Code: 9A04303 **R09**

II B.Tech I Semester (R09) Supplementary May 2012 Examinations
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Common to Electronics & Instrumentation Engineering, Electronics & Control Engineering and Electronics & Communication Engineering)

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

Answer any FIVE questions
All questions carry equal marks

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1. (a) State and prove the addition law of probability.
   (b) At a certain military installation six similar radars are placed in operation. It is known that a radar's probability of failing to operate before 500 hours of "on" time have accumulated is 0.06. What are the probabilities that before 500 hours have elapsed?
   (a) All will operate (b) All will fail and (c) only one will fail.

2. (a) What are the conditions for a random variable to be Gaussian? Explain.
   (b) Coin A has a probability of head equal to ¼ and probability of tail equal to ¾ . Coin B is a fair coin. Each coin is flipped four times. Let the random variable X denote the number of heads resulting from coin A and Y denote the resulting number of heads form coin B.
   (a) What is the probability that x=y=2.
   (b) What is the probability that x=y.
   (c) What is the probability that x+y≤5.

3. (a) Discuss about Chebychev's inequality.
   (b) Find the moment generating function of the random variable having probability density function.

$$f_x(x) = x, \quad 0 \le x \le 1.$$
$$= 2 - x, 1 \le x \le 2.$$
$$= 0 \quad \text{else where}$$

4. (a) Let X and Y be two standardized Gaussian random variable. Find the density function of Z=X+Y.
   (b) Explain the statistical independence of two random variables.

5. (a) State and prove the theorems of covariance.
   (b) If X and Y be independent random variables each having density function.

$$f_x(x) = 2.e^{-2x} \quad \text{for } x \ge 0;$$
$$= 0 \quad \text{else where;}$$
$$f_y(y) = 2\,e^{-2y} \quad \text{for } y \ge 0$$
$$= 0 \quad \text{else where}$$

   Find (a) E(X+Y) (b) $E[X^2+Y^2]$.

6. (a) Explain different types of random processes.
   (b) Sample functions in a discrete random process are a constants: that is

$$X(t) = C = \text{constant}$$

   Where C is a discrete random variable having possible values C_1=1, C_2=2, and C_3=3 occurring with probability 0.6, 0.3 and 0.1 respectively.
   (a) Is x (t) is determination.
   (b) Find the first-order density function of x(t) at any time t.

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7. (a) State and prove the properties of auto correlation function.
   (b) If x(t) is a stationary process having mean =3 and auto-correlation function $R_{xx}(\tau) = 9 + 2e^{-|\tau|}$. Find the mean and variance of the random variable.

8. (a) State and prove the properties of cross power density spectrum.
   (b) The cross spectral density of two random processes $x(t)$ and $y(t)$ is

$$S_{xy}(w) = 1 + \frac{Jw}{k} \quad \text{for} - k < w < k$$
$$= 0 \quad \text{else where}$$

Where $k > 0$. Find the cross correlation function between the processes.

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Code: 9A04304

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

SIGNALS & SYSTEMS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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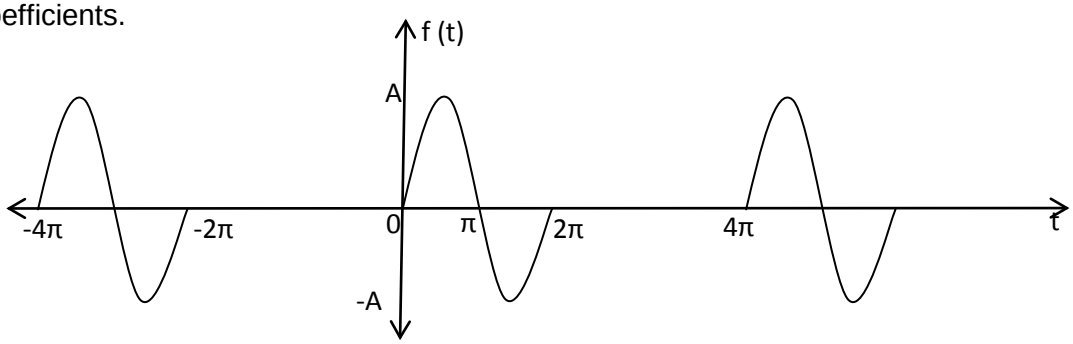
1 (a) Define and discuss the conditions for orthogonlity of functions.
(b) Prove that sinusoidal functions are orthogonal functions.

2 (a) Find the exponential Fourier series for the signal shown in figure by direct evaluation of the coefficients.



(b) Derive the relation between Trigonometric and exponential Fourier series coefficients.

3 (a) Find the Fourier transform of f (t) = Cos π t; -½≤t≤½ and f (t) = 0; otherwise.
(b) Find the Fourier Transform of (t-2) f (t) and (1-t) f (1-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) State and prove sampling theorem in frequency domain.
(b) What is aliasing? Explain its effect on sampling.

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) For the signal given below, find the Fourier transform from the Laplace transform, if possible. If it is not possible give the reason: $X(s) = \frac{s+2}{(s+1)(s+5)}$.
(b) State and prove convolution and differentiation properties of Laplace transform.

8 (a) Discuss in detail, the relationship between Laplace transform, and z transform. What is the region of convergence for z transform?
(b) Find the z transform of $x[n] = a^n u[-n-1]$.

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Code: 9ABS302 **R09**

II B.Tech I Semester (R09) Supplementary May 2012 Examinations
MATHEMATICS-III

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

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

Answer any FIVE questions
All questions carry equal marks

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1. (a) Show that $\beta(m,n) = \Gamma(m)\Gamma(n)/\Gamma(m+n)$
   (b) Show that $\int_0^1 \frac{x^n}{\sqrt{1-x^2}}dx = \frac{2.4.6.....(n-1)}{1.3.5.....n}$
   (c) Show that $\int_0^{\pi/2} \sqrt{\tan\theta}\ d\theta = 1/2\Gamma(1/4)\ \Gamma\ (3/4)$

2. (a) Prove that
   (a) $P_{n+1}^1(x) - P_{n-1}^1(x) = (2n+1)P_n(x)$.
   (b) $\frac{d}{dx}[x^{-n}J_n(x)] = -x^{-n}J_{n+1}(x)$
   (b) When n is an integer? Show that $J_n(x) = (-1)^n J_n(x)$.

3. (a) Find the analytic function whose imaginary part is $f(x,y) = x^3y - xy^3 + xy + x + y$ where $z = x + iy$.
   (b) Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|\text{Re } f(z)|^2 = 2|f^1(z)|^2$ where f|z| is analytic.

4. (a) Evaluate $\int_c \frac{(z^3 - \sin 3z)}{(z-\pi/2)^3}dz$ with c:$|z| = 2$ using Cauchy's integral formula.
   (b) Evaluate $\int_{0,0}^{1,1}(3x^2 + 4xy + ix^2)dz$ along $y = x^2$.
   (c) Evaluate $\int_c \frac{dz}{e^z(z-1)^3}$ where c: $|z| = 2$ using Cauchy's integral theorem.

5. (a) State and prove Laurent's theorem.
   (b) Obtain all the Laurent series of the function $\frac{7z-2}{(z+1)z(z+2)}$ about $z = -2$.

6. (a) Find the poles and the residue at each pole of $f(z) = \frac{z}{z^2+1}$.
   (b) Evaluate $\int_c \frac{ze^z dz}{(z^2+9)}$ where c is $|z| = 5$, by residue theorem.

7. (a) Show that $\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta} = \frac{2\pi}{\sqrt{a^2-b^2}}$ $(a > b > 0)$ using residue theorem.
   (b) Evaluate by contour integration $\int_0^{\infty} \frac{dx}{1+x^2}$.

8. (a) Find the image of the infinite strip $0 < y < 1/2$ under the transformation $w = 1/z$.
   (b) Find the bilinear transformation which maps the points (-1, 0, 1) into the points (0,i,3i).

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Code: 9ABS303

R9

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2012

ENVIRONMENTAL SCIENCE

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Discuss the multidisciplinary nature of environmental studies.
(b) Write notes on need for public awareness of environmental science.

2 (a) Write about the different water resources. Discuss the uses and over utilization of surface and ground water.
(b) Write about food resources available to the mankind. Discuss world food problems.

3 (a) Write in detail about the concept of an ecosystem. How does energy flow takes place in an ecosystem.
(b) Write about the characteristic features, structure and function of a forest ecosystem.

4 (a) Discuss the bio-geographical classification of India.
(b) Write about poaching of wildlife in respect of Indian context.

5 (a) Discuss the nuclear hazard caused by tsunami in Japan.
(b) Write about your role in prevention of pollution in your town.

6 (a) Write about rain water harvesting in rural and urban localities.
(b) Discuss about ozone layer depletion.

7 (a) What is value education? How does value education help in grooming one's career?
(b) Discuss violation of human rights giving examples from the past.

8 (a) Discuss disaster management in respect of earth quakes.
(b) Write short notes on nucleus hazards.

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Code: 9A02305

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

ELECTRICAL CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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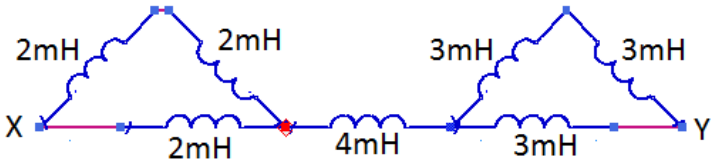
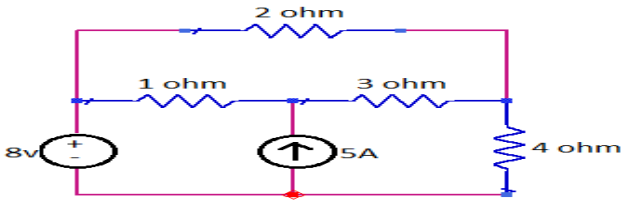
1 (a) State and explain the voltage current relationship for:
(i) Resistance. (ii) Inductance. iii) Capacitance.
(b) Find the equivalent inductance between terminals x-y in the inductive network of figure below.



2 (a) With three node general circuits explain the nodal analysis to find the node voltages.
(b) For the circuit shown find the currents and voltages in all the branches using node voltage method.



3 (a) Define form factor, RMS value, and average value of an alternating quantity.
(b) A reactor of reactance Xp is in parallel with a resistor of resistance Rp. Formulate the equivalence between parallel and series circuits.

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

5 (a) Derive expression for mutual inductance in terms of flux and current.
(b) Two coils connected in series have an equivalent inductance of 0.8 H when connected in aiding, and an equivalent inductance of 0.5 H when the connection is opposing. If one of the coils has self inductance of 0.3 H, find mutual inductance of the coils and also find coefficient of coupling between the coils.

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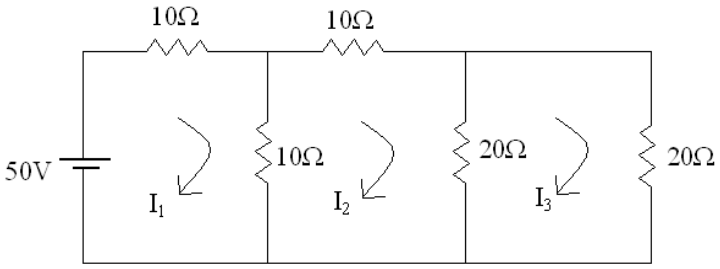
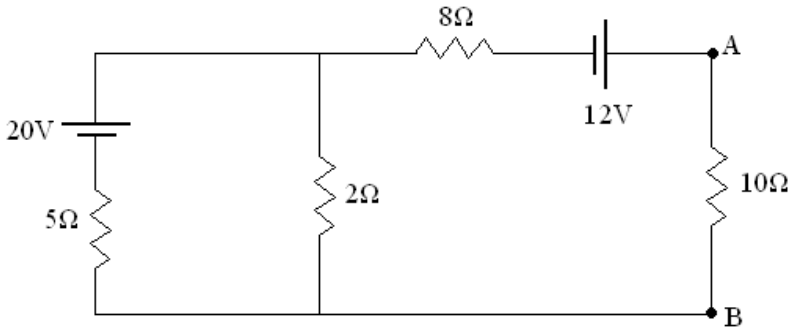
6 Draw the graph of the network shown, select a suitable tree to write tie-set schedule. Then find the loop currents.



7 (a) State and explain maximum power transfer theorem for A.C networks.
(b) In the circuit shown in figure, use Norton's Theorem to find current through 10 Ω Resistor.



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

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

ELECTRONIC DEVICES & 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
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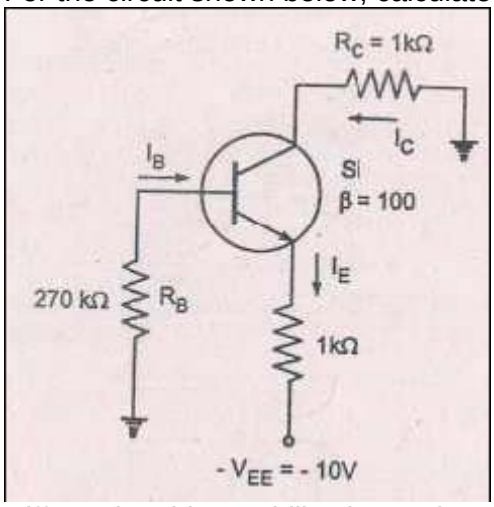
1 (a) What are the various applications of p-n junction diode? Explain them.
(b) What are the specifications of p-n junction diode? Explain how reverse saturation current varies with temperature both in Silicon and Germanium diodes.

2 (a) Calculate the value of capacitance to use in a capacitor filter connected to a full wave rectifier operating at a standard aircraft power frequency of 400 Hz, if the ripple factor is 10% for a load of 500 Ω
(b) Design a filter for full wave circuit with LC filter to provide an output voltage of 10 V with a load current of 200mA and the ripple is limited to 2%.

3 (a) The current gain of a transistor in CE circuit is 49. Calculate CB current gain and find the base current where the emitter current is 3mA.
(b) With neat diagram explain transistor current components.

4 (a) For the circuit shown below, calculate I_B, V_C and V_{CE}.



(b) Differentiate bias stabilization and compensation techniques.

5 (a) Explain the principle of MOSFET in depletion mode with neat sketches and o/p characteristics.
(b) Write about the broad classification of FET.

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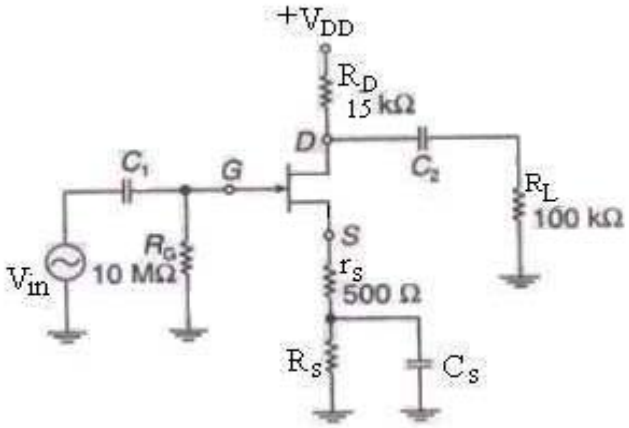
6 (a) The figure shown below is a swamped FET amplifier. Determine the voltage gain when R_L=100 K. Neglect the FET output resistance (r_d). Take g_m = 4mS.



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

7 Derive the equations of current gain A_I, voltage gain A_V, input impedance Z_i, output impedance Y_0, voltage gain with R_s(A_{VS}), current gain with R_s (A_{IS}) using a general two port active network.

8 (a) Draw the V-I characteristics of an SCR and explain it in detail.

(b) Obtain the relation between peak-point voltage 'V_P ' on the UJT characteristics, supply voltage 'V_{BB}', Intrinsic stand-off ratio 'η ' and the barrier potential of P-N junction. Explain the significance of peak-point voltage on switching action of UJT device.

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