Code: 9A04301

1

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

ELECTRONIC DEVICES & CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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

(b) Explain about avalanche and zener breakdown.

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

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

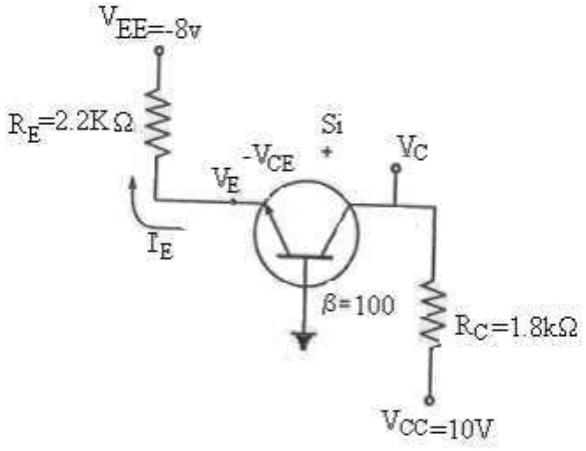
3 (a) Draw a diagram showing various currents in a PNP transistor in common collector mode.

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

(c) Draw the common collector transistor characteristics.

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

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



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

(b) Explain the different parameters of FET.

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

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

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

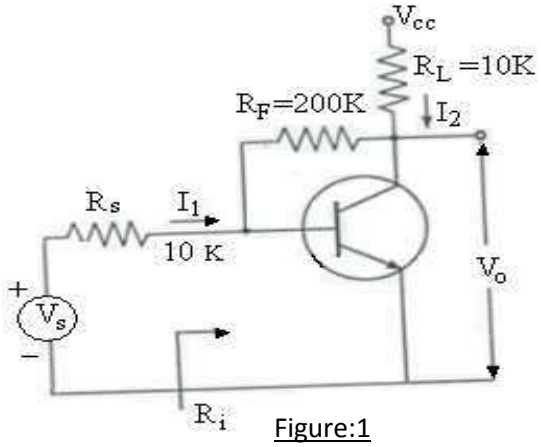

Figure:1

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

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

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

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Code: 9A04301

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

ELECTRONIC DEVICES & CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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

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

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

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

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

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

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

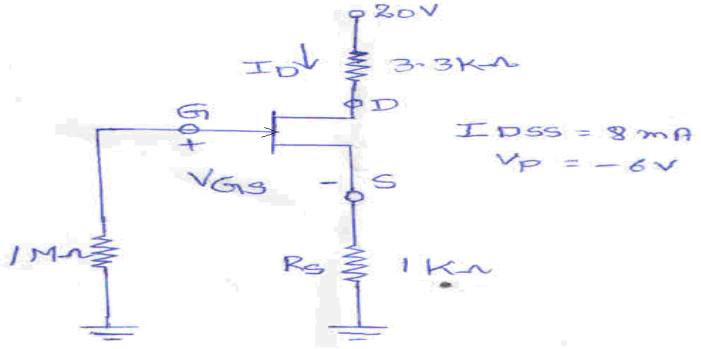
(b) Why biasing is necessary for a transistor circuit in a given configuration? Mention the three different types of biasing a Bipolar Junction Transistor.

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

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

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

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



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

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

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

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

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3

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

ELECTRONIC DEVICES & CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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

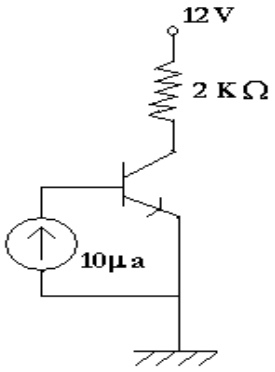
(b) Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at 25^0 C with I_0 = 25 μ*A* and at an applied voltage of 0.2 V across the diode.

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

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

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

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



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

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

Contd. in Page 2

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

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

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

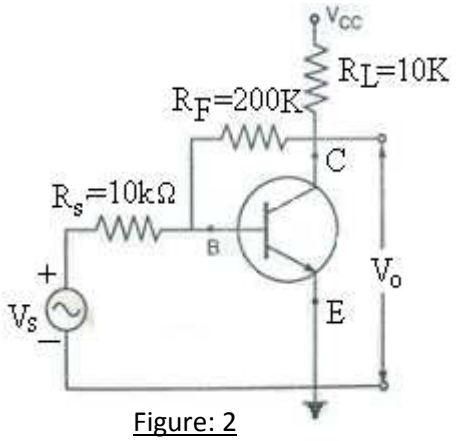


Figure: 2

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

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

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Code: 9A04301

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

ELECTRONIC DEVICES & CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Code: 9ABS302

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

MATHEMATICS-III

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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

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

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

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

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

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

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

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

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Code: 9ABS302

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

MATHEMATICS-III

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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

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

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

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

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

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

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

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

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Code: 9ABS302

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

MATHEMATICS-III

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

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

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

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

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

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

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

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

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

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Code: 9ABS302

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

MATHEMATICS-III

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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

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

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

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

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

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

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

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

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Code: 9ABS303

1

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

ENVIRONMENTAL SCIENCE

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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

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

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

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

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

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

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

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

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Code: 9ABS303

2

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

ENVIRONMENTAL SCIENCE

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

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

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

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

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

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

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

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

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

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Code: 9ABS303

3

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

ENVIRONMENTAL SCIENCE

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

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

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

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

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

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

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

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

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

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Code: 9ABS303

4

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

ENVIRONMENTAL SCIENCE

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

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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

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

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

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

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

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

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

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

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Code: 9A01308

1

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

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical and Electronics 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 fluid properties: Density, weight density, specific volume and specific gravity of a fluid.

(b) An oil film of thickness 1.5 mm is used for lubrication between a square plate of size 0.9 m × 0.9 m and an inclined plane having an angle of inclination 20^0. The weight of the square plate is 392.4 N and it slides down the plane with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of the oil.

2 (a) Cite two examples of unsteady, non-uniform flow. How can the unsteady flow be transformed to steady flow? Explain.

(b) A pipe of diameter 30 cm carries water at a velocity of 20 m/sec. The pressures at the points A and B are given as 34.335 N/cm^2 and 29.43 N/cm^2 respectively. While the datum head at A and B are 25 m and 28 m, find the loss of head between A and B.

3 (a) What is a pitot-tube? How will you determine the velocity at any point with the help of pitot-tube?

(b) A 30 cm x 15 cm venturimeter is inserted in a vertical pipe carrying water, flowing in the upward direction. A differential mercury-manometer connected to the inlet and throat gives a reading of 30 cm. Find the discharge. Take C = 0.98.

4 (a) Derive an expression for the force exerted by a jet of water on an inclined fixed plate in the direction of the jet.

(b) A jet of water of diameter 50 mm moving with a velocity of 20 m/sec strikes a fixed plate in such a way that the angle between the jet and the plate is 60^0.Find the force exerted by the jet on the plate.

(i) In the direction normal to the plate

(ii) In the direction of the jet.

Contd. in Page 2

5 (a) Discuss critically the economics of a hydal power plant for power generation.
(b) What is a flow mass curve? Explain how it is constructed.

6 (a) What are the design specifications of a Kaplan turbine? Explain.
(b) An outward flow reaction turbine has inner and outer diameter of the wheel as 1000 mm and 2000 mm respectively. The water enters the vane at an angle of 20^0 and leaves the vane radially. If the velocity of flow remains constant at 10 m/sec and the speed of the wheel is 300 rpm, find the vane angles at inlet and outlet.

7 (a) A hydraulic turbine develops 120 KW under a head of 10 m at a speed of 90 rpm and gives an efficiency of 92%. Find the water consumption and the specific speed. If a model of scale 1:30 is constructed to operate under a head of 8 m what must be its speed, power and water consumption to run under the conditions similar to prototype.
(b) What are the constant head characteristic curves of a turbine? What is the purpose of developing them?

8 (a) Why centrifugal pumps are less efficient as compared to turbines.
(b) A centrifugal pump has an impeller diameter 25 cm, outlet width 5 cm, 1100 rpm, working against a head of 11 m. Vane angle at outlet 30^0. Manometric efficiency = 90%. Calculate the discharge.

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Code: 9A01308

2

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

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Distinguish between ideal fluids and real fluids. Explain the importance of compressibility in fluid flow.

(b) A shaft of diameter 120 mm is rotating inside a journal bearing of diameter122 mm at a speed of 360 r.p.m. The space between the shaft and the bearing is filled with a lubricating oil of viscosity 6 poise. Find the power absorbed in oil if the length of bearing is 100 mm.

2 (a) Explain the terms: (i) Path line (ii) Streak line (iii) Stream line, and (iv) Stream tube.

(b) A 40 cm diameter pipe, conveying water, branches into two pipes of diameter 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/s. Find the discharge in this pipe. Also determine the velocity in 20 cm pipe if the average velocity in 30 cm diameter pipe is 2 m/s.

3 (a) Explain the term co-efficient of friction. On what factors does this co-efficient depend.

(b) An orifice-meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter give readings of 14.715 N/cm^2 and 9.81 N/cm^2 respectively. Find the rate of flow of water through the pipe in liters/s. Take C = 0.6.

4 (a) Derive an expression for the hydraulic efficiency when a liquid jet strikes a single moving curved vane.

(b) A jet of water of diameter 100 mm strikes a curved plate at its centre with a velocity of 15 m/s. The curved plate is moving with a velocity of 7 m/s in the direction of the jet. The jet is deflected through an angle of 150^0. Assuming the plate smooth find:
(i) Force exerted on the plate in the direction of the jet.
(ii) Power of the jet and iii. Efficiency.

Contd. in Page 2

5 (a) Explain how the load factor, capacity factor and utilization factor are interrelated. What is the significance of diversity factor?

(b) For a hydropower plant, the design capacity is 150 MW. If the generated power is 125 MW, determine the efficiency of the plant. If the peak discharge is 1.5 times the average discharge, determine the plant capacity and the plant factor.

6 (a) The head on a Francis turbine is 25 m. The outer and inner diameters of runner are 1.25 m and 0.9 m respectively. The guide vane angle is 15^0 and the runner vanes are radial at inlet. Determine the speed of runner in rpm and vane angle at outlet. If the power output is 365 MHP, what is the specific speed?

(b) A Kaplan runner has outer and inner diameters of 4.5 m and 2m respectively. It develops 30,000 MHP at 150 rpm under a head of 20 m. The hydraulic and overall efficiencies are 96% and 89% respectively. Determine the runner blade angles at hub periphery, outer periphery and mean diameter.

7 (a) Describe different types of surge tanks with neat sketches.

(b) A Kaplan turbine model built to a reduced scale of 1:10 develops 25 MHP when run at 400 rpm under a head of 6 m. If its overall efficiency is 85%, what flow rate should be supplied to the model? If the prototype machine works under a head of 40 m, compute the speed, power output and discharge of the machine. Assume the same overall efficiency for the model and prototype.

8 Explain how the discharge, head and power of a pump vary as the speed of the pump is varied.

A centrifugal pump discharges 0.15^3 m/s of water against a head of 12.5 m, the speed of the impeller being 600 rpm. The outer and inner diameters of the impellers are 500 mm and 250 mm respectively. The vanes are bent back at 35^0 to the tangent of the exit. If the flow area remains 0.07 m^2 from inlet to outlet, find:

(i) The manometric efficiency of the pump.

(ii) The vane angle at inlet.

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Code: 9A01308

3

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

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) What is the difference between dynamic viscosity and kinematic viscosity? State their units of measurements.

(b) Two plates are placed at a distance of 0.15 mm apart. The lower plate is fixed while the upper plate having surface area 1.0 m^2 is pulled at 0.3 m/s. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity of 1.5 poise.

2 (a) Define the equation of continuity. Obtain an express for continuity equation for a one dimensional flow.

(b) Water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 29.43 N/cm^2 and the pressure at the upper end is 14.715 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 50 lit/s.

3 (a) Define and explain the terms:
(i) Hydraulic gradient line and
(ii) Total energy line.

(b) An oil of kinematic viscosity 0.5 stoke is flowing through a pipe of diameter 300 mm at the rate of 320 litres per sec. Find the head lost due to friction for a length of 60 m of the pipe.

4 (a) Find the expression for the force exerted by the jet on a flat vertical plate moving in the direction of the jet.

(b) A jet of diameter 150 mm strikes a flat plate normally with a velocity of 20 m/sec. The plate is moving with a velocity of 5 m/sec in the direction of the jet and away from the jet. Find
(i) The force exerted by the jet on the plate.
(ii) Work done by the jet on the plate per second.

Contd. in Page 2

5 (a) Sketch and explain relative arrangement of different structures of a low head hydro power development.

(b) The load on a hydel plant varies from a minimum of 10,000 KW to a maximum of 35,000 KW. Two turbo generators of capacities 22,000 KW each have been installed. Calculate
(i) Total installed capacity of the plant.
(ii) Plant factor.
(iii) Load factor and
(iv) Utilization factor.

6 (a) With the help of velocity diagrams, derive the equations of theoretical power developed by a Pelton wheel and its hydraulic efficiency. Obtain the conditions for maximum hydraulic efficiency.

(b) A Pelton wheel has to be designed to develop 12,000 KW of power at an overall efficiency of 86%.The speed is 520 rpm and the head is 400 m. The wheel velocity is 0.46 times the jet velocity. Assuming a nozzle coefficient of 0.975 and an approximate jet ratio of 10, calculate the wheel diameter, number of jets, diameter of each jet and the number of buckets.

7 (a) Tests were conducted on a Francis turbine of 0.8 m diameter under a head of 9 m. The turbine developed 115 KW running at 240 rpm and consuming1.2 m^3/sec. If the same turbine is operated under a head of 16 m, predict its new speed, discharge and power.

(b) What are the requirements of a governor in hydropower installation? Explain.

8 (a) How are large pumps primed?

(b) What are the different devices that are employed to convert high velocity into high pressure? Sketch and explain.

(c) How does the specific speed help the choice of a correct pump for a given duty?

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Code: 9A01308

4

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

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) What is a manometer? How are they classified? Explain with sketches.

(b) The pressure intensity at a point in a fluid is given as 4.9 N/cm^2. Find the corresponding height of fluid when it is: (i) Water, and (ii) An oil of sp.gr.0.8.

2 (a) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it?

(b) A pipe line carrying oil of specific gravity 0.8, changes in diameter from 300 mm at a position A to 500 mm diameter to a position B which is 5 m at a higher level. If the pressures at A and B are 19.62 N/cm^2 and 14.91 N/cm^2 respectively, and the discharge is 150 liters/s. Determine the loss of head and direction of flow.

3 (a) What is a venturimeter? Derive an expression for the discharge through a venturimeter.

(b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to inlet and throat is 10 cm of mercury. Determine the rate of flow. Take C = 0.98.

4 A jet of water of 20 mm diameter and moving at 15 m/s, strikes upon the center of a symmetrical vane. After impingement, the jet gets deflected through 160^0 by the vane. Presuming vane to be smooth determine:

(a) The force exerted by jet on the vane, and

(b) The ration of velocity at outlet to that at inlet if actual reaction of the vane is 127 N.

5 (a) Discuss the factors that should be considered while selecting the turbine for a particular power plant.

(b) Where do you provide pumped storage plants? Explain the working of a pumped storage plant.

Contd. in page 2

6 (a) Compare the Pelton, Francis and Kaplan turbines on the basis of head and discharge. Also specify the ranges of them for these turbines.

(b) A Pelton wheel is required to develop 12000 KW when working under a head of 300 m. It rotates at a speed of 540 rpm. Assuming the jet ratio as 10 and overall efficiency as 84%, calculate:
(i) The diameter of the wheel.
(ii) The quantity of water required and
(iii) The number of jets.

7 (a) What do you understand by specific speed of a turbine? What is its use?

(b) What is the necessity of governing the turbines?

(c) How do you say that geometrically similar velocity triangles assure kinematic similarity?

8 (a) Differentiate between the volute casing and vortex casing for the centrifugal pump.

(b) Write short notes on NPSH in centrifugal pumps.

(c) A multistage centrifugal pump is required to lift 1820 liters of water per minute. From a mine, the total head including friction being 672 m. If the speed of the pump is 2920 rpm, how many stages are required? N_s for impeller = 600.

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Code: 9A02305

1

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

ELECTRICAL CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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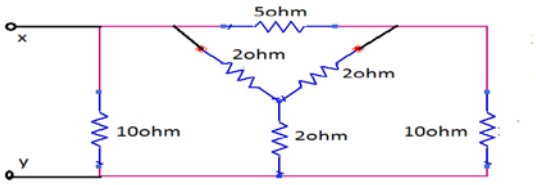
1 (a) What are the passive and active elements? Explain the volt-current relationship of passive elements with examples.

(b) Find the source current in figure below.



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

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

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

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

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

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

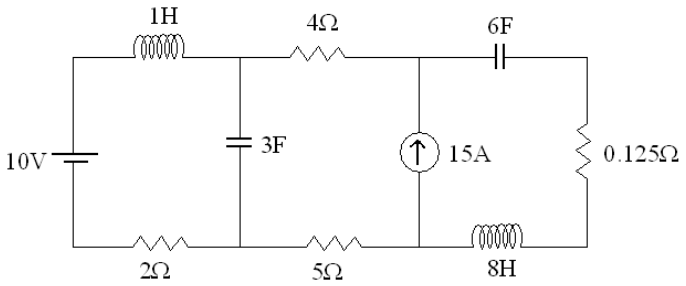
5 (a) Define: (i) Flux. (ii) mmf (iii) Reluctance. (iv) Magnetic field intensity.

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

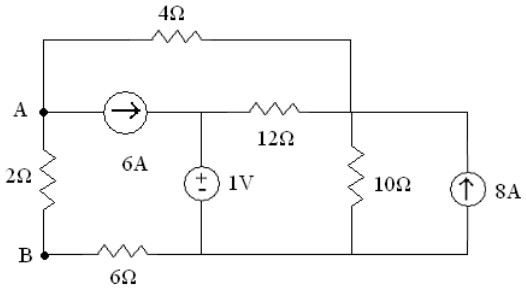
Contd. in Page 2

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

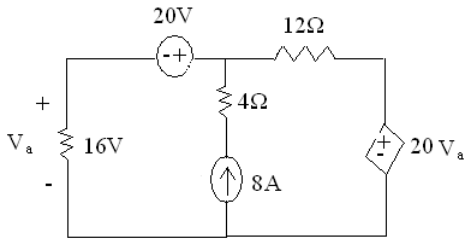
(b) Develop the fundamental tie-set matrix for the circuit shown.



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



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



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Code: 9A02305

2

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

ELECTRICAL CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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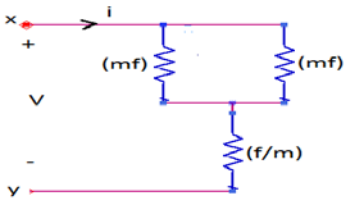
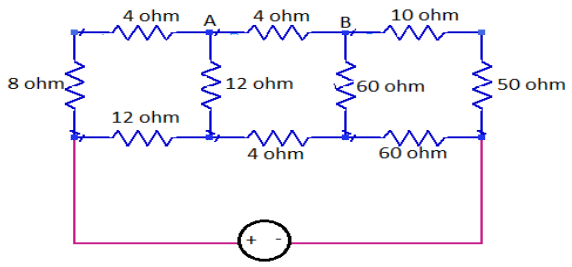
1 (a) Explain the difference between active elements and passive elements with suitable examples.

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



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

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



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

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

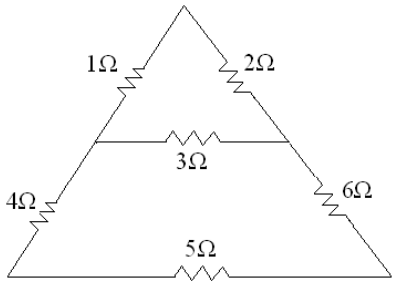
4 (a) Derive the expressions for selectivity and bandwidth of anti resonant circuit.

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

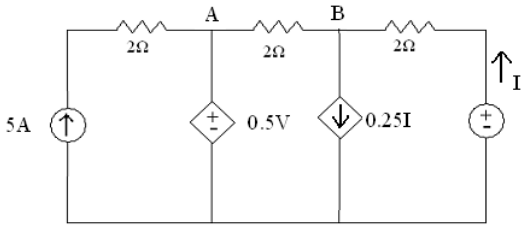
Contd. in page 2

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

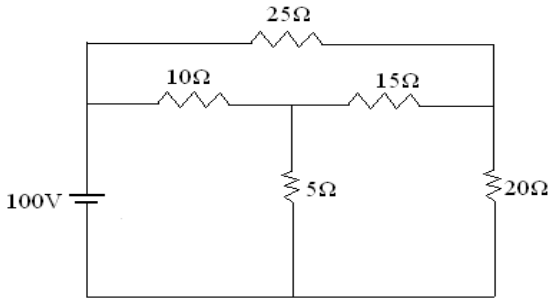
6 (a) Write the properties of tie-set matrix and cut-set matrix.
(b) For the network shown in figure, Obtain cut-set matrix.



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



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



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Code: 9A02305

3

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

ELECTRICAL CIRCUITS

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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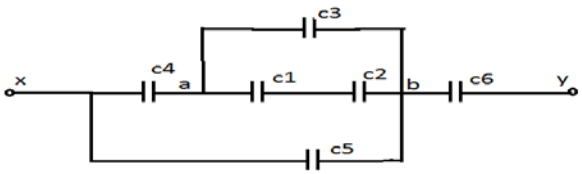
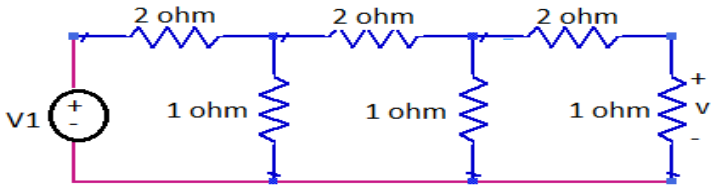
1 (a) Define the following: (i) Resistance. (ii) Inductance. (iii) Capacitance. Also give the V-I relationship For the above elements.

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



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

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



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

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

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

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

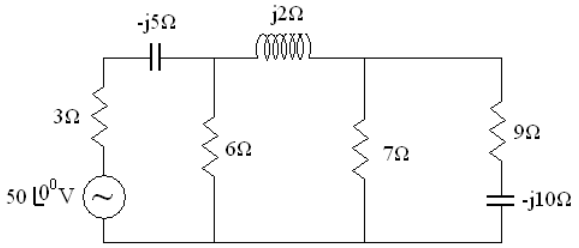
5 (a) Derive the expression for equivalent inductance of two coils connected in parallel opposing.

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

Contd. in Page 2

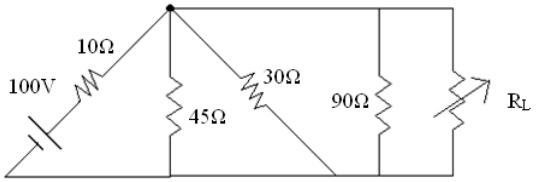
6 (a) Write the properties of tree with example.

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



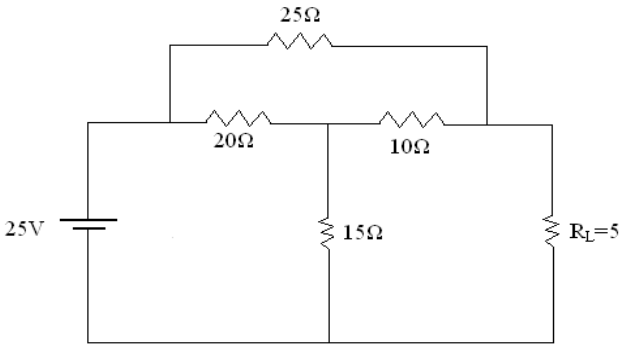
7 (a) State & explain Millman's theorem.

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



8 (a) Write limitations of reciprocity theorem.

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



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Code: 9A02305

4

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

ELECTRICAL CIRCUITS

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

Time: 3 hours Max Marks: 70

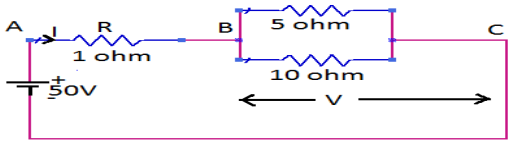
Answer any FIVE questions

All questions carry equal marks

*****

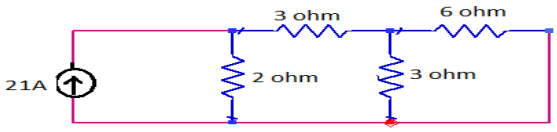
1 (a) Define ideal and practical voltage and current sources

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



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

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



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

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

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

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

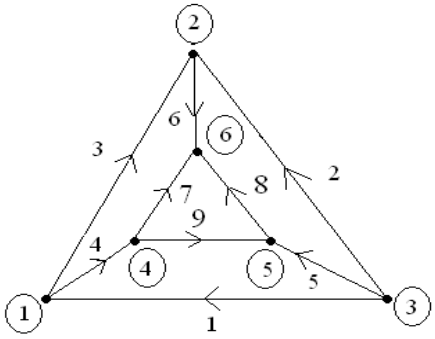
Contd. in Page 2

5 (a) Derive expression for coefficient of coupling.

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

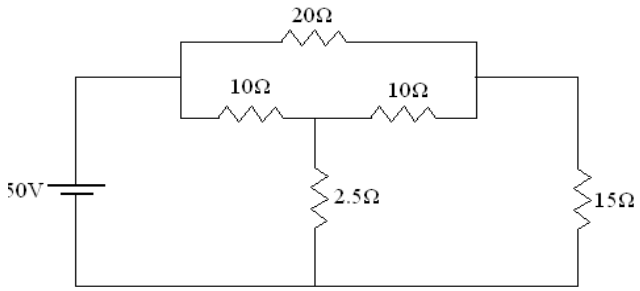
6 (a) Write the properties of a tree with an example.

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



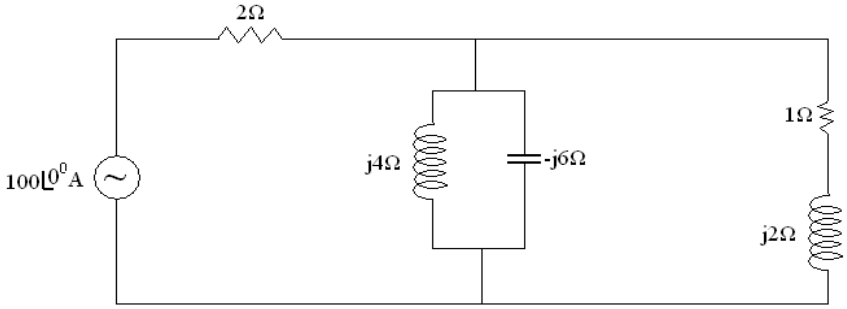
7 (a) State and explain Norton's theorem.

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



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

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



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Code: 9A02308

1

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

ELECTRICAL MACHINES - I

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) With neat relevant diagrams derive the expression for mechanical force of a singly-excited system when it is controlled by current.

(b) An exciting coil of a rectangular electromagnetic relay has 2000 turns. The cross-section of the core is 6 x 6 cm^2. Neglecting fringing effect and reluctance of magnetic circuit, calculate the maximum force acting on the armature if the flux density in the core is 0.6 T.

2 (a) Explain the action of commutator of a dc machine with the help of neat diagram. Why the carbon or graphite brushes preferred over copper brushes for use in dc machines?

(b) The armature of a 4-pole dc generator has wave winding with 660 conductors. Calculate the generated emf when flux per pole is 50 mWb and the speed is 1500 rpm.

3 What is Armature reaction? Explain in detail the phenomenon of armature reaction in a 2-pole dc generator with the help of neat sketches of flux distribution in space and relevant vector diagrams, before and after the armature reaction.

4 (a) What are the methods of excitation of dc generators? Explain with the help of diagrams.

(b) A 6-pole generator has 1000 armature conductors and is wave-wound. If the flux per pole is 0.02 Wb and the speed is 500 rpm, calculate the emf generated. If the above machine is self-excited, and the armature and field resistances are 0.5 Ω and 250 Ω respectively, calculate the output current when the armature current is 40 A.

5 What is the experimental procedure to obtain the load characteristics of dc shunt generator? Explain.

6 A 10 kW, 200 V, dc series motor runs at 900 rpm when operating at its full-load. The motor resistance is 0.4 Ω and magnetic circuit can be assumed unsaturated. What will be the speed if

(a) The load torque is increased by 75 %.

(b) The motor current is reduced to half of the full-load value.

Contd. in Page 2

7 (a) Explain Ward-Leonard' system of speed control of dc motor.

(b) A shunt motor is developing a torque of 130 N-m at speed 'n' rpm. Find the current at speed '2n' rpm (a) with field control and (b) with armature voltage control when (i) Output is constant and (ii) Torque is constant. Neglect losses.

8 The Hopkinson's test on two similar machines gave the following results at full-load.
Line current = 50 A
Line voltage = 120 V
Motor armature current = 220 A
The field currents are 3 A and 3.5 A. Armature resistance of each machine is 0.025 Ω. Calculate the efficiency of each machine assuming brush contact drop of 1 V per brush.

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2

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

ELECTRICAL MACHINES - I

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 State and explain the basic phenomena which are responsible for energy conversion in an electromechanical energy conversion device.

2 (a) Define the following terminology of armature winding of a dc machine
(i) Conductor. (ii) Turn. (iii) Coil & Coil-side. (iv) Coil Span.

(b) An 8-pole armature consists of 720 conductors. The average emf generated in each conductor is 1.5 V. Each conductor is capable of carrying a current of 8 A. Calculate the following when the machine is both lap-wound:
(i) Terminal voltage on no-load, (ii) Output current on full-load and
(iii) Power output at full-load.

3 (a) Explain why in dc generators, the polarity of inter-pole must be the same as that of the main pole ahead of it in the direction of rotation.

(b) A 4-pole dc generator supplies a current of 143 A. It has 492 armature conductors connected in lap method. Calculate the de-magnetizing ampere turns per pole. The field winding is connected in shunt and takes 2 A. Find the number of extra shunt field turns necessary to neutralize this de-magnetisation. When delivering full-load, the brushes are given a lead of 10^0 mechanical.

4 Explain how the magnetization characteristic of a dc machine can be obtained experimentally. Explain the procedure to obtain critical values of field resistance and speed.

5 What is the experimental procedure to obtain the load characteristics of dc compound generator? Explain.

6 What is Armature reaction? Explain in detail the phenomenon of armature reaction in a 2-pole dc motor with the help of neat sketches of flux distribution and flux density waveforms before and after the armature reaction.

Contd. in Page 2

7 (a) What are the advantages and disadvantages of 'rheostatic control method' of speed control?

(b) A 220 V, dc series motor takes 40 A and runs at 750 rpm while driving a fan load. The load varies as the square of the speed. The resistance between the terminals is 1.5 Ω. To run the machine at 800 rpm, at what voltage we have to supply energy to the motor. Assume that the flux is directly proportional to the armature current.

8 A 50 kW, 440 V dc shunt generator with an armature circuit resistance including inter-pole winding of 0.25 Ω at normal working temperature was run as a shunt motor on no-load at rated voltage and speed. The total current drawn by the motor = 3 A including shunt field current of 0.7 A. Calculate the efficiency of the shunt generator at ¾ th full-load.

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3

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

ELECTRICAL MACHINES - I

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Define field energy and co-energy. Give significance of co-energy in the derivation of force in an electromechanical energy conversion device.

(b) Mention the advantages of analyzing energy conversion devices by field-energy concept.

2 (a) Show the neat sketches of progressive and retrogressive simplex wave windings. Define the different winding pitches.

(b) The armature of a 4-pole dc generator having 520 conductors generates an induced emf of 520 V, when running at a speed of 1200 rpm. The flux per pole being 50 mWb. What is the type of the simplex winding used?

3 (a) Discuss how reactance voltage causes under-commutation in dc machines.

(b) A 4-pole, 30kW, 230V, wave-wound, shunt generator has 400 armature conductors. Brushes are given a lead of 3 commutator segments. Calculate the de-magnetizing ampere turns per pole if shunt field resistance is 150 Ω. Also calculate extra shunt field turns per pole required to neutralize the de-magnetization.

4 (a) Discuss the process of self-excitation in a dc machine. What conditions must be fulfilled for self-excitation?

(b) A short-shunt compound generator has armature, series-field and shunt-field resistances of 0.8 Ω, 0.6 Ω and 45 Ω respectively. The machine supplies a load of 5 kW at 250 V. Calculate the emf generated in the armature and armature current.

5 (a) Explain the parallel operation of two dc series generators with equalizer-bar connection and hence narrate the necessity of equalizer-bar connection.

(b) Two dc shunt generators operating in parallel. The generator-1 and generator-2 are inducing emfs of 220 V and 210 V, and have armature resistances of 0.7 Ω and 0.5 Ω respectively. The common load is 30 kW. Calculate the load sharing between the generators.

Contd. in Page 2

6 A 4-pole, 250 V, dc shunt motor takes 2 A on no-load, when running at 1200 rpm. The armature and field resistances are 0.15 Ω and 150 Ω respectively. The brush drop is 2 V. If the motor takes total current of 60 A at full-load, calculate its full-load speed. Assume that the flux gets weakened by 5% under full-load condition due to armature reaction.

7 A 250 V, dc shunt motor has an armature current of 16 A when running at 900 rpm against full-load torque. The armature resistance is 0.5 Ω. What resistance must be inserted in series with the armature to reduce the speed to 550 rpm at the same torque? What will be the speed if the load torque is halved with this resistance in the circuit? Assume the flux to remain constant.

8 A 15 kW, 900 rpm, 400 V dc shunt motor has armature circuit resistance (including brushes) of 0.9 Ω and shunt field resistance of 300 Ω. If efficiency at rated load is 90 %, then calculate by assuming that the flux remains constant;

(a) The no-load armature current,
(b) The speed when motor draws 25 A from the mains and
(c) The armature current, when the internal torque developed is 98.5 N-m.

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4

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

ELECTRICAL MACHINES - I

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 With neat sketch explain the multiple-excited magnetic field system in electromechanical energy conversion systems. Also obtain the expression for field energy in the system.

2 (a) Develop from the first principles an expression for emf of a dc generator.

(b) An 8-pole, lap-connected dc generator has 12 coils with 8 turns per coil. It is driven at 1500 rpm. If the flux per pole is 30 mWb, calculate the emf generated. If the machine is wave-connected, find the speed at which it is to be driven to generate the same emf as calculated with lap connection.

3 (a) What is the purpose of Compensating Winding and explain its operation with the help of diagram.

(b) A 500 V, 1000 A, lap-wound, 8-pole dc generator has 1260 armature conductors. Calculate the number of conductors in the pole face to give full compensation if the pole face covers 80% of pole-span.

4 (a) Explain the following with the help of neat diagrams:
(i) Cumulative compounding and
(ii) Differential compounding of dc machines.

(b) A 4-pole, lap-wound long-shunt dc compound generator has 1250 armature conductors. The armature, series-field and shunt-field resistances are respectively 0.6 Ω, 0.75 Ω and 225 Ω. If the shunt field flux and series field flux per pole are respectively 0.075 Wb and 0.0025 Wb, calculate the speed at which the machine has rotate to deliver a load of 120 A at 450 V. Consider the total brush drop as 2 V.

5 Two shunt generators are operating in parallel. The Generator-1 and Generator-2 are inducing emfs 120 V and 115 V, the armature resistances are 0.05 Ω and 0.04 Ω, the field resistances are 20 Ω and 25 Ω respectively. The load supplying by both generators is 35 kW. How do they share load?

Contd. in Page 2

6 A 250 V, 4-pole shunt motor has two-circuit armature winding with 550 conductors. The armature circuit resistance is 0.35 Ω, field resistance is 145 Ω and the flux per pole is 0.03 Wb. Neglect the armature reaction. Find the speed and torque developed, if the motor draws 15 A from the mains.

7 Design a starter with five resistor sections for a 5 kW, 200 V, dc shunt motor. The full-load efficiency is 86 %. The lower current limit is to be full-load current. The total copper losses are 3.7 % of the input power and the field resistance is 250 Ω.

8 (a) Explain effect of excitation, speed and load on the losses of a dc machine?

(b) A 230 V dc shunt motor is taking 5 A when running light. The armature resistance is 0.2 Ω and field circuit resistance is 115 Ω. For an input current of 72 A, calculate the shaft output and efficiency. Also calculate the armature current at which machine works at its maximum efficiency.

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