Code: 9A04304 **1**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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) Define orthogonal functions. Give some examples of orthogonal functions.
(b) Explain how a function can be approximated by a set of orthogonal functions.
(c) Derive the expression by which the Mean square error can be evaluated.

2 (a) Explain the concept of generalized Fourier series representation of signal f (t).
(b) State the properties of Fourier series.

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) Show that from the knowledge of the impulse response *h(t)* of a linear system, the response of any arbitrary function can be obtained.
(b) What is ideal filter? Find impulse response of a ideal Low Pass Filter.

5 (a) State and prove sampling theorem in frequency domain.
(b) What is aliasing? Explain its effect on sampling.

6 (a) Specify two distinctly different pulse signals that have exactly the same autocorrelation function.
(b) Consider a signal *g(t)* given by $g(t) = A_0 + A_1 Cos(2\pi f_1 t + \theta) + A_2 Cos(2\pi f_2 t + \theta)$.
(i) Determine the auto correlation function *R(τ)* of this signal.
(ii) What is the value of *R(0)*.
(iii) Has any information about *g(t)* been lost in obtaining auto correlation function?

7 (a) Prove that the Laplace transform of even and odd functions is even and odd functions respectively.
(b) Find the Laplace transform of $x(t) = e^{-t} Cos(w_0 t + \phi)u(t)$ and its ROC.

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 **2**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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 orthogonal functions. Give some examples of orthogonal functions. Verify that sinusoidal functions are orthogonal or not.
(b) Prove the orthogonality condition in the case of a signal represented by orthogonal signal space consisting of exponential functions, $\{e^{jnwot}\}$ for 'n' integer.

2 (a) Explain the concept of generalized Fourier series representation of signal f(t).
(b) State the properties of Fourier series.

3 (a) Determine the Fourier transform of a two sided exponential pulse $x(t) = e^{-|t|}$.
(b) Find the Fourier transforms of an even function $x_e(t)$ and odd function $x_o(t)$ of x(t).

4 (a) The transfer function of a system is given by $H(w)=k$, where k is a constant. Sketch the magnitude and phase function of this transfer function. Evaluate the impulse response of this filter. Sketch this response and state whether the filter is physically realizable.
(b) Obtain the conditions for the distortion less transmission through a system. And also define signal bandwidth and system bandwidth.

5 (a) Explain the Sampling theorem for Band Limited Signals with analytical proof.
(b) A signal g(t) = $Cos(200\pi t) + 2Cos(280\pi t)$ is sampled at a sampling frequency of 300Hz. If the sampled signal is transmitted through an ideal LPF with cut-off frequency of 250Hz. What frequency component will present in the output?

6 (a) Prove that the correlation and convolution functions are identical for even signals.
(b) Show that the auto-correlation function at the origin is equal to the energy of the function.

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) 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 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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) A rectangular function f(t) is defined by $f(t)$ =1for $0<t<\pi$ and f(t) =–1 for $\pi<t<2\pi$. Approximate this function by a waveform `Sint' over the interval (0,1) such that the mean square error is zero.

(b) Explain how signum function is expressed in terms of unit step function.

2 (a) For the continuous-time periodic signal $x(t) = 2 + \cos(\frac{2\pi}{3}t) + 4\sin(\frac{5\pi}{3}t)$ Determine the fundamental frequency W_0 and the Fourier series coefficients such that $x(t) = \sum_{k=-\alpha}^{\alpha} a_k e^{jkw_{ot}}$

(b) What is the Half-wave symmetry? Show the Fourier series expansion of a periodic wave having half wave symmetry is void of even harmonics.

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) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system.

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

5 (a) Derive the expression for transfer function of flat top sampled signal.

(b) If *m(t)* is band limited that is *M(w)=0*, for $|w| > w_m$. Then show that $\int_{-\infty}^{\infty} |m(t)|^2 \, dt = T_S \sum_{n=-\infty}^{\infty} [m(nT_S)]^2$ Where $T_S = \frac{\pi}{w_m}$

6 (a) Find the auto correlation of $f(t) = Sin(w_c t)$.

(b) Derive the relation between convolution and correlation functions of $f_1(t)$ and $f_2(t)$.

7 (a) If x(t) is an even function, prove that X(s) = X(–s) and if x(t) is odd prove that X(s) = –X(–s).

(b) Find the Laplace transform of $x(t) = e^{-t} Sin(w_0 t + \phi)u(t)$ and its ROC

8 (a) Find z-transform, ROC and pole-zero locations of $x[n] = a^n u[n]$.

(b) State and prove differentiation property of z-transform.

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Code: 9A04304 **4**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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) Derive the expression by which the Mean square error can be evaluated.
(b) Evaluate the following integrals: i) $\int_0^5 \delta(t)\sin(2\pi t)\,dt$ ii) $\int_{-\alpha}^{\alpha} e^{-\alpha t^2}\delta(t-10)dt$

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) Briefly discuss the classification of systems.
(b) Let the transfer function of an LTI system be $\frac{1}{jw+2}$. What is the output of the system for an input $(0.8)^t u(t)$.

5 (a) What is the effect of under sampling?
(b) The signal $x(t)$ with Fourier transform $X(j\omega) = u(\omega + \omega_0) - u(\omega - \omega_0)$ can undergo impulse train sampling without aliasing, provided that the sampling period $T<\pi/\omega_0$. Justify.

6 (a) Find the auto-correlation function and also power spectral density of the signal, $f(t) = ASin(\omega_0 t + \varphi_1) + BSin(2\omega_0 t + \varphi_2)$, where ω_0 is fundamental frequency component.
(b) Mention the applications of correlation function.

7 (a) Find the inverse Laplace transform of $X(s) = \frac{5s+13}{s(s^2+4s+13)}, \mathrm{Re}(s) > 0.$
(b) Prove the convolution property of Laplace transform.

8 (a) State and prove the scaling and time shifting properties of z transform.
(b) Find the z transform of $x[n] = a^n Cos[n\frac{\pi}{2}]$.

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Code: 9ABS302

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATHEMATICS-III
(Common to EEE, EIE, E.Con.E, ECE, ECC)

Time: 3 hours Max Marks: 70

1

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

1 (a) Prove that $\int_0^1 x^4\left[\log\left(1/x\right)\right]^3 dx = 6/625$

(b) Prove that $J_1^2(x) = \left(1-\frac{4}{x^2}\right)J_{1(x)} + \frac{2}{x}J_{0(x)}$

(c) Prove that $\int_{-1}^{1} p_n(x)dx = 0, for\ n \neq 0$

2 (a) Find the analytic function whose real part is $u = e^x[(x^2-y^2)cosy - 2xy\ siny]$

(b) Prove that $u = 2x - x^3 + 3xy^2$ is harmonic and find its harmonic conjugate. Find also the corresponding analytic function.

3 (a) Find the principal value of (i) $\sqrt{2i}$ (ii) $\left(\sqrt{i}\right)^i$

(b) Find all values of (i) 1^i (ii) i^{-2i}

4 (a) Evaluate $\int_c (y^2+z^2)dx + (z^2+x^2)dy + (x^2+y^2)dz$ from (0,0,0) to (1,1,1) where 'c' is the curve $x = t, y = t^2, z = t^3$ in the parametric form.

(b) Evaluate $\oint_c \frac{(z^2-z+1)}{(z-1)}$ $where\ c\ is\ (i)\ |z| = 1.$ $(ii)\ |z| = 1/2$

5 (a) Obtain the Taylor series expression of $f(z) = \frac{e^z}{z(z+1)}$ $about\ z = 2$

(b) Find the Laurent series expression of the function $\frac{z^2-1}{(z+2)(z+3)}$ $if\ 2 < |z| < 3$

6 (a) Find the residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$

(b) Evaluate $\int_c \frac{(z-3)dz}{(z^2+2z+5)}$; $c: |z+1+i| = 2$

7 Use Rouche's theorem to determine the number of roots of $f(z) = z^7 - 5z^4 + z^2 - 2$ within the annulus region $|z| = 1$

8 (a) Find the image of the rectangle R: $-\pi < x < \pi, \frac{1}{2} < y < 1$ under the transformation w=sinz.

(b) Find the bilinear transformation which maps the points $(\infty, i, 0)$ in the z-plane into $(-1, -i, 1)$ in the w-plane.

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Code: 9ABS302

2

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATHEMATICS-III
(Common to EEE, EIE, E.Con.E, ECE, ECC)

Time: 3 hours Max Marks: 70

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

1 (a) Show that $\int_0^2 x\sqrt[3]{8-x^3}\ dx = \frac{16\pi}{9\sqrt{3}}$
(b) Express $J_{7/2}(x)$ in terms of sinc cosinc functions.

2 (a) Find the analytic function f(z) such that $Re\left(f^1(z)\right) = 3x^2 - 4y - 3y^2\ and\ f(1+i) = 0$
(b) Show that $u = 2\log(x^2+y^2)$ is harmonic and find its harmonic conjugate.

3 (a) (i) Find all values of z such that e^{+z}=-2
(ii) Find all roots of the equation: tanz+2=0
(b) Find the real and imaginary parts of (i) cot z. (ii) cosec z.

4 (a) Evaluate $\int_c (x-2y)dx + (y^2-x^2)dy$ where 'c' is the boundary of the first quadrant of the circle $x^2+y^2=4$
(b) Evaluate $\oint_c \frac{dz}{z^{2+9}}$ where c is (i) $|z-3i|=4$. (ii) $|z+3i|=2$

5 (a) Obtain the Taylor's series to represent the function $\frac{z^2-1}{(z+2)(z+3)}$ in the region $|z|<2$
(b) Find the Laurent's series expansion of $f(z) = \frac{e^z}{z(1-z)}$ about z=1.

6 (a) Find the poles and the corresponding residue of $f(z) = \frac{2z+1}{z^2-z-2}$
(b) Evaluate $\int_0^\infty \frac{dx}{(x^2+9)(x^2+4)^2}$ using residue theorem.

7 (a) State and prove Rouche's theorem.
(b) Apply Rouche's theorem to determine the number of roots of z^4-5z+1 that lie within the annulus region $1<|z|<2$

8 (a) Find the image of the triangle with vertices (i, 1+i, 1-i) in the z-plane under the transformation w=3z+4-2i.
(b) Find the bilinear transformation that maps the points (∞, i, o) into the points (o, i, ∞).

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Code: 9ABS302

3

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATHEMATICS-III
(Common to EEE, EIE, E.Con.E, ECE, ECC)

Time: 3 hours Max Marks: 70

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

1 (a) Show that $\int_0^\infty e^{-x^4}dx = \frac{1}{4}\Gamma\left(\frac{1}{4}\right)$
(b) Express $J_{3/2}, J_{-3/2}$ in terms of sin and cos.
(c) Show that $P_n^1(1)=n(n+1)/2$

2 (a) Find the analytic function whose imaginary part is $e^{-x}(x\,cosy + ysiny)$
(b) State and prove Cauchy-Riemann equations in Cartesian coordinates.

3 (a) Find the principal value of $\left\{\frac{1}{2}[e(-1-i\sqrt{3})]\right\}^{3\pi i}$
(b) If $\tan\log(x+iy) = a+ib$ such that $a^2+b^2\neq 1$, show that $\tan\log(x^2+y^2) = \frac{2a}{1-a^2-b^2}$

4 (a) Evaluate $\int_{1-i}^{2+i}(2x+1+iy)dz$ along (1- i) to (2+i).
(b) Evaluate $\oint_c \frac{e^z dz}{z(1-z)^3}$ $where\ c\ is$ $(i)\ |z|=\frac{1}{2}$ $(ii)\ |z-1|=\frac{1}{2}$ $(iii)\ |z|=2$

5 (a) Expand $f(z) = {}^1\!/_{z^2-z-6}$ $about$ $(i)\ z=-1.$ $(ii)\ z=1.$
(b) Obtain the Laurent's series expansion of
$f(z) = {}^1\!/_{(z^2+1)(z^2+2)}$ $in\ the\ region\ 1<|z|<\sqrt{2}$

6 (a) Find the residues at all poles in finite plane $\frac{z^2-2z}{(z+1)^2(z^2+4)}$
(b) Evaluate $\int_c \frac{z-3}{z^2+2z+5}\,dz$ $where\ c: |z+1-i|=2$

7 Using argument principle prove that the complex polynomial equation $2z^4-3z^3+3z^2-z+1=0$ has no roots on the real and imaginary axes and has one complex root in each quadrant.

8 (a) Plot the image $1<|z|<2$ under the transformation w=2iz+1.
(b) Find the bilinear transformation that maps the points (1, i, -i) into the points (2, +i, -2).

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Code: 9ABS302

4

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATHEMATICS-III
(Common to EEE, EIE, E.Con.E, ECE, ECC)

Time: 3 hours Max Marks: 70

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

1 (a) Prove that $\beta(m,n) = \frac{1}{2}\int_0^\infty \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}\,dx$

(b) Prove that $J_n^{II} = \frac{1}{4}[J_{n-2} - 2J_n + J_{n+2}]$

(c) Prove that $x\,P_n^1(x) = n\,P_n(x) + P_{n-1}^1(x)$

2 (a) Show that the function f(z) defined by $f(z) = \begin{cases} x^3(1+i) - y^3(1-i), & (z \neq 0) \\ 0, & (z = 0) \end{cases}$ is continuous and the Cauchy – Riemann equations are satisfied at the origin but $f^1(0)$ does not exist.

(b) Verify that $u = x^2 - y^2 - y$ is harmonic in c and find a conjugate harmonic function v and u.

3 (a) Find the real and imaginary parts of $\log\sin(x+iy)$

(b) If $\tan(x+iy) = A + iB\ show\ that\ A^2 + B^2 + 2A\ cot 2x = 1$

4 (a) Evaluate $\int_c (y^2 + 2xy)dx + (x^2 - 2xy)dy$ where 'c' is the boundary of the region by $y = x^2\ and\ x = y^2$

(b) Evaluate using Cauchy's theorem $\int_c \frac{z^3 e^{-z}}{(z-1)^3}\,dz$, where 'c' is $|z-1| = 1/2$

5 (a) Expand $\log z$ by Taylor's series about z=1.

(b) Find the Laurent's expansion of $\frac{1}{z^2-4z+3}, for\ 1 < |z| < 3$

6 (a) Find the residues at all its poles in finite plane $50z/[(z+4)(z-1)^2]$

(b) Evaluate $\int_0^{2\pi} d\theta/2 + \cos\theta$

7 Prove that $z^4 + 2z^3 + 3z^2 + 4z + 5 = 0$ has no real or imaginary roots and that it has one complex root in each quadrant.

8 (a) Show that the function $w = 4/z$ transforms the straight line $x = c$ in the z-plane into a circle 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: 9ABS303

1

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ENVIRONMENTAL SCIENCE
(Common to EEE, EIE, E.Con.E, ECE, ECC, CSS)

Time: 3 hours Max Marks: 70

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

1 How can one create public awareness regarding various environmental problems faced by the society? Write an essay.

2 (a) Write notes on environmental effects of extracting and using mineral resources.
(b) Write about uses and over exploitation of surface and ground water.

3 (a) Give the characteristic features of a forest ecosystem.
(b) Discuss the structure and function of an ecosystem.

4 (a) Discuss poaching of wildlife in respect of our country.
(b) Write about ex – situ conservation of bio diversity.

5 (a) Define marine pollution. Discuss the control measures.
(b) Write about solid waste management of urban waste.

6 (a) Write about watershed management. Give the success story of any watershed management in the country.
(b) Write short notes on wasteland reclamation.

7 (a) Discuss population growth over the past ten years in the world.
(b) Write about the measures being taken by our government for controlling HIV/AIDS in the country.

8 Describe a visit to a local area to document environmental asset such as a river or a hill or a mountain.

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Code: 9ABS303

2

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ENVIRONMENTAL SCIENCE
(Common to EEE, EIE, E.Con.E, ECE, ECC, CSS)

Time: 3 hours Max Marks: 70

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

1 Write an essay on multidisciplinary nature of environmental studies.

2 (a) Write notes on effect of mining on forest and tribal people.
(b) Discuss the effects of modern agriculture on food resources of the world.

3 (a) Give the characteristic features of an aquatic ecosystem.
(b) Discuss the energy flow in the ecosystem.

4 (a) Define biodiversity. Give biogeographical classification of India.
(b) Write notes on man – wildlife conflicts quoting case studies.

5 (a) Define air pollution. Discuss the control measures.
(b) Discuss the cause, effects and control measures of noise pollution.

6 (a) Write about rain water harvesting in rural and urban areas.
(b) Give salient points of forest conservation act.

7 (a) Write notes on family welfare programme in our country.
(b) Discuss the role of IT in environment and human health with the help of a case study.

8 Report the field work undertaken by you during visit to a local area for study of a polluted site.

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Code: 9ABS303 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ENVIRONMENTAL SCIENCE
(Common to EEE, EIE, E.Con.E, ECE, ECC, CSS)

Time: 3 hours Max Marks: 70

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

1 Discuss the scope and importance of environmental studies.

2 (a) Write short notes on renewable energy resources.
(b) Write notes on uses and over exploitation of forest resources.

3 (a) Give the characteristic features of a grassland ecosystem.
(b) Write short notes ecological pyramid.

4 (a) Write about endangered and endemic species of India.
(b) Discuss in – site conservation of biodiversity.

5 (a) Write about causes, effects and control measures of industrial wastes.
(b) Write about nuclear hazards quoting a recently happened nuclear disaster.

6 (a) Write about watershed management leading to water conservation.
(b) Discuss ozone layer depletion and its effect on human health.

7 (a) What are human rights? How are they protected by law?
(b) Discuss HIV/AIDS control measures being taken by our government.

8 (a) How does value education help in grooming engineering graduates? Discuss.
(b) Briefly write about a local polluted site that you have visited recently.

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Code: 9ABS303

4

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ENVIRONMENTAL SCIENCE
(Common to EEE, EIE, E.Con.E, ECE, ECC, CSS)

Time: 3 hours Max Marks: 70

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

1 Write an essay on multidisciplinary nature of environmental studies.

2 (a) Write notes on effect of mining on forest and tribal people.
(b) Discuss the effects of modern agriculture on food resources of the world.

3 (a) Give the characteristic features of a grassland ecosystem.
(b) Write short notes ecological pyramid.

4 (a) Write about endangered and endemic species of India.
(b) Discuss in – site conservation of biodiversity.

5 (a) Define marine pollution. Discuss the control measures.
(b) Write about solid waste management of urban waste.

6 (a) Write about watershed management. Give the success story of any watershed management in the country.
(b) Write short notes on wasteland reclamation.

7 (a) Write notes on family welfare programme in our country.
(b) Discuss the role of IT in environment and human health with the help of a case study.

8 (a) How does value education help in grooming engineering graduates? Discuss.
(b) Briefly write about a local polluted site that you have visited recently.

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Code: 9A02305

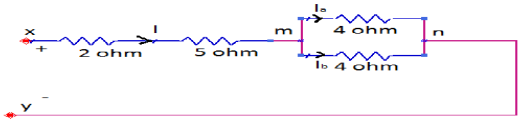
1

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL CIRCUITS
(Common to EEE,EIE, E.Con.E, ECE, and ECC)

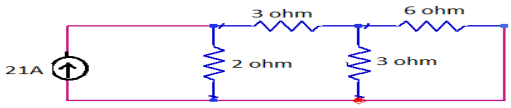
Time: 3 hours Max Marks: 70

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

1 (a) Draw the volt-current characteristic of practical voltage source.
(b) Calculate the voltage that is to be connected across terminal x-y in figure such that the voltage across the 2ohms resistor is 5V. Also find Ia and Ib. what is the total-power loss in the circuit?



2 (a) With three mesh general circuits explain the mesh analysis to find the loop currents.
(b) Determine the current through 6ohm resistor and the power supplied by the current source for the circuit shown in the figure.



3 (a) a) Derive the basic equation of an alternating quantity. Hence state its various forms.
(b) A 50Hz sinusoidal voltage applied to a single phase circuit has its RMS value of 200V. 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.

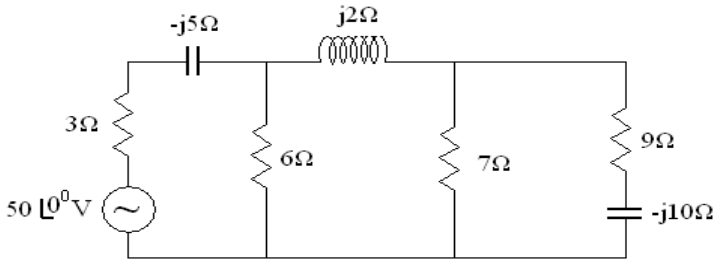
4 (a) Give the expression for frequency and current at resonance in parallel resonance circuit.
(b) A RLC series circuit consists of R=50 ohms L=0.16H and C= 4micro farads. Calculate resonant frequency, quality factor, band width and half power frequencies.

5 (a) Explain Statically Induced emf.
(b) Two coils having 500 and 1000 turns, respectively, are wound side by side on a closed iron circuit of area of cross section 100cm^2 and mean length 800cm. calculate the coefficient of self induction of the two coils and the mutual induction between the two coils. Neglect leakage. Take μ_r as 2000. Find coefficient of coupling between two coils.

Cont... Page 2

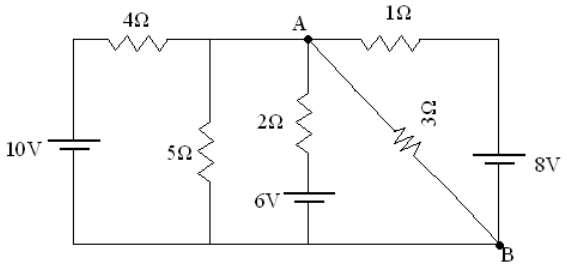
6 (a) Write the properties of tree with example.

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

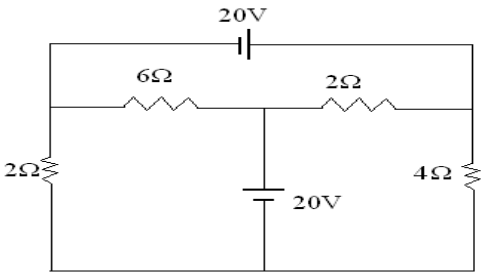


7 (a) Determine the condition for Maximum Power transfer to the load for A.C networks, here load impedance is constant resistance and variable reactance.

(b) In the circuit shown, calculate voltage across 3Ω resistor using Milliman's theorem.



8 Find the voltage across 4Ω resistor in the circuit shown using Superposition theorem and also verify it using mesh analysis.



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Code: 9A02305 **2**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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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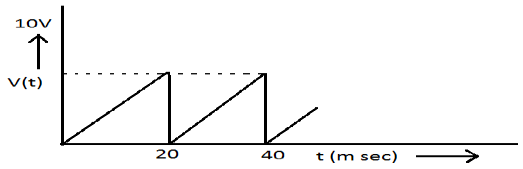
1 (a) Write a note on resistance and V-I relationship with suitable examples.
(b) A saw tooth voltage as shown in figure is applied to a capacitor of C= 30micro Farad. Find the capacitor current.



2 (a) The expressions for n resistances connected in parallel.
(b) A 20V battery with an internal resistance of 5ohms is connected to a resistor of x ohms. If an additional resistance of 6ohms 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 average power consumed by pure inductor and capacitor is zero.

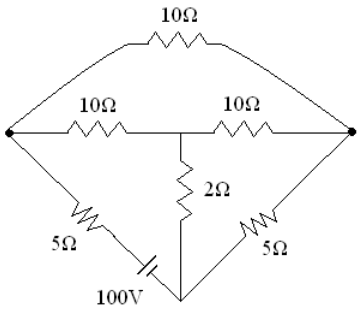
(b) A resistance of 16ohms is connected in parallel to an inductance of 20mH and the parallel combination is connected to an ac supply of 230V, 50Hz. Determine the current through the elements and power delivered by the source, draw the phasor diagram.

4 Show that the locus of the current in an R-L circuit with XL variable is a semicircle. Find the radius and the center of the circle.

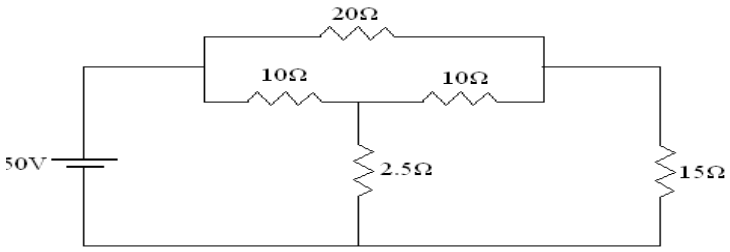
5 (a) Write the comparison between magnetic circuits and electric circuits.
(b) A solenoid of 1000 turns is wound uniformly on an iron ring of mean diameter 50cm. a radial saw cut of 2.5mm is provided in the ring. Calculate the excitation current required in the coil so that a flux density of 2.5wb/m^2 exists in the ring. Given that relative permeability of iron is 1500.

Cont... Page 2

6 For the network shown in figure, write a tie set schedule and equilibrium equation on current basis. Obtain the values of branch currents & branch voltages.



7 (a) State and explain Norton's Theorem.
(b) Find Current through 15Ω resistor using Thevenin's Theorem.



8 (a) State and explain Tellegen's theorem.
(b) Write limitations of Super position theorem.
(c) Prove Reciprocity theorem.

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Code: 9A02305

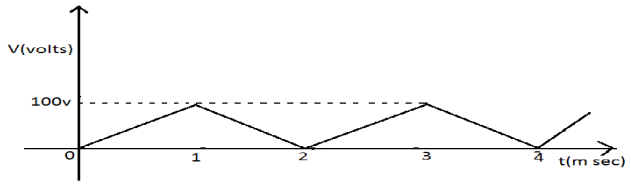
3

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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) Define (i) passive and active networks. (ii) ideal and practical voltage sources. (iii) ideal and practical current sources
(b) The voltage waveform shown In figure is applied to a pure capacitor of 50micro farads. Sketch i(t), p(t) and determine Im and Pm.(D)



2 (a) Derive the expressions for n capacitors connected in parallel.
(b) A heater element takes 8W of power when connected to the power mains. This element is redrawn such that the length of the element is doubled. Determine the power consumed now when connected to the same power mains.

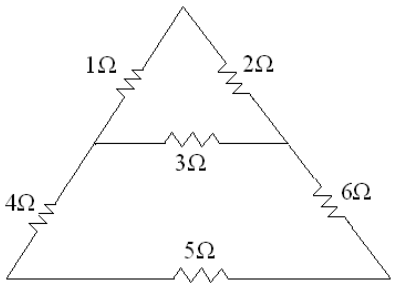
3 (a) Derive the expressions for ac through series RC circuit.
(b) Calculate the resistance and inductance or capacitance in series for each of the following impedances assume the frequency to be 60 Hz.
(i) 12+j30 ohms, (ii) –j60 ohms (iii) 20< 60degrees ohms

4 (a) Derive the expressions of quality factor using the general definition and show that greater the quality smaller the band width, using current vs. angular frequency plot for various values.
(b) For the RLC series circuit R=5ohms, L=0.03H, C=100 micro farads. Determine the frequency at which the circuit resonates. Also find the quality factor, voltage across the inductance, voltage across capacitance, at resonance.

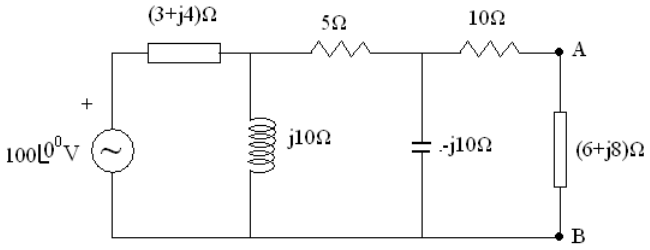
5 (a) Derive the expression for equivalent inductance of two coils connected in parallel opposing.
(b) Two coupled coils with respect to self inductances L_1=0.6H, L_2=0.4H having a k=0.4. coil 2 has 100 turns. The current in coil 1 is I_1=10sin200t A. determine the voltage at coil 2 and maximum flux set up by coil 1.

Cont... Page 2

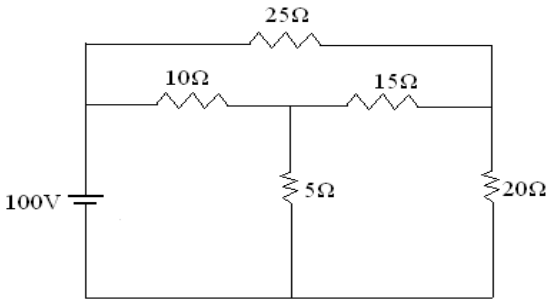
6 (a) Write the properties of tie-set matrix and cut-set matrix.
(b) For the network shown in figure, Obtain cut-set matrix.



7 (a) Write steps to find Norton's equipment circuit for the given circuit.
(b) Calculate voltage across (6+j8) Ω impedance using thevenins 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

4

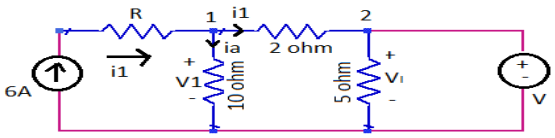
II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL CIRCUITS
(Common to EEE,EIE, E.Con.E, ECE, and ECC)

Time: 3 hours Max Marks: 70

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

1 (a) Explain the classification of electrical networks.
(b) Star connected network consists of three resistances 3 ohm, 6ohm, and 10 ohm. Convert the star connected network to equivalent delta network.

2 (a) Derive the expressions for n capacitors connected in series.
(b) Find v in figure below, if v1=20V.



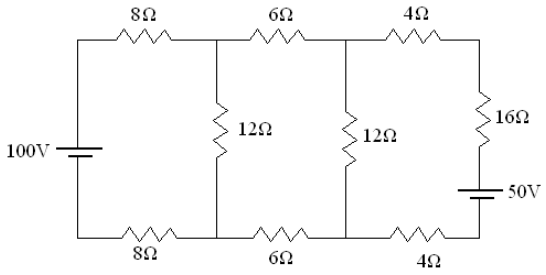
3 (a) a) Derive the expressions for ac through pure capacitance circuit.
(b) Define the concept of capacitive reactance.
(c) A 50 Hz alternating voltage of 150V RMS is applied independently to
(i) Resistance of 10 ohms. (ii) inductance of 0.2H. (iii) capacitance of 50 micro farads. Find the expressions for the instantaneous current in each case. Draw the phasor diagram in each case.

4 (a) Explain all the characteristics of parallel resonant circuit with necessary derivations.
(b) In a RLC series circuit, the resistance, inductance and capacitance are 10 ohm , 100mH 10 micro farad. Calculate ω0, ω1 and ω2. Also find Band Width and selectivity.

5 Derive expression for reluctance in series magnetic circuits.
(b) An iron bar with 50 c.m long and 2.5 c.m in diameter is bent into a circular shape. It is then wound with 800 tunrs of wire. Calculate current required to produce a flux of 0.8 mwb in the magnetic circuit in the following cases
(i) No air gap. (ii) With an air gap of 0.8 mm, assume μ_r of iron is 5000.

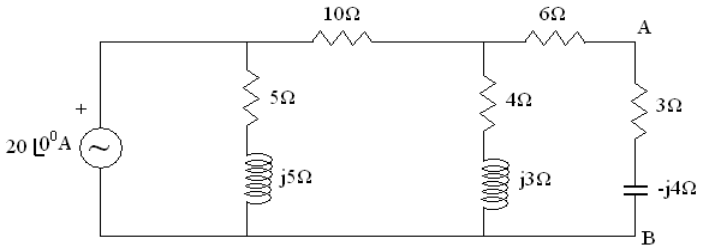
Cont... Page 2

6 Using mesh analysis find current through all the elements in the circuit shown and also find power absorbed by all the resistors.



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

(b) Obtain voltage across (3-j4)Ω impedance using Norton's theorem for the network shown below.



8 (a) State and explain Tellegen's theorem.

(b) Write limitations of Super position theorem.

(c) Prove Reciprocity theorem.

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Code: 9A04301

1

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRONIC DEVICES AND CIRCUITS
(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE & MCT)

Time: 3 hours Max Marks: 70

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

1 (a) With a neat diagram explain the working of an open circuited PN junction. Give necessary response curves.
(b) The current flowing in a germanium PN junction diode at room temperature in $9x10^{-7}$A, when the large reverse voltage is applied. Calculate the current flowing when 0.1V forward bias is applied.

2 (a) With a neat circuit diagram and necessary wave forms explain the operators of PN junction diode half wave rectifier.
(b) An ac supply of 220V is applied to a half wave rectifier circuit through a transformer with a turns ratio of 10:1. Find (i) dc output voltage. (ii) PIV. Assume the diode to an ideal one.

3 (a) Draw the circuit of a BJT in CB configuration and explain its input and output characteristics with neat curves.
(b) An NPN transistor with α=0.9 is connected in CB configuration and gives a reverse saturation current I_{co}=15μA. Calculate the base and collector currents for an emitter current of 4mA.

4 (a) Draw the fixed bias circuit a transistor and derive the relevant expressions/ equations for fixed dias.
(b) A fixed dias circuit with V_{CC}=10V, a resistor R_C=2kΩ is connected between V_{CC}(+) and collector, Rb=100kΩ is connected between base and collector. Find I_B, I_C and V_{CE} with β=100. Transistor is made of silicon.

5 (a) With a neat construction diagram explain the principle of operation of a JFET. Give its characteristics.
(b) An n-channel JFET has I_{DSS}=10mA and V_P=-2V. Determine the drain source resistance 'r_{DS}' for (i) V_{GS}=0V. (ii) V_{GS}=-0.5V.

6 (a) Explain and give the expression for self bias arrangement of a FET with a neat circuit diagram.
(b) A FET amplifier in the common source configuration uses a load resistance of 250kΩ and the transconductance is 0.5mA/V. What is the voltage gain of the amplifier? Given r_d=200kΩ.

7 (a) For an emitter follower circuit determine A_I, A_V ,R_I, and R_O.
(b) For the emitter follower with R_S=0.5kΩ and R_L=5kΩ, calculate A_I, R_i, A_{VS} and R_o. Assume h_{fe}=50, h_{ie}=1kΩ, h_{oe}=25μA/V.

8 Write short notes on the following
(a) Varacter diode.
(b) Uni junction transistor.

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Code: 9A04301

2

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRONIC DEVICES AND CIRCUITS
(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE, & MCT)

Time: 3 hours Max Marks: 70

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

1 (a) Explain the working of a PN junction diode in both forward and reverse bias conditions along with characteristics.
(b) A diode reaches its maximum power rating of 2.5 watts when operating in the forward bias at the forward voltage of 900mv. Calculate
(i) The maximum allowable forward current I_f (max).
(ii) The forward diode resistance R_f.

2 (a) Explain the working of a full wave rectifier with a neat circuit diagram and with relevant wave forms.
(b) A full wave single phase rectifier employer a π-section filter consisting of two 4μF capacitors and one 20H choke. The load current is 50 μA. Calculate the DC output voltage and the ripple voltage. The resistance of the choke is 200Ω.

3 (a) Explain the operation of a BJT in CE configuration. Give its input – output characteristics. Define β.
(b) What is the value of α for a BJT that has a β of 90? Find the base and the emitter current if the collector current is 4mA.

4 (a) Give the analysis of a voltage – divider bias derive the necessary equations.
(b) In a transformer coupled amplifier stage, V_{CC}=12 V, R_C=4.3 KΩ V_{BE}=0.7 V and β=50. the quiescent voltage V_{CE} is 4V. Determine
(i) R_E. (ii) The stability factor 'S'.

5 (a) Explain the working of a depletion type MOSFET with a neat construction diagram and its characteristics.
(b) An n-channel depletion type MOSFET has I_{DSS}=10mA and V_p=-2v. Determine the actual value of drain to source resistance r_{DS} when (i) V_{GS}=1V. (ii) V_{GS}=2V.

6 (a) With a neat circuit diagram explain the operation of a voltage divider bias arrangement of JFET with necessary equations.
(b) The Q-point of a JFET in a source self – bias arrangement is chosen at V_{GS}=-1.5V and I_{Dsat}=2mA. Find the value of the resistance R_S.

7 (a) For a BJT derive the expressions for the current gain (A_I), voltage gain (A_V), input resistance (R_i) and output resistance (R_O).
(b) Design an emitter follower having R_i=500kΩ, R_O=20Ω. Assume h_{fe}=50, h_{ie}=1kΩ, h_{oe}=25μA/v. Also find A_I and A_V for the emitter follower.

8 Write short notes on the following
(a) Schottky Barrier diode.
(b) Light dependent resistor.

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Code: 9A04301 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRONIC DEVICES AND CIRCUITS
(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE, & MCT)

Time: 3 hours Max Marks: 70

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

1 (a) Discuss about temperature dependence of the V-I characteristics of a PN junction diode.
(b) For a diode calculate (i) The maximum allowable forward current I_f(max).
(ii) The forward diode resistance R_f when the maximum power rating of diode is 3.0watts and forward bias voltage of 1200mv.

2 (a) Explain the working of a bridge rectifier with a neat circuit diagram and with relevant wave forms.
(b) Ideal diodes are used in a bridge rectifier with a source of 230V, 50Hz. If the load resistance is 150Ω and turns ratio of transformer is 1:4, find the dc output voltage and pulse frequency of the output.

3 (a) With a neat diagram explain how a transistor acts as an amplifier. Give the DC load line analysis of a BJT.
(b) For a transistor calculate (i) β and (ii) α if the base current is 20μA and the collector current is 5mA.

4 (a) Discuss about stabilization in a transistor against variations in I_{CO}, V_{BE} and β.
(b) In a voltage divider bias circuit, V_{CC}=20 V and R_C=1.5 kΩ, the Q point is V_{CE}=8V and I_C=4mA. Stability factor S=12 and β=50. Find R_1, R_2 and R_E.

5 (a) Explain the working of an enhancement type MOSFET with a neat construction diagram and its characteristics.
(b) An n-channel enhancement type MOSFET has k=25mA/v^2 and $V_\gamma = 2v$. Determine drain-source resistance γ_{DS} for (i) V_{GS}=4V; (ii) V_{GS}=6V; (iii) V_{GS}=10V.

6 (a) Give the comparison between JFET and BJT.
(b) For a constant drain – to –source voltage, if the gate – to – source voltage is changed from 0 to 2V. The corresponding change in the drain current becomes 2mA. Calculate transconductance of the FET if the ac drain resistance is 200 kΩ. Also calculate the amplification factor of the FET.

7 (a) For common base amplifier derive A_I, A_V, R_I and R_O.
(b) For the emitter follower with R_S=1 kΩ and R_L=2 kΩ. Calculate A_I, R_i, A_V, A_{VS} and R_O. Assume h_{fe}=50, h_{ie}=1 kΩ, h_{oe}=25 μA/V.

8 Write short notes on the following
(a) Thermistor.
(b) Right emitting diode.

*****

Code: 9A04301 **4**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRONIC DEVICES AND CIRCUITS
(Common to EIE, E.Con.E, ECE, ECC, CSS, IT, CSE, EEE & MCT)

Time: 3 hours Max Marks: 70

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

1 (a) Discuss about working of a zener diode using its V-I characteristics.
(b) The current flowing in a silicon PN junction diode at room temperature is 10μA, when the large reverse voltage is applied. Calculate the current flowing when 0.2v forward bias is applied.

2 (a) With a neat circuit diagram explain the working principle of a Zener voltage regulator.
(b) For a Zener shunt regulator if v_z=10v, R_S=1kΩ, R_L=10kΩ and the input voltage varies from 25 to 40 V. Find the maximum and minimum values of Zener current.

3 (a) Define α and β. Derive the relationship between α and β of the transistor.
(b) For a PNP transistor α=0.98 connected in CB configuration and reverse saturation current is 10μA. Calculate the base and collector currents for an emitter current of 5mA.

4 (a) Bring out the differences between Emitter feedback bias and collector to emitter feedback bias.
(b) In a self bias circuit V_{CC}=10v, R_C=2.5kΩ and the Q point is V_{CE}=5v and I_C=2mA. A stability factor of 10 is desired and β=60. Calculate R_1, R_2 and R_E.

5 (a) Give the analysis of a JFET small signal model. Derive the necessary equations.
(b) Determine drain to source resistance γ_{ds} of an m-channel depletion type MOSFET having I_{DSS}=10mA and V_P=-2v for V_{GS} values of (i) 3v and (ii) 4.5v.

6 (a) With a neat circuit diagram explain about fixed bias arrangement of a JFET.
(b) Calculate the dynamic resistance of a JFET having an amplification factor of 80 and transconductance of 400 μmho.

7 (a) For a common emitter amplifier derive the expressions for A_I, A_V, R_I and R_O.
(b) For the emitter follower with R_S=0.75 kΩ and R_L=3 kΩ. Calculate A_I, R_I, $A_V A_{VS}$ and Ro. Assume h_{fe}=50, h_{ie}=1 kΩ, h_{oe}=25 μA/v.

8 Write short notes on the following
(a) Tunnel diode.
(b) Silicon controlled rectifier.

*****

Code: 9A04303 **1**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Common to Electronics & Instrumentation Engg, Electronics & Control Engg, Electronics & Communication Engg)

Time: 3 hours Max Marks: 70

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

1 (a) Define (i) Probability. (ii) Certain event. (iii) Impossible event.
(b) A die is tossed find the probability of event A=$\{odd\ number\ show\ up\}$, B= $\{number\ larger\ than\ 3\ shows\ up\}$, A ∪ B $and\ A \cap B$

2 (a) Telephone calls are initiated through an exchange at the average rate of 75 per minute and are described by a Poisson process. Find the probability that more than 3 calls are initiated in any '5' second period.
(b) The Rayleigh density function is given by $f(x) = \begin{cases} xe^{-x^2/2}, & x \geq 0 \\ 0, & x < 0 \end{cases}$ find the distribution function $F_x(x)$ and p(0.5<x≤2)

3 (a) Find the moment generating and characteristic function of a Gaussian random variable 'x' which has uniform distribution.
(b) The characteristic function for an Gaussian RV 'y' having a mean value of '0' is $\emptyset x(\omega) = exp(-\pi^2\omega^2 / 2)$ Find second moment of x using $\emptyset x(\omega)$

4 (a) The joint density of two RV. x and y is $f_{x,y}(x,y)=0.1\delta(x)\delta(y) + 0.12\ \delta(x-4)\delta(y) + 0.05\delta(x)\delta(y-1) + 0.25\delta(x-2)\delta(y-1)$. Find and plot the marginal distributions of x and y.
(b) Write the properties of the joint density function.

5 (a) Gaussian Rv x_1 and x_2 for which $\overline{x1}$ =2, σ_{x1}^2=9, $\overline{x2}$ =-1, σ_{x2}^2=4 and C_{x1x2}= -3 are transformed to new Rv y_1 and y_2 according to $y_1=-x_1+y_2$, $y_2=-2x_1-3x_2$. Find (a) $\overline{x_1^2}$ (b) $\overline{y_2^2}$
(c) f_{x1x2} (d) σ_{y1}^2 (e) σ_{y2}^2 and (f) C_{y1y2}.

6 (a) Given the ACF for a stationary ergoclic proceis with no periodic component is $R_{xx}(y)=25+4/1+6y^2$. Find the mean value and variance of the process X(t).
(b) Let X(t) be a wide sense stationary random process with ACF $R_{xx}(y)=e^{-a/y}$, a>0 is a constant. We assume X(t) amplitude modulate a carrier $\cos(\omega_0 t+\Phi)$, where ω_0 is a constant and θ is a random variable uniform on (-π,π) that is statistically independent of X(t). We determine the ACF of $X(t)=X(t_1 \cos(\omega_0 t+\theta)$.

7 (a) A wss random process X(t) has $R_{xx}(T)=A_0\begin{cases} 1-\frac{|\tau|}{\tau} & -\tau < t \leq \tau \\ 0 & else\ where \end{cases}$
(b) $R_{xx}(y)=\frac{A_0^2}{2} sin\omega_0\tau$. Find $S_{xx}(\omega)$

8 (a) Find the power density spectrum of the random process for which $R_{xx}(\tau)=P cos^4(\omega_0\tau)$, if P and ω_0 are constants. Determine the power in the power.
(b) A random process has the power density spectrum $y_{xn}^{(w)} = \frac{6w^2}{1+w^4}$ find the average power in the process.

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Code: 9A04303

2

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Common to Electronics & Instrumentation Engg, Electronics & Control Engg, Electronics & Communication Engg)

Time: 3 hours Max Marks: 70

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

1 Define and explain the following with example
(a) Probability (b) Sample space
(c) Discrete sample space (d) Continuous sample space

2 (a) A random variable 'x' has the distribution function $F_x(x) = \sum_{n=1}^{12} \frac{n^2}{650} 4(x-n)$. Find the probabilities (i) p{-α<x≤6.5} (ii) p{x>y} (iii) p{6<x≤9}.

(b) Determine the real constant a,f arbitrary real constants m and b>0, such that $f_x(x)=ae^{-(x-m)/b}$ is a valid density function.

3 (a) Explain the following terms in detail
(i) Expectation of a RV. (ii) Expected value of a function of a RV.

(b) Let 'x' be a RV defined by the density function $f_x(x) = \begin{cases} \frac{\pi}{16}\cos\left(\frac{\pi x}{8}\right), -4 \le x \le 4 \\ 0 \ else\ where \end{cases}$

4 Given the function $f_{x,y}(x,y) = \begin{cases} b(x+y)^2, \ -2 < x < 2 \ and -3 < y < 3 \\ 0 \ else\ where \end{cases}$

(a) Find the constant 'b' such that this is a valid density function.
(b) Determine the marginal density function $f_x(x)$ and $f_y(y)$.

5 Two random variables x and y are defined by $\bar{X} = 0, \bar{Y} = -1, \overline{X^2} = 2, \overline{Y^2} = 4$ and R_{xy}=-2. Two new RV ωεu are ω=2x+y, u=-x-3y. Find $\bar{\omega}, \bar{U}, \overline{\omega^2}, \overline{U^2}, R_{\omega U}, \sigma_x^2 \ and \ \sigma_y^2$

6 A random process is defined by Y(t)=X(t) $\cos(w_0 t + \theta)$, where X(t) is a Wss random process that amplitude modulates a carrier of constant angular frequency 'ω_0' with a random phase 'θ' independent of X(t) and uniformly distributed on (-π,π).
Find (i) E[y(t)]. (ii) ACF of y(t) (iii) Is y(t) wide sense stationery.

7 A random process has a power spectrum $y_{xx}(w) = \begin{cases} 4 - \left(w^2/9\right), |w| \le 6 \\ 0 \ else\ where \end{cases}$ Find the
(a) Average power (b) the rms band width and ACF of the process.

8 (a) Derive the relation between PSD of input and output random process of an LTI system.
(b) Derive the relation between cross power spectrum and cross correlation function.

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Code: 9A04303 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Common to Electronics & Instrumentation Engg, Electronics & Control Engg, Electronics & Communication Engg)

Time: 3 hours Max Marks: 70

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

1 (a) In a ball there are 500 coloured balls: 75 black, 150 green, 175 red, 70 white and 30 blue. What are the probabilities of selecting a ball of each colour.
(b) A single card is drawn from a 52 card deck.
(i) What is the probability that a card will be a 5 or small?
(ii) What is the probability that a card is a jack?
(iii) What is the probability that the card is a red 10?

2 (a) Show that the mean value and variance of the Rv having the uniform density functions are $\bar{X} = \frac{(a+b)}{2}\ and\ \sigma_X^2 = \frac{(b-a)^2}{12}$
(b) A Rv 'x' has a probability density $f_x(x) = \begin{cases} \frac{1}{2}\cos(x), -\frac{\pi}{2} < x < \frac{\pi}{2} \\ 0\ \ else\ where\ \ in\ x \end{cases}$ Find the mean value of the functions $g(x)=4x^2$.

3 Explain and sketch the PDF and probability distribution functions of
(i) Exponential distribution. (ii) Rayleigh distribution. (iii) Uniform distribution.

4 (a) Find a constant b (in terms of a) so that the function
$f_{x,y}(x,y) = \begin{cases} \text{b}\, e^{-(x+y)}\ 0 < x < a\ and\ 0 < y < \propto \\ 0\ \ else\ where \end{cases}$ is a valid joint density function.
(b) Find an expression for the joint distribution function.
(c) Find the marginal density functions.

5 Two Rv X and Y have means $\bar{x} = 1\ and\ \bar{y} = 2$, variances $\sigma_X^2 = 4\ and\ \sigma_y^2 = 1\ and\ af_{xy} = 0.4$. New Rv w and v are defined by $v = -x + 2y, w = x + 3y$. Find the
(a) Means. (b) Variances. (c) The correlations. (d) The correlation coefficient f_{vw} of v and w.

6 Explain the classification of random process with neat sketches.

7 A random process is given by $w(t) = Ax(t) + By(t)$, where A and B are real constants and x(t) and y(t) are jointly wss process. Find the
(a) Power spectrum $ר_{ww}^{(w)}\ of\ w(t)$ (b) Find $ר_{ww}^{(w)}\ if\ x(t) and\ y(t)$ are uncorrelation.
(c) Find the cross power spectrums of $ר_{xw}(w)\ and\ ר_{yw}(w)$.

8 (a) Derive the relation between PCDs of input and output random process of an LTI system.
(b) Derive the relation between crols power spectrum and crols correlation function.

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Code: 9A04303 **4**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Common to Electronics & Instrumentation Engg, Electronics & Control Engg, Electronics & Communication Engg)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Explain about the total probability.
(b) What is the probability of picking an ace and a king from a deck of 52 cards?
(c) A box contains 4 point contact diodes and 6 allay junction diodes. What is the probability that 3 diodes picked and random contain at least two point contact diodes?

2 (a) Telephone calls are initiated through an exchange at the average rate of 75 per minute and are described by a poisons process. Find the probability that more than 3 calls are initiated in any 5 seconds period.

(b) The Rayleigh density function is given by $f_x(x) = \begin{cases} xe^{\frac{-x^2}{2}} & x \geq 0 \\ 0 & x < 0 \end{cases}$ Find the distribution function $F_x(x)$ and $p(0.5<x\leq 2)$.

3 (a) If 'x' is a Rv, show that $V_{ar}(a+b)=a^2V_{ar}(x)$ and $E[ax]=aE[x]$.
(b) A random variable 'x' is uniformly distributed on the interval (-5, 15). Another Rv $y=e^{-x/5}$ is formed find E[y].

4 Two Rv x and y have a joint probability density function

$$f_{x,y}(x,y) = \begin{cases} {}^{5}/_{16}\,x^2y, & 0<y<2, 0<x<2 \\ 0 & else\ where \end{cases}$$

(a) Find the marginal density functions of x and y.
(b) Are x and y statistically independent. (c) Find f(x/y).

5 (a) Write the expression for expected value of a function of Rv and prove that the mean value of a weighted sum of random variables equals the weighted sum of mean values.
(b) Determine the variance of random variable y, where y=-6x+22.

6 Find the time average mean and time ACF of a random process for the random process $x(t)=A\cos(\omega_0 t+\theta)$ where A, ω_0 are constants and θ is the intervals(0, 2π).

7 Explain any 3 properties of crols correlation function.

8 Write any 3 properties of ACF.

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