

(c) Draw the common collector transistor characteristics.

4 (a) Explain in detail about thermal runaway and thermal resistance.

(b) For the circuit shown below, determine I_E, V_C and V_{CE} . Assume V_{BE} = 0.7 V



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5 (a) Explain the principle of MOSFET in depletion mode with neat sketches and o/p characteristics.

(b) Explain the different parameters of FET.

6 (a) JFET amplifier with voltage dividing biasing circuit has the following parameters. V_P = -2 V, I_{DS} = 4 mA, r_d = 910 Ω, R_S = 3 KΩ, R_1= 12 MΩ, R_2 = 8.57 MΩ, V_{DD} = 24 V. Find the value of drain current I_D at operating point.
Verify whether FET will operate in pinch-off region or not.

(b) How FET is used as a voltage variable resistor.

7 (a) A transistor with h_{ie} = 1.1 K, h_{fe} = 50, h_{re} = 2.5 X 10^{-4}, h_{oe} = 25 μA/V is connected in CE configuration as shown in figure 1. Calculate A_I, A_V, R_I, R_0.

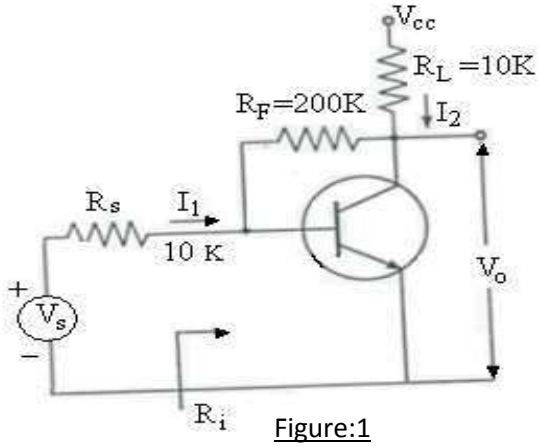

Figure:1

(b) Analyze a single stage transistor amplifier using h - parameters.

8 (a) Explain the working principle of an LED with its characteristics.

(b) What is a tunnel diode? Draw the V-I characteristics of such a diode and explain the occurrence of the negative differential resistance.

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Code: 9A04301

2

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRONIC DEVICES & CIRCUITS

(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Draw the energy band diagram of p-n diode for no bias, forward bias and reverse bias.

(b) What are general specifications of p-n junction diode?

2 (a) Draw the circuit diagram of full-wave rectifier with inductor filter.

(b) A full-wave rectified voltage of 18 V peak is applied across a 500 µF filter capacitor. Calculate the ripple and d.c. voltages if the load takes a current of 100 mA.

3 (a) Define α_{dc} and β_{dc} of a transistor.

(b) Explain the input and output characteristics of a transistor in CB configuration.

4 (a) Prove that stability factor $S^{11}= \dfrac{(I_C - I_{C01})S}{\beta(\beta+1))}$

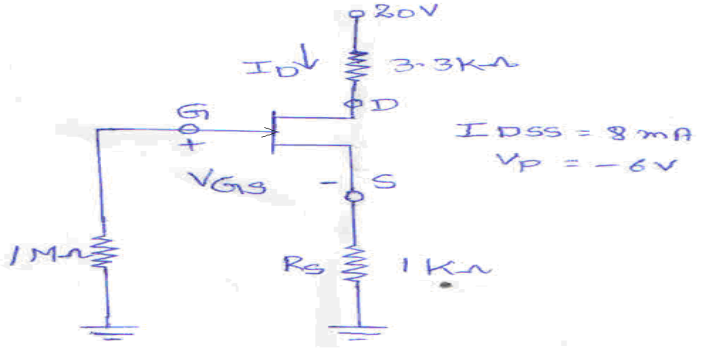
(b) Why biasing is necessary for a transistor circuit in a given configuration? Mention the three different types of biasing a Bipolar Junction Transistor.

5 (a) Why we call FET as a voltage controlled device?

(b) Draw the drain characteristics of depletion type MOSFET. Explain clearly different operating regions in characteristics with proper reasoning.

6 (a) Draw the small signal model of FET amplifier in CS connection and derive the equation for voltage gain, input impedance and output impedance.

(b) Determine the following for the circuit shown below: (i) V_{GSQ} (ii) I_{DQ} (iii) V_{DS} (iv) V_S



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7 (a) A transistor used in CE amplifier connection has the following set of h parameters, h_{ie} = 1KΩ, h_{fe} = 100, h_{re} = 5×10^{-4}, h_{oe} = $2\times10^{-5}\Omega^{-1}$, R_s = 15 KΩ, R_L= 5 KΩ. Determine input impedance, output impedance, current gain and voltage gain.

(b) Draw the hybrid parameter equivalent circuit for an n-p-n common emitter transistor and briefly explain.

8 (a) With a neat circuit diagram explain two transistor analogy of an SCR and explain its working with the help of V-I Characteristics.

(b) Describe the construction of a light-emitting diode and explain its operational mechanism.

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Code: 9A04301

3

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRONIC DEVICES & CIRCUITS

(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain about various current components in a forward biased p-n junction diode.

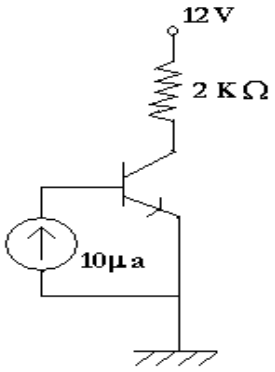
(b) Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at 25^0 C with I_0 = 25 μ*A* and at an applied voltage of 0.2 V across the diode.

2 (a) Discuss a full wave rectifier with π-filter.

(b) Compare the performance of L-section and π-filters.

3 (a) Discuss qualitatively the conditions of flow of currents through a NPN Transistor contributing to the fact that Emitter current is the sum of Collector and Base currents.

(b) A silicon transistor with V_{BE} = 0.7 V, α = 0.98 and collector cut-off current of 10 μA is connected as shown below. Find (i) β *and* I_{CO} (ii) I_C and I_E



4 (a) Draw a BJT fixed bias circuit and derive the expression for the stability factor 'S'.

(b) An NPN transistor with β = 50 is used in a common emitter circuit with V_{CC} = 10 V, R_C = 2 KΩ. The bias is obtained by connecting a 100 KΩ resistance from collector to base. Assume V_{BE} = 0.7 V. Find (i) the quiescent point and (ii) the stability factor, S

Contd. in Page 2

5 (a) What are the differences between BJT and FET?
(b) Draw the small signal model of common source MOSFET amplifier and define all parameters.

6 (a) Draw two biasing circuits for an enhancement type MOSFET and explain.
(b) Calculate the value of R_S required to self bias an n-channel JFET with I_{DSS} = 40 mA, V_P = -10 V, V_{GSQ} = -5 V.

7 (a) The figure 2 shows a CE amplifier with collector to base bias. Calculate A_I , A_V , R_I . The transistor parameters are h_{ie} = 1.1 K, h_{fe} = 50, h_{oe} = 25 x 10^{-6} A/V, h_{re} = 2.5 x 10^{-4}.

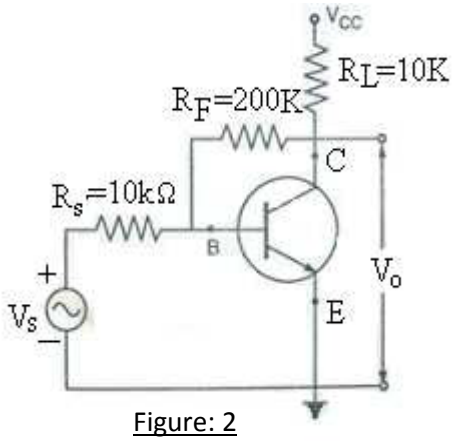


Figure: 2

(b) Draw the circuit diagram of CE amplifier with emitter resistance and obtain its equivalent hybrid model and derive expressions for A_I, R_I, and A_V. Use approximate analysis.

8 (a) Explain the V-I characteristics and the features of Tunnel diode.
(b) If V*E*<V*P* and V*E*>V*P*, explain how UJT works for these conditions.

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Code: 9A04301

4

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

ELECTRONIC DEVICES & CIRCUITS

(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain about Forward bias and Reverse bias in the case of a p-n junction diode.

(b) Draw the band diagram of PN junction under open circuit conditions and explain.

2 (a) Calculate the value of capacitance to use in a capacitor filter connected to a full wave rectifier operating at a standard aircraft power frequency of 400 Hz, if the ripple factor is 10% for a load of 500 Ω.

(b) Explain the working of the Half wave rectifier circuit using signal waveforms at various points in the circuit.

3 (a) Explain the input and output characteristics of a transistor in CB configuration.

(b) Calculate the collector current and emitter current for a transistor with α_{dc} = 0.99 and I_{CBO} = 50 μA when the base current is 20 μA.

4 (a) Explain the criteria for fixing operating point.

(b) List out the different types of biasing methods.

5 (a) Discuss FET small signal low frequency model.

(b) Sketch the cross section of an NMOS enhancement transistor and briefly explain.

6 (a) Draw the circuit diagram of common source JFET amplifier and derive the expressions for input resistance and output resistance.

(b) How should the gate-source junction of a JFET be biased? Explain how the potential applied to this junction controls the drain current.

7 (a) Derive the input impedance, output impedance, voltage gain, current gain in CC configuration using approximate model.

(b) A CE amplifier is drawn by a voltage source of internal resistance r_s = 1000 Ω. The h-parameters are h_{ie} = 1 KΩ, h_{re} = 2 x 10^{-4} , h_{fe} = 50, h_{oe} = 25 μA/V. Calculate the current gain, voltage gain and output resistance using exact analysis.

8 (a) Draw the two transistor version of an SCR and explain its firing characteristics with this circuit.

(b) Write a brief note on light dependent resistor.

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Code: 9A04303

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to Electronics & Instrumentation Engineering, Electronics & Control Engineering, and Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain the following: (i) Random experiment (ii) Trial (iii) Event (iv) sample space.
   (b) Find the probability of obtaining 14 with 3 dice using Baye's theorem.

2. (a) Explain with an example discrete, continuous and mixed random variables.
   (b) Explain CDF with its properties.

3. What is a characteristic function? Explain its properties with its proofs.

4. (a) State and explain 'Central Limit Theorem'.
   (b) The joint pdf of two random variable 'X' and 'Y' is given by
   $f_{XY}(x,y) = \begin{cases} K, & (x^2+2y); \\ 0 & \text{otherwise} \end{cases}$ $x = 0,1,2, y = 1,2,3,4$
   Find (i) The 'K' value (ii) $P(X=1, Y=2)$ (iii) $P(X \le 1, Y \ge 3)$. (iv) $f_X(x)$& $f_Y(y)$ (v) $f_{Y/X}(y/1)$ & $f_{X/Y}(x/2)$.

5. (a) Explain about joint moments about the origin with an example.
   (b) 'X' is a random variable with mean '4' and variance '3'. Another random variable 'Y' is related to 'X' as Y=2X+7. Determine (i) $E[X^2]$ (ii) $E[Y]$ (iii) var $[Y]$ (iv) R_{XY}

6. (a) Differentiate WSS & SSS.
   (b) Prove the following: (i) $|R_{XX}(\tau)| \le R_{XX}(0)$.(ii) $R_{XX}(-\tau) = R_{XX}(\tau)$. (iii) $R_{XX}(0) = E[X^2(t)]$.

7. (a) What is meant by co-variance and explain its properties.
   (b) A random process $X(t) = A\cos\omega_0 t + B\sin\omega_0 t$, where ω_0 is constant and A & B are random variables. If A and B are uncorrelated zero mean having same variance σ^2 but different density functions then show that $X(t)$ is a wide sense stationary.

8. (a) Give the relation between cross power spectrum and cross correlation function.
   (b) A random process has a power spectrum
   $$S_{XX}(\omega) = \begin{cases} 4 - \left(\frac{\omega^2}{9}\right), & |\omega| \le 6 \\ 0 & \text{elsewhere} \end{cases}$$
   Find (i) . Average power (ii) RMS bandwidth.

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Code: 9A04303

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to Electronics & Instrumentation Engineering, Electronics & Control Engineering, and Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. (a) Explain the following: (i) Principles of counting (ii) probability as a relative frequency.
   (b) How many positive integers less than 1000 have no common factor with 1000?

2. (a) Define a random variables and give the conditions for a function to be a random variable.
   (b) Explain about normal distribution with its properties.

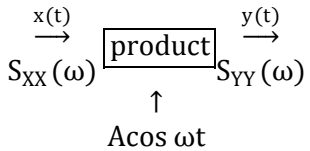
3. Find the mean and variance of Binomial Distribution and Poisson Distribution.

4. (a) Explain about joint density function with its properties.
   (b) The joint density function of two random variables 'X' ad 'Y' is given by $f_{XY}(x,y) = \frac{1}{\pi\sqrt{3}} e^{\frac{-2}{3}(x^2 - xy + y^2)}$. Determine the marginal probability density function $f_X(x)$ and $f_Y(y)$.

5. (a) Explain about jointly Gaussian Random variables.
   (b) A random variable 'Z' has pdf $f_Z(z) = ae^{-a(z-b)}u(z-b)$. Show that the characteristic function of z is $\emptyset_z(\omega) = \frac{a}{a-jw} e^{-jwb}$ has the probability function $P(x) = {}^{1}/_{3^{2x}}$, $x = 1,2,3 - - - N$.

6. (a) What is random process and classify it and explain.
   (b) A stationary continuous random process 'X' is differentiable and $\dot{X}(t)$ is its derivates. Show that $E[\dot{X}(t)] = 0$

7. (a) A WSS noise process N(t) has ACF $R_{NN}(\tau) = Pe^{-3|\tau|}$. Find PSD and plot both ACF and PSD.
   (b) If X(t) is WSS, find $R_{YY}(\tau)$ and hence $S_{YY}(\omega)$ in terms of $S_{XX}(\omega)$ for the product device shown in below fig.



8. If a random process $X(t) = A_0(\cos\omega_0 t + \theta)$, where A_0 & ω_0 are constants and 'θ' is a uniformly distributed random variable in the interval $(0, \pi)$ Find
   (i) Whether $X(t)$ is WSS process?
   (ii) Power in $X(t)$ by time averaging of its second moment.
   (iii) The power spectral density of$X(t)$.

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Code: 9A04303

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to Electronics & Instrumentation Engineering, Electronics & Control Engineering, and Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. (a) Explain the following: (i) probability (ii) Axioms.
   (b) From the urn containing 'n' balls any numbers of balls are drawn. Show that the probability of drawing an even number of ball is $(2^{n-1} - 1)/(2^n - 1)$

2. (a) Differentiate pmf and pdf.
   (b) Show that $f_X(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{(x-\mu)^2}{2\sigma^2}}, -\alpha_0 < x < \alpha_0, \sigma > 0$ is a distribution function.

3. (a) The pdf of the random variable 'X' follows
   $$f_X(x) = \frac{1}{2\theta} e^{\frac{-|x-\theta|}{\theta}}, -\alpha_0 < x < \alpha_0$$
   Find m.g.f . Hence or otherwise find $E(X)$ and $\mathrm{var}(X)$.

4. Joint pdf $f_{XY}(x, y)$ of two continuous random variables $'X'$ and $'Y'$ is given by
   $$f_{XY}(x, y) = \begin{cases} K, e^{-(2x+y)} & \text{for } x, y \geq 0; \\ 0 & \text{otherwise} \end{cases}$$
   Where K is constant. (i) find K value and $f_X(x)$ and $f_Y(y)$. (ii) Are $'X'$ and $'Y'$ are statistically independent? (iii) Determine joint CDF and marginal distribution function. (iv) Determine the conditional density functions.

5. (a) Explain about joint central moments with an example.
   (b) A random variable $'Z'$ with pdf $f_Z(z) = \frac{1}{2}; -1 \leq Z \leq 1$. Another random variable random variables (RV)s $'X' = Z$ and $'Y' = Z^2$. Show that $'X'$ and $'Y'$ are uncorrelated.

6. (a) What is meant by stochastic process and classify with an example to each.
   (b) Check the following for WSS. (i) $R_{XX}(t, t+\tau) = \cos t\, e^{-|t+\tau|}$) (ii) $R_{XX}(t, t+\tau) = \sin 2\tau/(1+\tau^2)$ (iii) $R_{XX}(t, t+\tau) = -10^{-|\tau|}$ (iv) $R_X(t, t+\tau) = 5e^{-|\tau|}$

7. (a) Explain in detail the cross power spectral density.
   (b) If $X(t)$ and $Y(t)$ are random processes. Prove that
   (i). $S_{XY}(\omega) = S_{YX}(-\omega) = S^*_{YX}(\omega)$ (ii) $S_{XY}(\omega) = S_{YX}(\omega)$ if $X(t)$ & $Y(t)$ are uncorrelated WSS random processes.

8. (a) Give the relation between power spectrum and auto correlation function.
   (b) Find the cross correlation function corresponding to the cross power spectrum
   $$S_{XY} = 6/[(9+\omega^2)(3+j\omega)^2]$$

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Code: 9A04303

4

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to Electronics & Instrumentation Engineering, Electronics & Control Engineering, and Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1. (a) State the Baye's theorem and prove it.
   (b) There are 300 students in a class room. It is known that 180 can program 'JAVA', 120 in 'C++' 30 in 'SQL', 12 in 'JAVA' and 'SQL', 18 in 'C++' and 'SQL', 12 in JAVA and 'C++' and 6 in all three languages. (i) A student is selected at random. What is the probability that she can program in exactly two languages. (ii) Two students are selected at random. What is the probability that they can (a) Both program in 'JAVA' (b) Both program only in 'JAVA'.

2. (a) Explain about pdf.
   (b) The diameter of a cable $'X'$ is taken to be a random variable with pdf $f_X(x) = 6x(1-x), 0 \le x \le 1$ (i) verify $f_X(x)$ is a pdf or not.(ii) Determine $'b'$ such that $P(x < b) = P(x > b)$.

3. (a) Define and explain moments of a random variable.
   (b) Find the moment generating function of a random variable.

4. (a) Find the density of W=X+Y , where the densities of 'X' and 'Y' to be $f_X(x) = u(x) - u(x-1)$ & $f_Y(y) = u(y) - u(y-1)$.
   (b) Explain the following (i) Joint distribution function. (ii) conditional distribution function (iii) Marginal distribution function.

5. (a) Show that the variance of variance of a weighted sum of uncorrelated random variables equals the weighted sum of t he variances of the random variables.
   (b) Explain about transformation of multiple random variables.

6. Explain about the concept stationarity in detail connected with stochastic processes.

7. (a) Explain about WSS and prove any two properties of it.
   (b) $Y(t) = X(t)\cos(\omega_0 t + \theta)$, where $X(t)$ is a random process and $'\theta'$ is uniformly distributed over the interval $(0,2\pi)$. Determine under what conditions is $Y(t)$ wide seuce stationary. Assume $'\theta'$ and $'X(t)$ are statistically independent and ω_0 is constant.

8. (a) Write different types of band pass processes with band limited processes.
   (b) Find the rms band width of the power spectrum

$$S_{XX}(\omega) = \begin{cases} A\cos\left(\frac{\pi\omega}{2W}\right), & |\omega| \le W \\ 0, & |\omega| \le W \end{cases}$$

Where $\omega > 0$ & $W > 0$ are constants?

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Code: 9A04304

1

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

SIGNALS AND SYSTEMS

(Common to EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Prove that sinusoidal functions are orthogonal functions.

(b) Write short notes on orthogonal functions?

2 (a) Obtain the Fourier components of the periodic rectangular waveform shown below in the figure-9.

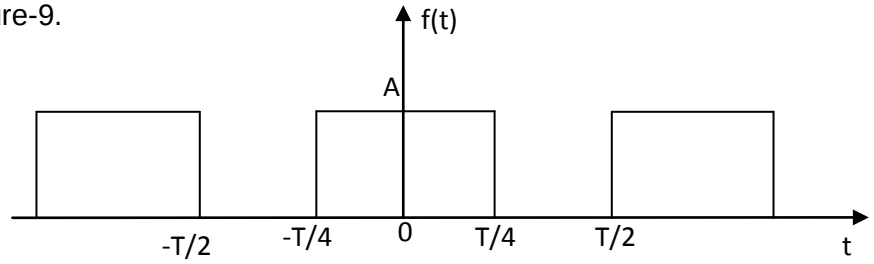

Figure (9)

(b) Write a short note on Dirichlets' conditions.

3 (a) The Fourier transform of m(t) is $F\{m(t)\} = M(f)$. Show that

$$F[m(t)\cos 2\pi f_c t] = \frac{1}{2}[M(f + f_c) + M(f - f_c)]$$

(b) State and prove Parseval's power theorem

4 (a) Explain causality and physical reliability of a system and hence give poly-wiener criterion.

(b) Obtain the relationship between the bandwidth and rise time of ideal low pass filter.

5 (a) State and prove sampling theorem for band limited signals using graphical approach

(b) Determine the minimum sampling rate and Nyquist interval of *Sin (200πt) + Sin (100πt)*.

6 (a) Explain briefly detection of periodic signals in the presence of noise by correlation.

(b) Explain briefly extraction of a signal from noise by filtering.

7 (a) Determine the Laplace transform and the associate region convergence for each of the following functions: (i) x(t) = 1; 0 ≤ t ≤ 1 (ii) x(t) = t for 0 ≤ t ≤ 1 and x(t)=2–t for 1 ≤ t ≤ 2.

(b) State and prove initial value theorem of Laplace transform.

8 (a) What are the constraints on ROC for various classes of signals in z-transform?

(b) Find the z-transform of the sinusoidal signal $x[n] = Sin[bn]u[n]$.

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Code: 9A04304

2

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

SIGNALS AND SYSTEMS

(Common to EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Prove that the complex exponential functions are orthogonal functions.

(b) Sketch the following signal: 3u (t) + tu (t) - u(t–1) + u(t+1) - 5u (t–2).

2 (a) Discuss the concept of exponential Fourier series and derive the expressions for coefficient.

(b) Explain about Dirichlet's conditions.

3 (a) Find the F.T of d.c and unit step signals.

(b) Find the Fourier transform of $f(t) = \frac{1}{T}[1 - \frac{|t|}{T}]$ for $|t|<T$ and $f(t)=0$; otherwise.

4 (a) Determine the impulse response of the system defined by the difference equation:

$$y(n) + y(n-1) - 2y(n-2) = x(n-1) + 2x(n-2)$$

(b) What are the conditions for distortion less transmission from through a system?

5 (a) Distinguish natural and flat top samplings.

(b) Explain the effect of under sampling.

(c) Determine the minimum sampling rate and Nyquist interval of *Sin (100t)+Sin(1000t)*.

6 (a) State and prove Parseval's power theorem.

(b) Compute the signal energy for $x(t) = e^{-4t}u(t)$

7 (a) State and prove the properties of Laplace transforms.

(b) Derive the relation between Laplace transform and Fourier transform of signal.

8 (a) Given $H(z) = \frac{z^2}{(z - 0.5 - j0.5)(z - 0.5 + j0.5)}$. Find *h[n]*.

(b) Derive the time domain condition for the stability of LSI discrete time system.

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Code: 9A04304

3

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

SIGNALS AND SYSTEMS

(Common to EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Derive the expression for mean square error when functions are approximated in set of mutually orthogonal functions.

(b) Discuss the reasons for preference of mean square error over mean error.

(c) Discuss the concept of impulse function.

2 (a) State the properties of complex Fourier series.

(b) Determine the Fourier series of the function shown in figure-15.

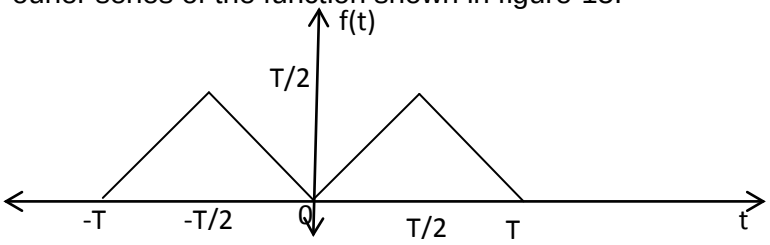

Figure (15)

3 (a) State and prove time convolution and time differentiation properties of Fourier transform.

(b) Find the Fourier transform of a gate pulse of unit height, unit width and centered at t = 0.

4 (a) Sketch and explain characteristics of an ideal low pass, high pass and band pass filters.

(b) Draw a circuit diagram of a physically realizable LPF. Sketch its impulse response.

5 (a) What is sampling? Explain the need for sampling and clearly discuss the process of sampling low pass signals and derive conditions for optimum reconstruction of signal.

(b) Distinguish between natural and flat-top sampling.

6 (a) State and prove any two properties of ACF.

(b) Derive the relation between PSDs of input and output for an LTI system.

7 (a) Invert the following Laplace transform and compute its initial and final values, if possible:

$$X(s)=\frac{s^3+3s^2+3s+1}{(s^4+4s^3+6s^2+4s+1)}.$$

(b) Find the frequency response of $X(s)=\frac{(s+2)}{(s+1)(s+5)}$ and plot its spectrum.

8 (a) Explain the properties of the region of convergence of X (z).

(b) Discuss in detail about the double sided and single sided Z- transform. Correlate Laplace transform and Z-transform in their end use.

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Code: 9A04304

4

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

SIGNALS AND SYSTEMS

(Common to EIE, E.Con.E, ECE and ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define and discuss the conditions for orthogonlity of functions.

(b) Define and sketch the:
(i) Impulse function. (ii) Unit Step function. (iii) Ramp function. (iv) Signum function.

2 (a) Discuss the concept of trigonometric Fourier series and derive the expressions for coefficients.

(b) Explain how exponential Fourier series can be extended for periodic functions.

3 (a) Obtain the Fourier transform of the following functions:
(i) Impulse function δ(t) (ii) DC signal (iii) Unit step function

(b) State and prove time differentiation property of Fourier transform.

4 (a) Explain the characteristics of an ideal LPF. Explain why it can't be realized.

(b) Differentiate between causal and non-causal systems.

5 (a) State and prove sampling theorem in case of low pass signals.

(b) If a signal is naturally sampled with a sample width *z* and with frequency w_S rad/sec. Obtain the expression for bandwidth.

6 (a) State and prove Rayleigh's energy theorem.

(b) Find the total energy of the Sinc pulse $ASinc(2w_c t)$.

7 (a) Find the Laplace transform of $[4e^{-2t}Cos5t - 3e^{-2t}Sin5t]\,u(t)$ and its ROC.

(b) Find the signal x(t) that corresponds to the Laplace transform $X(s) = \dfrac{3s^2 + 22s + 27}{(s^2 + 3s + 2)(s^2 + 2s + 5)}$.

8 (a) Find the z-transform the sequence $x[n] = \dfrac{1}{n}(-2)^{-n}u[-n-1]$.

(b) Find the inverse z-transform of $X(z) = \dfrac{z^4 + z^2}{(z - \frac{1}{2})(z - \frac{1}{4})}$, $ROC : |z| > \frac{1}{2}$.

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