Code 9A04304 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
SIGNALS & SYSTEMS
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Verify the following signals sin $m\omega_0 t$ and sin $m\omega_0 t$ are orthogonal or not over the interval$(t_0, t_0 + 2/w_0$)
   (b) Approximate the function described below by a wave form sin t over the interval (0,2). The function is f(t)=1 0<t<
   =-1 <t<2
   Also sketch the original function and approximated 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) Find the Fourier transform of symmetrical gate pulse and sketch the Spectrum.
   (b) State and prove following properties of Fourier transform
      i. Time shifting
      ii. Differentiation time domain
4. (a) Define transfer function
   (b) Justify why ideal LPF cannot be realized.
   (c) Find signal band width of
      i. sin 100t +sin 1000t
      ii. Triangular Pulse
5. (a) State and prove frequency Convolution property of Fourier transform.
   (b) Find the correlation of symmetrical gate pulse with amplitude and time duration '1' with itself.
   (c) Evaluate u(t)*u(t).
6. (a) State and prove sampling theorem for band limited signals using graphical approach
   (b) Determine the minimum sampling rate and Nyquist interval of $\sin(200\pi t) + \sin(100\pi t)$
7. (a) Find Laplace transforms and sketch their ROC of
   (b) x (t)=u(t-3)
   (c) $x(t) = e^{j5t}u(t)$
   (d) Find the inverse Laplace transform of X(s) =(-5s-7)/(s+1)(s-1)(s+2)
8. (a) Find z-transform, ROC and pole-zero locations of x(n)=□^{n}u(n)
   (b) State and prove differentiation in z-domain property
   (c) Find the inverse z-transform of $X(z) = [1/(1 - 0.2z^{-1})] + [2/(1 - z^{-1})]$ Assuming signal is causal

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Code 9A04304 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
SIGNALS & SYSTEMS
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Define and Sketch the
   (b) Impulse function
   (c) Unit step function
   (d) Ramp function
   (e) Signum function
   (f) Approximate the function described below by a wave form sin rt, where 'r' value with in sin rt is '3' over the interval(0,2). The function is
   $f(t) = 1 \quad 0 < t <$
   $= -1 \quad < t < 2$
   Also sketch the original function and approximated function.
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 Fourier transform of symmetrical triangular pulse and sketch the Spectrum.
   (b) State and prove symmetry property of Fourier transform.
4. (a) Discuss the conditions required for distortion less transmission.
   (b) Find the relation ship between input and output of LTI system in time Domain.
5. (a) State and prove properties of Auto-Correlation.
   (b) Prove the following
   (c) $\delta(t-1) * \delta(t-3) = \delta(t-4)$
   (d) $f(t) * \delta(t) = f(t)$
   (e) $\delta(t-t1) * f(t-t_2) = f(t-t_1-t_2)$
6. (a) State and prove sampling theorem for band limited signals using analytical approach
   (b) Give introduction to band pass sampling.
7. (a) Find the Laplace transform of $x(t) = e^{-t}(t-3)u(t-3)$
   (b) Find the initial and final values of signal X(t) whose Laplace transform is $X(s) = (7s+10)/[s(s+2)]$
   (c) Find inverse of following Laplace transform$X(s) = (1/(s+1)) - (2/(s-1))$ If ROC is -1<Re(s)<1
8. (a) Find z-transform, ROC and pole-zero locations of x(n)=-□^{n}u(-n-1)
   (b) State and prove z-transform time convolution property.
   (c) Find the inverse z-transform of$X(z) = (1/1+z) + (2z/z-0.2)$

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Code 9A04304 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
SIGNALS & SYSTEMS
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Verify the following signlas cos n$\omega_0 t$ and cos m$\omega_0 t$ are orthogonal or not over the interval$(t_0, t_0 + 2/\omega_0)$
   (b) Discuss the reasons for preference of mean square error over mean error.
   (c) Discuss the concept of Impulse function.
2. (a) Expand following function f(t) by trigonometric Fourier series over the interval(0,1). In this interval f(t) is expressed as F(t)=At
   (b) Prove that discrete magnitude spectrum is symmetrical about vertical axis whereas phase spectrum anti-symmetrical about vertical axis.
3. (a) Find Fourier transform of signum function
   (b) State and prove following properties of Fourier transform
      i. Frequency shifting
      ii. Scaling
4. (a) Derive the relationship between rise time and bandwidth
   (b) Sketch the frequency response of ideal LPF,HPF,and BRF.
5. (a) Derive the expression for power in frequency domain
   (b) Find the Convolution of following signals
   $f_1(t) = 1 \quad -1 \le t \le 1$
   $= 0 \quad Otherwise$
   $f_2(t) \quad = t \ 0 \le t \le 3$
   $= 0 \quad$ Otherwise
6. (a) Sketch the spectrum of naturally sampled signal for following cases
      i. $\omega_0 = 2\omega_m$
      ii. $\omega_0 > 2\omega_m$
      iii. $\omega_0 < 2\omega_m$
      Where 'ω_0 ' is frequency corresponding to sampling interval and 'ω_m' is maximum frequency in the spectrum of base band signal. Explain the each sketch.
   (b) Explain the reconstruction of signal from its samples.
7. (a) Describe the ROC of the signal $x(t) = e^{-b|t|}$
   For b>0 and $b \le 0$
   (b) Find the inverse Laplace transform of X(s)=(-5s-7)/(s+1)(s-1)(s+2) When ROC is -1<Re(s)<1
8. (a) Determine z-transform, pole-zero locations and sketch of ROC of following signal $x(n) = -u(-n-1) + (1/3)^n u(n)$
   (b) Find the inverse z-transform of$X(z) = (2 + z^{-1)})/(1 - 0.5z^{-1})$ with ROC $|z| > 1/2$ using power series expansion.

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Code 9A04304 4

II B.Tech I semester (R09) Regular Examinations, November 2010
SIGNALS & SYSTEMS
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

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 is approximated in set of mutually orthogonal functions
   (b) Explain how signum function is expressed in terms of unit step function.
2. (a) Consider full rectified sine have with peak amplitude '1' and time period is '1' expand this function in terms of exponential Fourier series. Also sketch the spectrum
   (b) Express the trigonometric Fourier series coefficient 'b_n' in terms of exponential Fourier series coefficient 'F_n'
3. (a) Find the Fourier transform periodic impulse train.
   (b) Find Fourier transform of sin $\omega_0 t$.
4. (a) Discuss the Poly-wiener criterion for physical realization of systems.
   (b) Compare signal bandwidth and system bandwidth.
   (c) Find band width of Sin 100t+sin1000t
5. (a) Derive the expression for energy in frequency domain.
   (b) Find the Auto-Correlation of f(t) = cos $\omega_0 t$ and sketch.
6. (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)
7. (a) For the signal below check the possibility of finding Laplace transform by sketching ROC $x(t) = e^{-2t}u(t) + e^{-t}u(-t)$.
   (b) Find the inverse Laplace transform of
   $X(s) = 4S^2 + 15s + 8/(s+2)^2(s-1)$ Assuming signal is causal
8. (a) Determine z- transform, pole-zero locations and sketch of ROC of following signal $x(n) = (1/2)^n u(n) + (-1/3)^n u(n)$
   (b) Find the inverse z-transform of
   $X(z) = 1 - z - 1 + z - 2/(1 - 0.5z - 1)(1 - 2z - 1)(1 - z - 1)$
   With ROC of $1 < |z| < 2$

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Code :9ABS302 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-III
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Show that $\int_{-1}^{1} (1+x)^{p-1} (1+x)^{q-1} dx = 2^{p+q-1} \frac{\sqrt{(p)}\sqrt{(q)}}{\sqrt{(p+q)}}$.
   (b) Show that $\frac{n}{x} J_n(x) + J_n^1(x) = J_{n-1}(x)$
2. (a) State the necessary condition for f(z) to be analytic in cartesion co-ordinates.
   (b) Prove that the function f(z) defined by $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, (z \neq 0)$ $= 0 \quad , (z = 0)$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f^1(0)$ does not exist.
3. (a) Find the real part of the principle value $i^{\log(1+i)}$.
   (b) Find real and imaginary parts of
      i. cos z
      ii. tan z
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) Evaluate $\int_c \frac{z-3}{z^2+2z+5} dz$ where C is the circle
      i. |z| = 1
      ii. |z + 1 − i| = 2
5. (a) Find Taylor's expansion of $f(2) = \frac{2z^3+1}{z^2+z}$ about the point
      i. z=i
      ii. z=1.
   (b) Obtain all the Laurent series of the function $\frac{7z-2}{(z+1)z(z-2)}$ about $z_0 = -1$
6. (a) State and prove Cauchy's Residue theorem.
   (b) Show that $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta} = \frac{2\pi}{\sqrt{a^2-b^2}} (a > |b| > 0)$
7. Show that all the roots of $z^5 + 3z^2 = 1$ lie inside the circle $|z| < \sqrt[3]{4}$.and that two of its roots lie inside the circle $|z| < 3/4$
8. (a) Show that the relation $w = \frac{5-4z}{4z-2}$ transform the circle$|z| = 1$ into a circle of radius unity in the w-plane.
   (b) Find the bilinear transformation which maps the points $(2, i, -2)$ into the points $(1, i, -1)$.

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Code :9ABS302 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-III
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, 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 $\int_0^1 \frac{x^2}{\sqrt{1-x^4}}dx \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$
   (b) Prove that $J_{-n}(x) = (-1)^n J_n(x)$, where n is a positive integer.
2. (a) If U(x,y) and V(x,y) are harmonic functions in a region R, prove that the function $\left(\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}\right) + i\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$ is an analytic function.
   (b) Determine the analytic function whose real part is
      i. $e^x \cos y$
      ii. $e^{2x}(x\cos 2y - y\sin 2y)$
3. (a) If $Sin(\theta + i\alpha) = cos\alpha + i\sin\alpha$, then prove that $Cos^4\theta = \sin^2\alpha$.
   (b) If $cosec\left(\frac{\pi}{4} + i\alpha\right) = u + iv$, prove that $(u^2+v^2)^2 = 2(u^2 - v^2)$.
4. (a) Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the paths
      i. $y = x$
      ii. $y = x^2$
   (b) Using Cauchy's integral formula, evaluate $\int_c \frac{z^4}{(z+1)(-i)}dz$ where C is the ellipse $9x^2 + 4y^2 = 36$.
5. (a) Show that when $|z+1| < 1, z^{-2} = 1 + \sum_{n=1}^{\infty}(n+1)(z+1)^n$
   (b) Find the Laurent series expansion of the function $f(z) = \frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$
6. (a) Find the poles of $f(z)$ and the residues of the poles which lie on imaginary axis if $f(z) = \frac{z^2+2z}{(z-1)^2(z^2+4)}$.
   (b) Evaluate $\int_c \frac{(2z+1)^2}{4z^3+z}dz$ where c is the circle $|z| = 1$ using Residue theorem.
7. (a) Show that one root of the equation $z^4 + z + 1 = 0$ lies in the first quadrant.
   (b) Apply Rouche's theorem to determine the number of roots of $f(z) = z^4 - 5z + 1$ within annulus region $1 < |z| < 2$.
8. (a) Find the image of the rectangle $R: -\pi < x < \pi, \frac{1}{2} < y < 1$ under the transformation W=sinz.
   (b) Determine the bilinear transformation that maps the points 1-2i, 2+i, 2+3i respectively 2+2i, 1+3i, 4.

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Code :9ABS302 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-III
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Show that $\sqrt{\left(\frac{1}{2}\right)}\sqrt{(2n)} = 2^{2n-1}\sqrt{(n)}\sqrt{\left(n+\frac{1}{2}\right)}$.
   (b) Prove that $J_0(x) = 1 - \frac{x^2}{2^2} + \frac{x^4}{2^2.4^2} - \frac{x^6}{2^2.4^2.6^2} + - - - - -$
2. (a) Prove that Z^n (n is a positive integer) is analytic and hence find its derivative.
   (b) Show that the function $u = e^{-2xy}\sin(x^2 - y^2)$ is harmonic, find the conjugate function 'v' and express $u + iv$ as an analytic function of z.
3. (a) Separate the real and imaginary parts of
      i. cosec z
      ii. cot z
   (b) Find all principal values of $\left(1 + i\sqrt{3}\right)\left(1 + i\sqrt{3}\right)$
4. (a) Evaluate $\int_0^{3+i} z^2 dz$, along
      i. The line $y = \frac{x}{3}$
      ii. Parabola $x = 3y^2$
   (b) Evaluate $\int_c \frac{z^2-2z-2}{(z^2+1)^2 Z} dz$ where C is $|Z - i| = \frac{1}{2}$ using cauchy's integral formula.
5. (a) Find the Laurent series of $\frac{7z-2}{(z+1)z(z-2)}$ in the annulus $1 < |Z + 1| < 3$.
   (b) Expand $f(z) = e^{1+z}$ in powers of (Z - 1).
6. (a) Evaluate $\oint_c \frac{zdz}{(z-1)(z-2)^2}$ where $C : |z - 2| = \frac{1}{2}$.
   (b) Evaluate $\int_0^{2\pi} \frac{d\theta}{(5-3\sin\theta)^2}$ using residue theorem.
7. (a) Determine the number of roots of the equation $2z^5 - 6z^2 + z + 1 = 0$ in the region $1 \le |z| < 2$.
   (b) Use Rouche's theorem to show that the equation $z^2 + 15z + 1 = 0$ has one root in the disk $|z| > \frac{3}{2}$ and four roots in the ammulus $\frac{3}{2} < |z| < 2$.
8. (a) Find the image of the infinite strip bounded by x = 0 and $x = \frac{\pi}{4}$ under the transformation $w = \cos z$.
   (b) Find the bilinear transformation which maps vertices $(1 + i, -i, 2 - i)$ of the triangle T of the Z- plane into the points (0,1,i) to the w-plane.

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Code :9ABS302 **4**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-III
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Evaluate $4\int_0^\infty \frac{x^2}{1+x^4}dx$ using $\beta-\Gamma$ functions.
   (b) Prove that $P_n(x)=\frac{1}{2^x n!}\frac{d^n}{dx^n}(x^2-1)^n$.
2. (a) Show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\log|f^1(z)|=0$ where f(z) is an analytic function.
   (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) Find all the roots of sinz=2.
   (b) If tan(x+iy)=A+iB, show that
      i. $A^2+B^2+2A\cot 2x=1$
      ii. $A^2+B^2-2B\coth 2y+1=0$
4. (a) Show that $\int_c (z+1)dz=0$ where c is the boundary of the square whose vertices at the points z = 0, z = 1, z = 1 + i, z = i.
   (b) Evaluate $\int_c \frac{e^{2z}}{(z-1)(z-2)}dz$, where C is the circle $|z|=3$.
5. (a) Expand $f(z)=\frac{z^2-4}{z^2+5z+4}$ valid for $|z|<1$.
   (b) obtain the Laurent's series which represents the function $\frac{1}{(1+z^2)(z+2)}$ when
      i. |z| < 1
      ii. 1 < |z| < 2
6. (a) Evaluate $\int_c \frac{z-2}{z(z-1)}dz$ where c is $|z|=2$ using Residue theorem.
   (b) Evaluate $\int_0^{2\pi}\frac{\sin 3\theta}{5-3\cos\theta}d\theta$ using Residue theorem.
7. (a) Show that the equation $z^4+4(1+i)z+1=0$ has one root in each quadrant.
   (b) State and prove fundamental theorem of algebra.
8. (a) Find the image of the line x = 4 in z-plane under the transformation $w=z^2$.
   (b) Find the bilinear transformation that maps the points 1, i, -1 into the points 2, i, -2.

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Code 9ABS303 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
ENVIRONMENTAL SCIENCE
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communications Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. Write a detailed note on the role any four organizations in the field of environment and there contribution to better management.
2. Discuss the following:
   (a) Biosphere
   (b) Environment
   (c) Pollution
   (d) Municipal solid waste
3. (a) Discuss about energy cycle integration of cycles in nature.
   (b) Write short note on ecological succession.
4. (a) Discuss about consumptive use value and productive use value.
   (b) Discuss about genetic diversity with examples.
5. (a) Discuss about definition, cause, effects and control measures of nuclear hazards pollution.
   (b) Discuss about air pollution.
6. Write the issues and possible solutions of environmental ethics.
7. (a) What are the risks involved due to utilization of chemicals in food?
   (b) Discuss about climate and health.
8. Discuss the water polluted site in your field work.

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Code 9ABS303 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
ENVIRONMENTAL SCIENCE
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communications Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. What are the different activities that can be taken up to increase public awareness of environment issues? Explain how they help in better environmental management.
2. Discuss the following:
   (a) Growing energy needs
   (b) Renewable and non-renewable energy sources
   (c) Use of alternate energy sources
3. (a) Discuss about producers, consumers and decomposers with examples.
   (b) Write short note on ecosystem.
4. Discuss about in-situ and ex-situ conservation of biodiversity.
5. (a) Discuss about definition, cause, effects and control measures of thermal pollution.
   (b) Discuss about water pollution.
6. Discuss about rainwater harvesting, and water shed management.
7. Write short notes on:
   (a) Infectious diseases.
   (b) Water related diseases.
8. Write a detailed explanation about local polluted site of your choice.

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Code 9ABS303 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
ENVIRONMENTAL SCIENCE
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communications Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. Discuss about environmental crisis and sustainable development.
2. (a) Discuss role of an individual in conservation of natural resources.
   (b) Discuss the environment effects of extracting and using mineral resources.
3. (a) Write short notes on ecosystem.
   (b) Discuss about ecosystem degradation and resources utilization.
4. (a) Discuss about habitat loss, poaching of wild life.
   (b) Discuss about endangered and endemic species of India with examples.
5. (a) Discuss about definition, cause, effects and control measures of water pollution.
   (b) Discuss about characteristics of municipal solid waste, and vermicomposting.
6. What control measures be taken to develop unsustainable to sustainable development?
7. Write detailed explanation on environment and human health.
8. Write the report of your field work on ecosystem of your choice.

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Code 9ABS303 4

II B.Tech I semester (R09) Regular Examinations, November 2010
ENVIRONMENTAL SCIENCE
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communications Engineering, Electronics & Computer Engineering, 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) Write reasons for studying the state of environment.
   (b) Define Environmental studies.
   (c) Discuss about interrelated nature of environmental problems.
2. Discuss importance of environmental studies with respect to the following statements:
   (a) We live in the world wherein natural resources are limited.
   (b) Green space and gardens are vital to the physiological and physical health of city dwellers.
3. Discuss about forest ecosystem and explain with proper examples.
4. (a) Discuss about species and ecosystem diversity.
   (b) Write biogeography classification of India.
5. Discuss about
   (a) Floods
   (b) Earthquakes
   (c) Cyclones
   (d) Land slides
6. (a) Discuss about ethical basis of environmental education and awareness
   (b) Write the note on conservation of ethical values and traditional values of India.
7. (a) Discuss about family welfare programs in India.
   (b) Discuss about climate and health
8. Write the report of your field work on forest grassland

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Code :9A02305

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II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRICAL CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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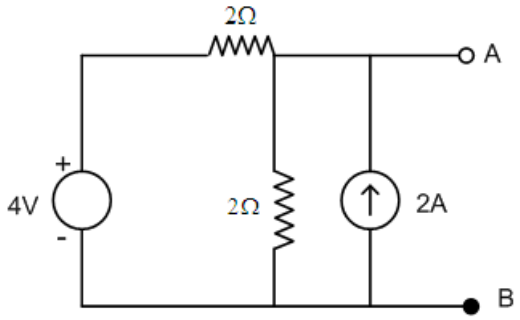
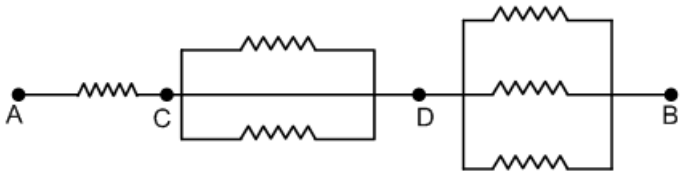
1. (a) Differentiate between active and passive elements with suitable examples.
   (b) Find the equivalent voltage and current source representation of the following network across AB.



2. (a) Two resistances when they are in series have an equivalent resistance of 9 ohms and when connected in parallel have an equivalent resistance of 2 ohms. Find the resistance and the ratio of the voltage and current sharing between these elements if supply voltage is 100v.
   (b) Find the equivalent resistance between the terminals AB in the network shown in the figure, if each has a resistance of R ohms and hence find the total current, current through each element if the voltage is 45v.



3. (a) Define power factor. What is its Importance in a.c. Circuits?
   (b) The impedances of a parallel circuit are Z_1=(6+j8)Ω and Z_2 =(8-j6)Ω . If the applied voltage is 120V, find
      i. current and power factor of each branch
      ii. overall current and power factor of the circuit
      iii. Power Consumed by each impedance. Draw phasor diagram.

4. (a) What is quality factor? Explain its effect on bandwidth.
   (b) A series RLC circuit has a quality factor of 5 at 50rad/sec. The current flowing through the circuit at resonance is 10 A and the supply voltage is 100v. The total Impedance of circuit is 20 Ω. Find the circuit constants.

5. (a) Define magnetizing force and flux density.
   (b) Compare magnetic circuit with electric circuit
   (c) For the circuit shown in fig. 5 find input impedance, assume load impedance to be Z_L.

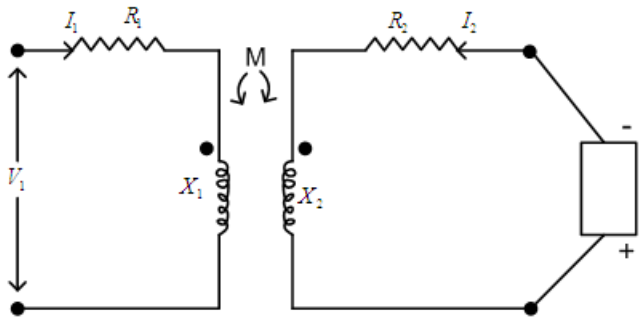


Fig5.

6. (a) Determine the voltages at each node for the circuit shown in Fig.6

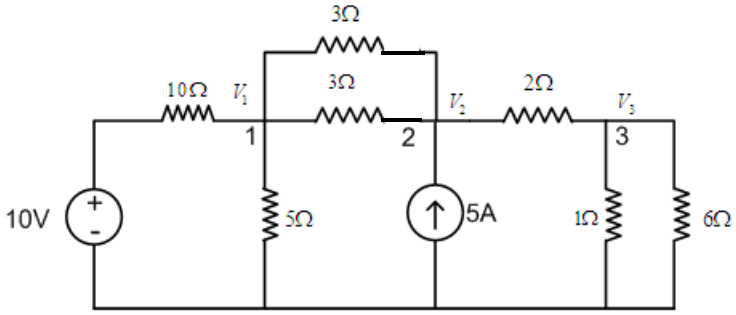


Fig.6

7. (a) State and explain maximum power transfer Theorem
   (b) In the network shown in the Fig. 7 find the value of Z_L so that the power transfer from the source is maximum. Also find P_{max}.

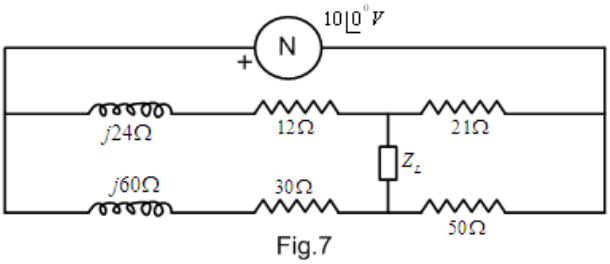


Fig.7

Figure for Question No.7

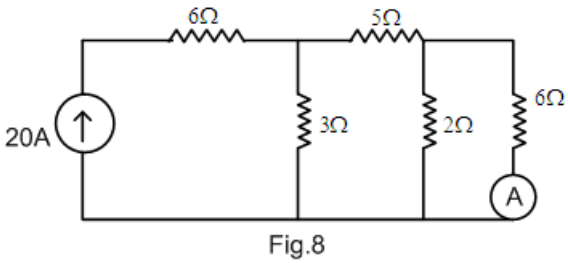


Fig.8

Figure for Question No.8

8. (a) State and explain Tellegen's theorem.
   (b) Using compensation theorem, determine the ammeter reading when it is connected to 6 Ω resistor as shown in fig.8 given above. The internal resistance of the ammeter is 2Ω .

Code :9A02305

2

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRICAL CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Differentiate between ideal sources and practical sources.
   (b) An inductor shown in fig 1. a is supplied with a current wave from given in fig. 1.b Draw the wave forms for the voltage and energy in the inductor .

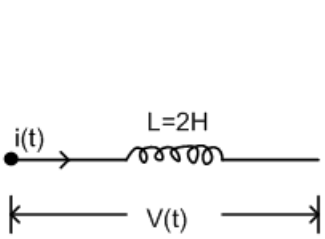

Fig. 1.a

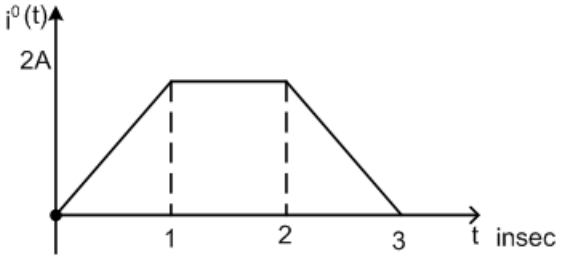

Fig.1.b

2. Find the node voltages V_1,V_2 and V_3 in the network of fig.2. And find the current I_x.

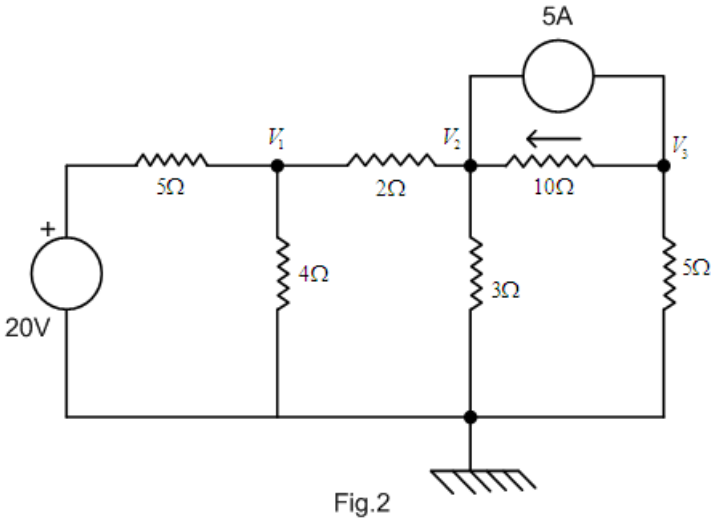

Fig.2

3. (a) Derive the expression for power in 1-∅ A.C. Circuits.
   (b) A sinusoidal 50Hz voltage of 200v supplies the three parallel circuits as shown in figure 3. Find the current in each circuit and the total current. Draw the vector diagram.

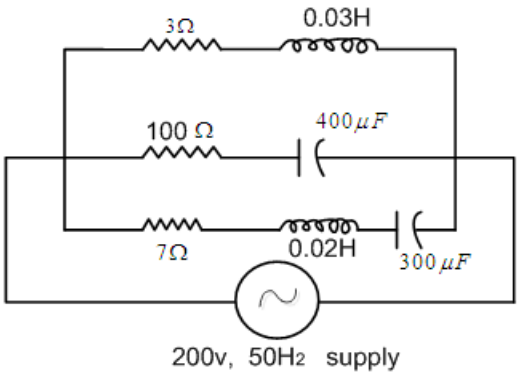

Fig.3.

4. (a) Determine the quality factor of a coil for the series circuit consisting of R=10 Ω , L=0.1 H and C=10μF.
   (b) Two impedances Z_1 = 20+j10 and Z_2=10-j30 are connected in parallel and this combination is connected in series with Z_3=30+jX. Find the value of X which will produce resonance

5. (a) Explain the terms magnetic field strength, magnetic flux and magnetic flux density.
   (b) Define coefficient of coupling. What is its range of vasiatim? In which type of circuits it is minimum and in which type of circuits it is maximum?
   (c) The combined inductance of two coils connected in series are 0.6 H and 0.1 H in series aiding and series opposing connections. If the self inductance of each coil is 0.2H, find the coefficient of coupling.

6. Using nodal analysis, find the power dissipated in the 6Ω resistor for the circuit shown in fig.6.

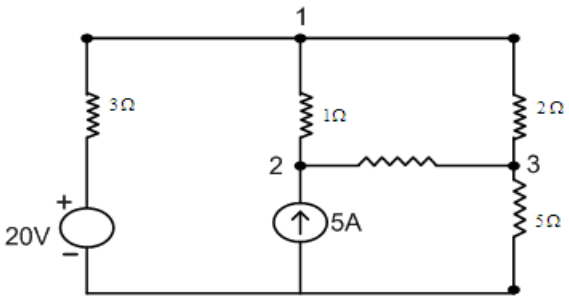

Fig.6.

7. (a) State and explain Norton's theorem.
   (b) Find the current through load resistance R_L and also find the voltage drop across load using Millman's theorem for the network as shown in fig.7.

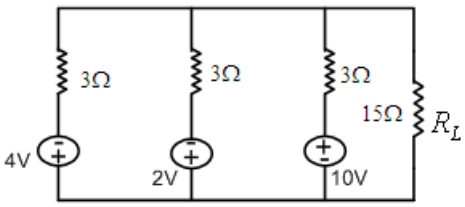

Fig.7

Figure for Question No.7

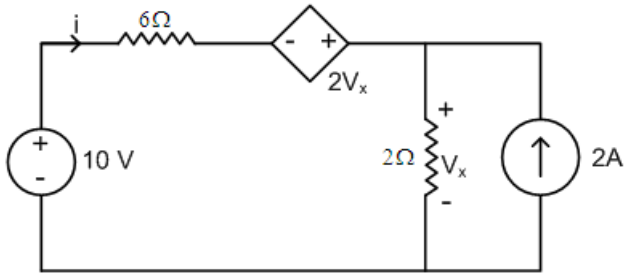

Fig.8

Figure for Question No.8

8. (a) State and explain Reciprocity theorem.
   (b) Find the current i in the circuit shown in fig. 8 given above using superposition theorem.

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3

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRICAL CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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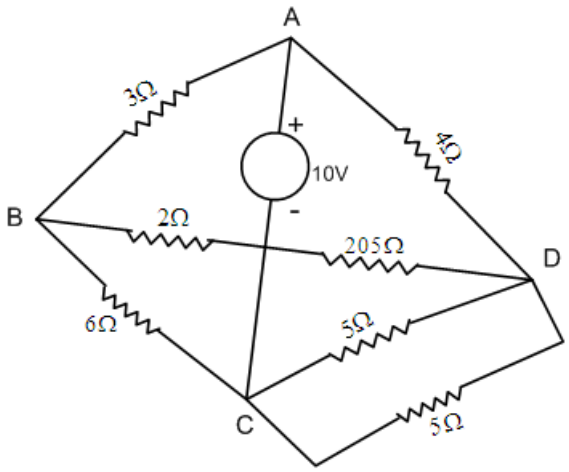
1. (a) Derive an expression for the energy stored in an inductor and a capacitor.
   (b) When a dc voltage is applied to a capacitor, the voltage across its terminals is found to build up in accordance with $V_C = 50\left(1 - e^{-100t}\right)$. After a lapse of 0.01 s, the current flow is equal to 2 mA.
      i. Find the value of capacitance in microfarads
      ii. How much energy is stored in the electric field at this time?
2. (a) Stats and explain Kirchhoff's laws.
   (b) Find the power delivered by the source in the circuit shown in the following figure.



3. (a) Define the following
      i. RMS value
      ii. Average value
      iii. Form factor of an alternating quantity
   (b) A series circuit consisting of a 10 Ω resistor, a 100 μ F capacitor and a 10 m H inductor is driven by a 50 Hz a.c. voltage source of maximum value 100 volts. Calculate the equivalent Impedance, current in the circuit, the power factor and power dissipated in the circuit.
4. A series RLC circuit has R= 10Ω, L=0.5 H, and C= 40 μ F. The applied voltage is 100V. Find
   (a) Resonant frequency
   (b) Quality factor of coil.
   (c) Upper and lower half power frequencies
   (d) Band width
   (e) Current at half power points.
   (f) Voltage across inductance at resonance.
5. (a) write a short note on dot convention used in magnetically coupled coils.
   (b) In the network shown in Fig. 5, L_1=1H, L_2=2H, M=1.2 H. Assuming the inductance coils to be ideal, find the amount of energy stored after 0.1 sec of the circuit connected to a d.c. source of 10v.

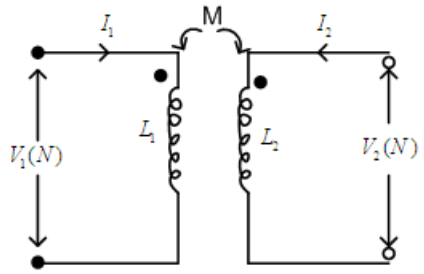


Fig.5

6. For the circuit shown in fig.6 find the voltage across the 4Ω resistor by using nodal analysis.

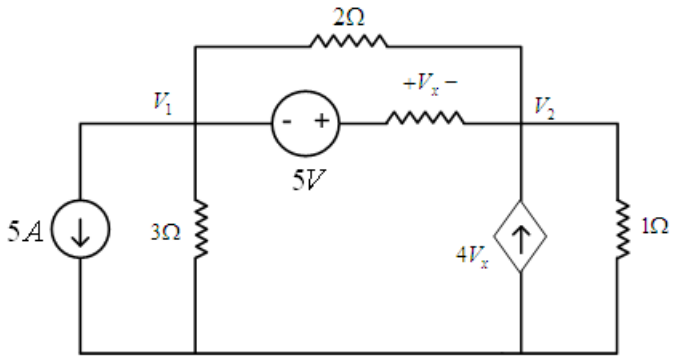


Fig.6.

7. (a) State and explain Thevinin's and Norton's theorems
   (b) Calculate the current I shown in fig. 7 using Millman's theorem.

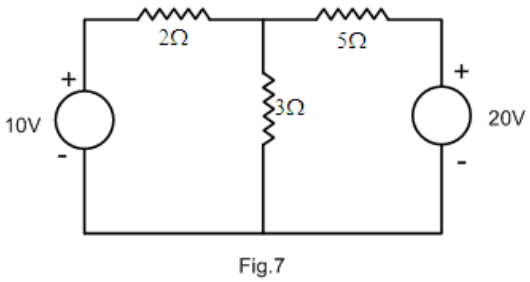


Fig.7

Figure for Question No.7

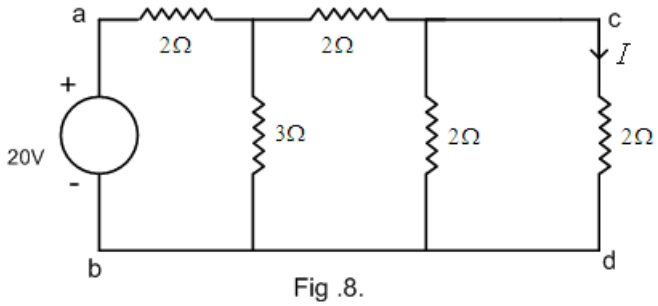


Fig .8.

Figure for Question No.8

8. (a) State and explain compensation theorem.
   (b) verify the Reciprocity theorem for the network shown in fig.8 given above.

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Code :9A02305

4

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRICAL CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Differentiate between independent and dependent sources.
   (b) Consider the resistor shown in fig. 1a. A voltage v(t) of the wave form given in fig. 1b is applied at its terminals. Obtain the wave form of current through it.

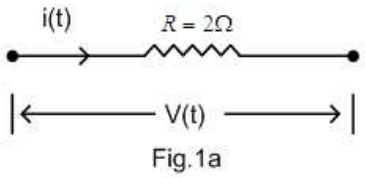

Fig.1a

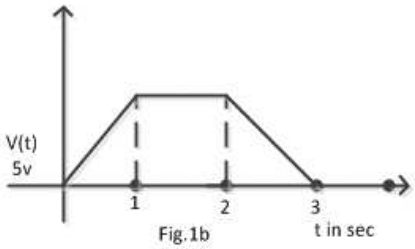

Fig.1b

2. Determine the current drawn by the circuit shown in fig 2.

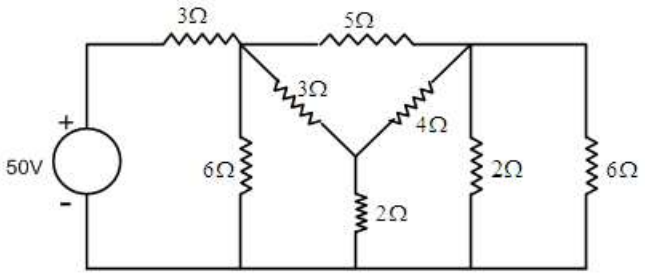

Fig.2

3. (a) Explain the following:
      i. Impedance.
      ii. Reactance.
      iii. Phase angle difference.
      iv. Power factor.
   (b) An alternating voltage (80+j60) V is applied to a circuit and current flowing is (-4+j10)A. Find the
      i. Impedance of the circuit and.
      ii. The power factor

4. (a) What is resonance? Sketch the resonance curves for a series resonant circuit with variable frequency and constant R, L and C.
   (b) A series circuit comprising R, L and C is supplied at 220V, 50 HZ. At resonance, the voltage across the capacitor is 550V. The current at resonance is 1A. Determine the circuit parameters R, L and C.

5. (a) Define MMF, Flux and Reluctance.
   (b) What is a magnetic circuit? Compare magnetic circuit with an electric circuit.
   (c) Find the total inductance of the three series connected coupled coils as shown in figure 5.

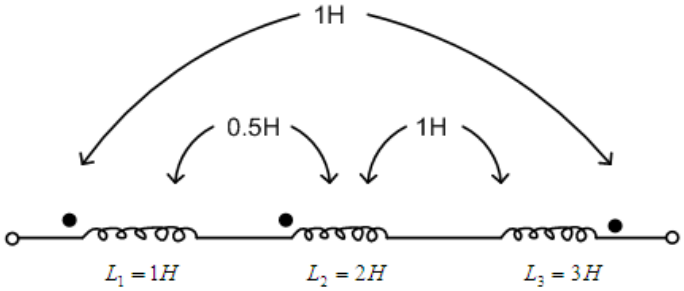

Fig.5

Figure for Question No.5

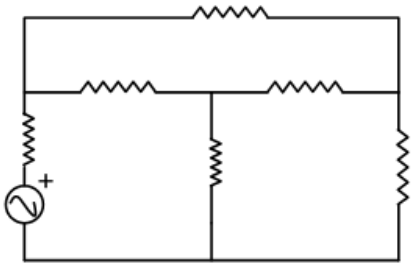

Fig.6.

Figure for Question No.6

6. (a) Explain the procedure for obtaining fundamental Tieset matrix of a given network.
   (b) For the circuit shown in fig.6. given above draw the graph and tree.

7. (a) State and explain Millman's theorem.
   (b) Determine the Thevinin's and Norton's equivalent circuits across AB for the circuit shown in fig. 7.

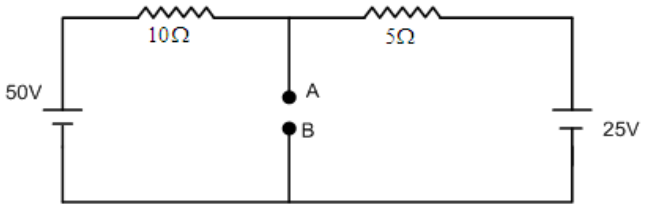

Fig.7.

8. (a) State and explain Tellegen's Theorem.
   (b) For the resistive network shown in fig. 8, find the current in each resistor, using the superposition principle.

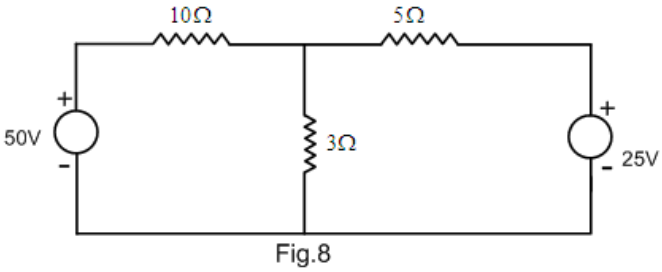

Fig.8

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Code 9A04301

1

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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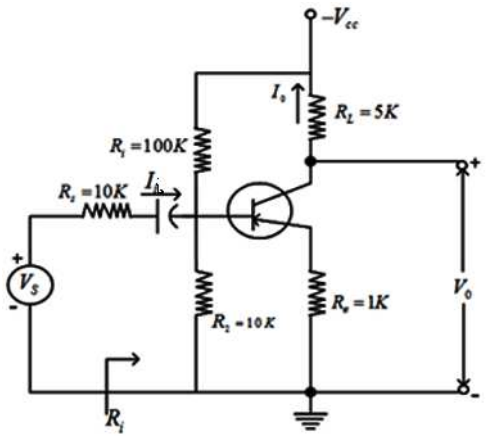
1. (a) Discuss PN diode VI characteristics with neat sketch.
   (b) Calculate the factor by which the current will increase in silicon diode operating at a forward voltage of 0.4 Volts, when the temperature is raised form 25^0C to 150^0C.
2. (a) With Circuit and necessary waveforms explain the operation of centered tapped FWR.
   (b) Derive the expression for ripple factor for the circuit FWR with inductor filter.
3. (a) With neat sketch explain the different current components of transistor.
   (b) In an NPN transistor emitter is grounded, base is connected with 4 Volts supply in series with 100 K ohms resistor and collector base is connected with 4 Volts supply in series with 2 K ohms. Assume $V_{CC} = 12Volts, V_{BE} = 0.7Volts, \beta = 100$. Find I_B, I_C *and* I_E
4. (a) What are the draw backs of transistor fixed bias circuits?
   (b) Derive an expression for stability factor S in self bias circuit.
5. (a) With neat structure explain the principle of operation of depletion MOSFET.
   (b) Explain drain characteristics of JFET.
6. (a) Derive an expression for voltage gain, Input Impedance and output impedance of CS amplifier at low frequencies.
   (b) Discuss self biasing of JFET.
7. For the transistor amplifier shown below, Compute $A_I = I_o/I_i, A_V, A_{VS}$ *and* R_i. Assume $h_{ie} = 1100\,ohms$, $h_{fe} = 50, h_{re} = 2.5 \times 10 - 4, h_{oe} = 24uA/V$



8. Discuss the principle of operation and VI characteristics of
   (a) Photo Diode
   (b) Uni Junction Transistor

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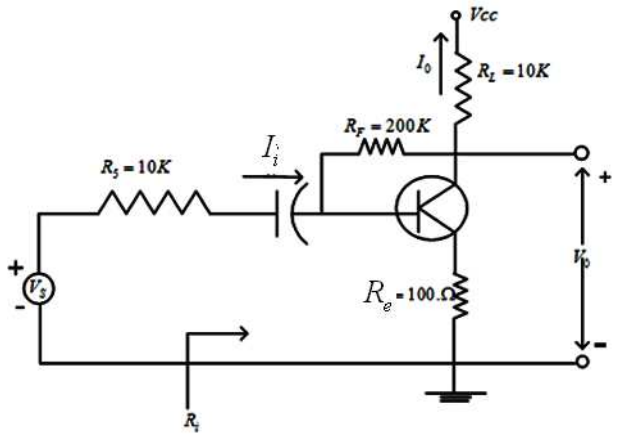
Code 9A04301 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss energy band diagram for PN diode for the following cases
   i. Un biased
   ii. Forward biased
   iii. Reverse biased
   (b) Determine the forward resistance of PN diode, when the forward current is 5 MA at T=300K. Assume the diode is silicon.
2. (a) With circuit and necessary waveforms explain the operation of HWR
   (b) Derive the expression for ripple factor for the circuit HWR with capacitor filter.
3. (a) Explain how transistor will act as an amplifier.
   (b) Discuss in detail about early effect and its consequences.
   (c) Derive the relation base current and collector current.
4. (a) Explain diode compensation circuit for variations in V_{BE} for self bias circuit.
   (b) Derive an expression for stability factor S' in self bias circuit
5. (a) With neat structure explain the principle of operation of enhancement MOSFET
   (b) Discuss the relationship between FET parameters.
6. (a) Derive an expression for voltage gain, input Impedance and output impedance of CD amplifier at low frequencies.
   (b) Discuss voltage divider biasing of JFET
7. For the transistor amplifier shown below, Compute $A_I = I_0/I_i, A_V, A_{VS}$ *and* R_i. Assume $h_{ie} = 1100\,ohms,\ h_{fe} = 50,\ h_{re} = 2.5\,X\,10 - 4\ h_{oe} = 24\ uA/V$



8. Explain the principle of operation and VI characteristics of SCR. Also state few applications of SCR.

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Code 9A04301 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss temperature dependence of PN diode VI characteristics.
   (b) Derive an expression for dynamic resistance of PN diode.
   (c) The voltage across a silicon diode at room temperature is 0.7 Volts when 2 mA current flows through it. If the voltage increases to 0.75 Volts, Calculate the diode current.
2. (a) With circuit and necessary waveforms explain the operation of Bridge Rectifier.
   (b) Design a filter for FWR circuit with LC filter to provide an output voltage of 10 Volts with a load current of 200 mA and the ripple is limited to 2%.
3. (a) Explain input characteristics transistor CB configuration.
   (b) A transistor with $\alpha = 0.97$ has a reverse saturation current of 1 uA in CB configuration. Calculate the value of leakage current in the CE configuration. Also find the collector current and the emitter current if the value of base current is 20 uA.
4. (a) Explain diode compensation circuit for variations in I_C for self bias circuit.
   (b) How self bias circuit will eliminate drawbacks in fixed bias circuit?
5. (a) With neat structure explain the principle of operation of JFET.
   (b) Explain how depletion mode MOSFET can also act as enhancement mode MOSFET.
6. (a) Derive an expression for voltage gain, Input impedance and output impedance of CG amplifier at low frequencies.
   (b) In an N - channel JFET based voltage divider common drain configuration, determine the value of resistor R_S so as to have the operating point as IDQ = 5mA, VDSQ =10 V. Given that VDD=28V, R1 1 M ohms, R2=0.5 M ohms, saturation drain current of the FFET is 10 mA and gate source pinch off voltage is '-5V'.
7. (a) Give the comparison of CE,CC and CB amplifiers with respect to voltage gain, current gain, input impedance and output impedance.
   (b) Find expressions for voltage gain, current gain, Input impedance and output impedances of CC amplifier using simplified hybrid model?
8. Discuss the principle of operation of
   (a) Varactor Diode
   (b) LED
   (c) LDR

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Code 9A04301 4

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss zener and avalanche break down mechanisms.
   (b) Derive an expression for transition capacitance of PN diode.
2. (a) With simple circuit explain how Zener diode will act as a regulator.
   (b) In a bridge rectifier, the transformer is connected to 220 Volts, 60Hz mains and turns ratio of the step down transformer is 11:1. Assuming the diodes to be ideal, find
      i. Voltage across the load
      ii. D.C. Current
      iii. PIV
3. (a) Explain output characteristics transistor CE configuration?
   (b) The reverse leakage current of the transistor when connected in CB configuration is 0.2 uA and it is 18 uA when the same transistor is connected in CE configuration. Calculate α_{dc} and βdc .
4. (a) What is thermal runaway and what is the condition for thermal stability in CE configuration?
   (b) In an NPN transistor if $\beta = 50$ is used in common emitter circuit with VCC = 10 Volts and RC=2 K Ohms. The bias is obtained by connecting 100 K Ohms resistor from collector to base. Find the operating point.
5. (a) State advantages and disadvantages of FET's over BJT's.
   (b) Discuss the VI characteristics of depletion mode MOSFET.
6. (a) Explain how FET acts as VVR.
   (b) Discuss the concept of biasing of MOSFET's (Both Depletion and Enhancement)
7. Derive the expressions for voltage gain, current gain, Input impedance, output impedance, voltage gain with respect to source and current gain with respect to source for generalized transistor amplifier at low frequencies.
8. Explain the principle of operation and characteristics of Tunnel diode with the help of energy band diagrams.

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Code 9A04303 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Define a probability density function and obtain the relationship between probability and probability density.
   (b) In a box there are 500 colored balls. 75 black, 150 green, 175 red, 70 white and 30 blue. What are the probabilities of selecting a ball of each color?

2. (a) Explain the Raleigh Probability density function.
   (b) Find a constant b>0 so that the function. $f_x(x) = \begin{cases} e^{3x}/4; 0 < x < b \\ 0 \quad ; \text{elsewhere} \end{cases}$ is a valid probability density.

3. (a) If the random variable x has uniform distribution ; find its variance.
   (b) Let x is a Gaussian random variable with zero mean and variance σ^2 . Let $y = x^2$. Find mean of random variable y.

4. (a) State the properties of joint distribution
   (b) Given the function $f_{x,y}(x,y) = \begin{cases} b(x+y)^2 ; -2 < x < 2 \text{and} -3 < \text{y} < 3 \\ 0 \quad ; \text{elsewhere} \end{cases}$
      i. Find the constant b such that this is a valid joint density function.
      ii. Determine the marginal density functions $f_x(x)$ and $f_y(y)$.

5. (a) Find the n^th moment of uniform random variable & hence its mean.
   (b) A joint density function is given as $f_{x,y}(x,y) = \begin{cases} x(y+1.5); 0 < x < 1 \text{ and } 0 < \text{y} < 1 \\ 0 \quad ; \text{elsewhere} \end{cases}$
   Find all the joint moments m_{nk} and k = 0, 1, ...

6. (a) Explain the concept of Random process .
   (b) Distinguish between
      i. Deterministic and non deterministic process.
      ii. Stationary and non stationary random process.

7. A random process is defined by x(t) =At where A is a continuous random variable uniformly distributed on (0,1) and t represents time. Find
   (a) $E[x(t)]$
   (b) $R_{xx}[t, t+\tau]$
   (c) Is the process stationary?

8. Find the auto correlation function and power spectral density of the random process $x(t) = k\cos(\omega_0 t + \theta)$ where θ is a random variable over the ensemble and is uniformly distributed over the range $(0, 2\pi)$.

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Code 9A04303 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) State and prove Bayes theorem of probability.
   (b) An ordinary 52 Card deck is thoroughly shuffled. You are dealt four cards up. What is the probability that all four cards are fives.

2. (a) Explain the Gaussian distribution with neat sketches.
   (b) For the Gaussian density function of a random variable X with $a_x = 0$ and $\sigma_x = 1$ show that $\int_{-\infty}^{\infty} x f_x(x)\, dx = a_x$

3. (a) Show that the mean of the binomial distribution is the product of the parameter P and the number of times n.
   (b) A random variable x can have values -4, 1,2,3,4 each with probability 1/5. Find
      i. the mean
      ii. the variance of the random $y = 3x^3$.

4. (a) Differentiate marginal distribution functions and conditional distribution functions.
   (b) Find a value of the constant b so that the function $f_{x,y}(x, y) = bxy^2 \exp(-2xy)\, u(x-2)\, u(y-1)$ is a valid joint probability density.

5. (a) Prove that the moment generating function of the sum of two independent variables is the product of their moment generating functions.
   (b) A Gaussion distribution random variable x of zero mean and variance σ^2 transformed by rectifiers characterized by input- output relation
   $y = ax^2, \mathrm{x} > 0$
   $= 0, \mathrm{x} < 0$
   Determine the probability of y.

6. (a) State the conditions for wide sense stationary random process.
   (b) Distinguish between stationary and non stationary random process.

7. A random process is defined by $x(t) = A\cos(\pi t)$. Where A is a guassian random variable with zero mean and variance σ_A^2 .
   (a) Find the density functions of x(0) and x(1).
   (b) Is x(t) stationary?

8. (a) Derive the relation between PSDs of input and output random process of an LTI system.
   (b) If x(t) is a stationary process, find the power spectrum of $y(t) = A_0 + B_0 x(t)$ in terms of the power spectrum of x(t) if A_0 *and* B_0 are real constants.

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Code 9A04303 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
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1. (a) Define conditional probability and mention its properties.
   (b) Distinguish between mutually exclusive events and independent events.
   (c) In a single throw of two dice, what is the probability of obtaining a sum of atleast 9.

2. (a) Explain the concept of random variable .
   (b) Find the value for constant A such that
   $$f_x(x) = \begin{cases} 0 & ; x < -1 \\ A\left(1-x^2\right)\cos(\pi x/2) & ; -1 \le x \le 1 \\ 0 & ; 1 < x \end{cases}$$
   Is a valid probability density function .

3. (a) What is the difference between one to one and many to one transformations? Give the meaning of monotonic increasing and monotonic decreasing transformations with examples.
   (b) List the properties of Gaussian curve.

4. (a) Find a constant b (in terms of a) so that the function.
   $$f_{x,y}(x,y) = \begin{cases} be^{-(x+y)} & ; 0 < x < a \quad \text{and} \quad 0 < y < \infty \\ 0 \ ; & \text{elsewhere} \end{cases}$$
   Is a valid joint density function .
   (b) Find an expression for the joint distribution function.

5. (a) For the random variable x whose density function is
   $f(x) = \frac{1}{b-a}; a \le x \le b$
   $= 0;$ otherwise
   Determine
      i. Moment generating function
      ii. Mean & variance.
   (b) Let x and y be independent variables. Prove that var(xy)= Var(x) Var (y) if E[x]=E[y]=0

6. (a) Explain the classification of random process with neat sketches.
   (b) Write short notes on ergodic random processes.

7. Given two random processes x (t) and y(t) find expressions for auto correlation function of $w(t) =$ x (t) +y (t) if
   (a) x (t) and y (t) are correlated.
   (b) x (t) and y (t) are uncorrelated.
   (c) x (t) and y (t) are uncorrelated with zero means.

8. Find the input auto correlation function, output spectral density of RC lowpass filter, where the filter is subjected to a white noise of spectral density No/2.

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Code 9A04303 **4**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Define the following with examples.
   i. Sample space
   ii. Event
   iii. Mutually exclusive events.
   iv. Independent events.
   (b) Two cards are drawn from a 52 card deck.
   i. Given the first card is queen, what is the probability that the second is also a queen?
   ii. Repeat the above for the first card a queen and the second card a 9.
2. (a) Define a probability density function and list its properties.
   (b) A random variable x is known to be poisson with b=4.
   i. Plot the density and distribution functions for this random variable.
   ii. What is the probability of the event $\{0 \leq x \leq 5\}$
3. (a) Derive an expression for the average value and variance associated with the Gaussian probability density function.
   (b) A random variable x is uniformly distributed on the interval (-5,15). Another random variable $y = e^{-x/5}$ is formed. Find E[y].
4. (a) Write the statement of central limit theorem.
   (b) A Joint probability density function of two random variables x and y is given by
   $f_{x,y}(x,y) = \begin{cases} \frac{5}{16}x^2y; 0 < y < x < 2 \\ 0 \quad ; \text{elsewhere} \end{cases}$
   i. Find the marginal density functions of x and y.
   ii. Are x and y statistically independent?
5. Random variables x and y have the joint density function.
   $f_{x,y}(x,y) = \begin{cases} (x+y)^2 \big/ 40; -1 < x < 1 and -3 < \text{y} < 3 \\ 0 \quad ; \text{elsewhere} \end{cases}$
   (a) Find all the second order moments of x and y.
   (b) What are the variances of x and y?
6. (a) Explain Ergodic random process.
   (b) State and prove properties of Auto correlation function.
7. Let x(t) be the sum of a deterministic signal s(t) and a wide-sense stationary noise process N(t) .Find the mean value, and auto correlation and auto covariance functions of x(t). Discuss the stationarites of x(t).
8. The autocorrelation function of a random process x(t) is
   $RXx(\text{T}) = 3 + 2\exp\left(-4\text{T}^2\right)$
   (a) Find the power spectrum of x(t).
   (b) What is the average power in x(t)?
   (c) What fraction of the power lies in the frequency band $-1/\sqrt{2} \leq w \leq -1/\sqrt{2}$?

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