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
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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.

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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.

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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: 9A01308

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
FLUID MECHANICS & HYDRAULIC MACHINERY
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

1

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

1 (a) Explain the phenomenon of capillarity. Obtain an expression for capillary rise of aliquid.
(b) A 150 mm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 151 mm. Both the cylinders are of 250 mm height. The space between the cylinders is filled with a liquid of viscosity 10 poise. Determine the torque required to rotate the inner cylinder at 100 r.p.m.

2 (a) State Bernoulli's theorem. Mention the assumptions made. How is it modified while applying in practice.
(b) Diameter of a pipe decreases gradually from 2 m at end A to 0.5 m at B. A liquid flowing through the pipe has a velocity of 1.2 m/s at B. Determine the velocity of the liquid at A and at the middle of the pipe.

3 (a) Explain the terms: hydraulic gradient and equivalent pipe with the help of a neat sketch.
(b) A 10 cm by 6 cm orifice meter is used to measure the discharge of bromine. If the pressure difference across the orifice plate is 18250 N/m^2, determine the discharge in 1it/m. Assume C_d = 0.64. specific gravity of bromine = 3.1.

4 (a) Define the term: impact of jets. Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.
(b) Find the force exerted by a jet of water of diameter 100 mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30m/sec.

5 (a) Discuss critically, how you plan a power house.
(b) The average annual yield of a river at a dam site is 2×104 ha-m. Assuming the entire yield is available for power generation, estimate the water power potential and the available energy. The average net head is 100 m. Take overall efficiency as 90%.

6 (a) Define the terms: speed ratio, flow ratio and jet ratio.
(b) Design a Pelton wheel for a head of 80 m and speed 300 r.p.m. The Pelton wheel develops 103 kW S.P. Take Cv=0.98, speed ratio = 0.48 and overall efficiency =0.80.

7 (a) How will you determine the possibility of cavitation to occur in the installation of a turbine or a pump?
(b) What is water hammer? Under what conditions it may occur. Explain.

8 (a) Discuss the detailed classification of pumps.
(b) What precautions are to be taken while starting and closing the pump.

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Code: 9A01308

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
FLUID MECHANICS & HYDRAULIC MACHINERY
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

2

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

1 (a) Define surface tension. Derive the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure.
(b) One litre of crude oil weighs 9.6 N. Calculate its specific weight, density and specific gravity.

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/cm2 and the pressure at the upper end is 14.715 N/cm2. Determine the difference in datum head if the rate of flow through pipe is 50 lit/s.

3 (a) What is the significance of : upper and lower critical Reynolds numbers.
(b) A differential manometer is connected between the inlet and throat sections of a venturi meter. Show that the manometer reading is unaltered whatever be the inclination of the venturi meter.

4 (a) A jet of water of 5 cm diameter and velocity 40 m/s enters a stationary curved vane at 20° to horizontal and leaves at 30° to horizontal so that the total deflection angle of the jet is 130°. Assuming the flow to be frictionless and shockless, compute the magnitude and direction of the force on the vane.
(b) A jet with a velocity V strikes a single curved vane moving in the same direction as the jet with a velocity 'u'. The velocity of the vane is (V – u). The vane causes the flow direction to be completely reversed. Show that V = 3u for maximum efficiency. Determine this maximum efficiency.

5 (a) Distinguish between run-of- river plants and storage plants.
(b) Write detailed notes on the selection of suitable type of turbine for a hydroelectric scheme.

6 (a) Define and explain hydraulic efficiency, mechanical efficiency and overall efficiency of a turbine.
(b) A Kaplan turbine runner is to be designed to develop 7357.5 kW S.P. The net available head is 10 m. Assume that the speed ratio as 1.8 and flow ratio 0.6. If the overall efficiency is 70% and diameter of the boss is 0.4 times the diameter of the runner, find the diameter of the runner, its speed and specific speed.

7 (a) What are the conditions for the kinematic similarity to exist between model and prototype.
(b) How do you compare the performance of a turbine under different working conditions?

8 (a) (a) What is the difference between single-stage and multistage pumps. Describe multistage pump with (i) impellers in parallel, and (ii) impellers in series.
(b) Find the number of pumps required to take water from a deep well under a total head of 156 m. Also the pumps are identical and are running at 1000 r.p.m. The specific speed of each pump is given as 20 while the rated capacity of each pump is 150 litre/s.

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Code: 9A01308

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
FLUID MECHANICS & HYDRAULIC MACHINERY
(Electrical & Electronics Engineering)

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

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

1 (a) Show that the fluid pressure always acts normal to a surface.
(b) Give a complete classification of different types of manometers (do not give sketches) mentioning the conditions for which each type of manometer is suitable.

2 (a) (a)What is the difference between momentum equation and impulse momentum equation.
(b) A 30 cm diameter pipe carries water under a head of 15 metres with a velocity of 4 m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend.

3 (a) Define and explain the terms: (i) Hydraulic gradient line. (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 jet of water having a velocity of 20m/sec strikes a curved vane, which is moving with a velocity of 10m/sec. The jet makes an angle of 200 with the direction of motion of vane at inlet and leaves at an angle of 1300 to the direction of motion of the vane at outlet. Draw the velocity triangles and calculate
(a) Vane angles, so that the water enters and leaves the vane without shock.
(b) Work done per second per unit weight of water striking the vane.

5 (a) Write short on the (i) Necessity of Storage and pondage and (ii) Stream flow Data requirement in Hydropower plants.
(b) The designed capacity of a hydropower plant is 1.32 x 105 KW. If the power generated in the plant is 9 x 104 KW, find the efficiency of the plant. If the peak discharge is 1.5 times the normal discharge, determine the plant capacity, plant factor and total energy produced in a year.

6 (a) Explain the design specifications of a Pelton wheel.
(b) A Pelton wheel has a tangential velocity of buckets of 15 m/sec. The water is being supplied under a head of 36m at the rate of 20 lit/sec. The bucket deflects the jet through an angle of 160^0. If the coefficient of velocity of the nozzle is 0.98, find the power product by the turbine.

7 (a) Define specific speed of a turbine and derive an expression for the same.
(b) Show that Pelton turbine is a low specific speed turbine.

8 (a) Discuss in general the important operating characteristics of an axial flow pump.
(b) Define and derive an expression for the specific speed of a pump. How does specific speed help in pump selection?

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Code: 9A01308

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
FLUID MECHANICS & HYDRAULIC MACHINERY
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70 **4**

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

1 (a) Discuss and give the expressions for the pressure intensity inside a droplet, a soap bubble and a liquid jet.
(b) Calculate the pressure in pascals corresponding to (i) 8 cm column of a liquid of relative density 0.8 (ii) 6 cm column of mercury (iii) 2 m column of water.

2 (a) (a) Cite two examples of unsteady, non-uniform flow. How can the unsteady flow are 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) Define an orifice-meter. Derive an expression for the discharge through an orifice-meter.
(b) A horizontal Venturimeter with inlet diameter 30 cm and throat diameter 15 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 50 litres/s, find the reading of the oil-mercury differential manometer. Take Cd = 0.98.

4 A jet of water moving at 12m/sec impinges on vane shaped to deflect the jet through 120^0 when stationary. If the vane is moving at 5m/sec, find the angle of the jet so that there is no shock at inlet. What is the absolute velocity of the jet at exit in magnitude and direction and the work done per second? Assume that the vane is smooth.

5 (a) Define Storage, Pondage, Firm power and Secondary power.
(b) Draw a neat sketch of a hydropower plant and explain the various elements.

6 A Kaplan turbine develops 60,000 kw of power under a head of 25m with overall efficiency of 90%. Taking the value of flow ratio = 0.5, speed ratio = 1.6, the hub diameter as 0.35 times the diameter of the runner, find:
(i) The diameter of the runner, (ii) The speed of the turbine
(iii) The specific speed of the turbine.

7 (a) A model turbine 1m in diameter acting under a head of 2m runs at 150 rpm. B Estimate the scale ratio if the prototype develops 20 KW under a head of 225 m with a specific speed of 100.
(b) What do you mean by cavitation? What are the physical indicators for the presence of cavitation in turbines.

8 (a) (a) Discuss the concept of multistage pumps in detail.
(b) A centrifugal pump has three stages discharging 120 lit/s, working against a head of 45m, running at 1400 rpm. Calculate the specific speed of the pump.

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Code: 9A02305

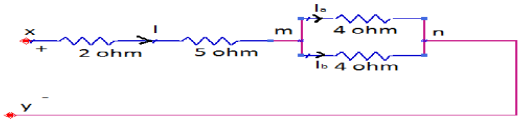
1

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

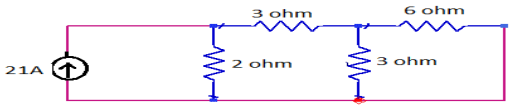
Time: 3 hours Max Marks: 70

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.

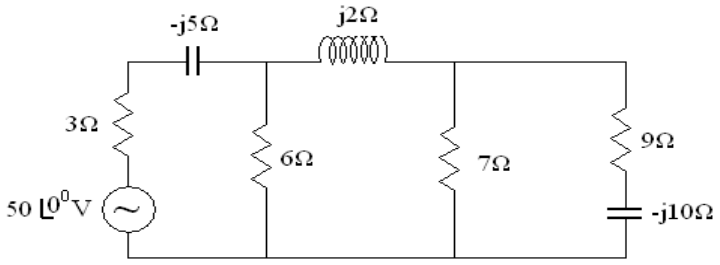
4 (a) Give the expression for frequency and current at resonance in parallel resonance circuit.
(b) A RLC series circuit consists of R=50 ohms L=0.16H and C= 4micro farads. Calculate resonant frequency, quality factor, band width and half power frequencies.

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

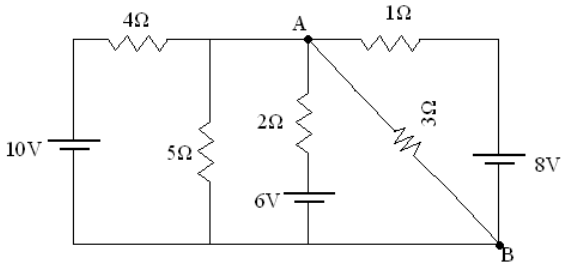
6 (a) Write the properties of tree with example.

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

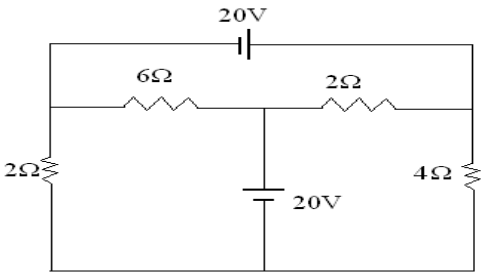


7 (a) Determine the condition for Maximum Power transfer to the load for A.C networks, here load impedance is constant resistance and variable reactance.

(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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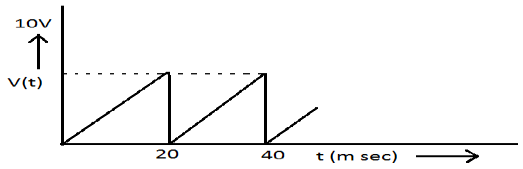
Code: 9A02305 **2**

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
*****

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.

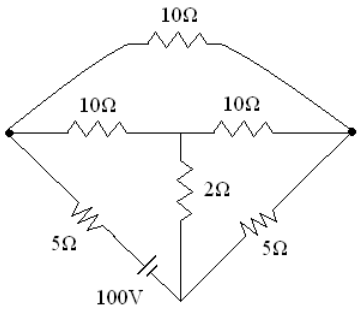
(b) A resistance of 16ohms is connected in parallel to an inductance of 20mH and the parallel combination is connected to an ac supply of 230V, 50Hz. Determine the current through the elements and power delivered by the source, draw the phasor diagram.

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.

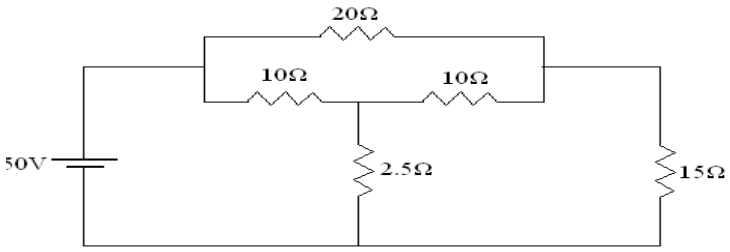
5 (a) Write the comparison between magnetic circuits and electric circuits.
(b) A solenoid of 1000 turns is wound uniformly on an iron ring of mean diameter 50cm. a radial saw cut of 2.5mm is provided in the ring. Calculate the excitation current required in the coil so that a flux density of 2.5wb/m^2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

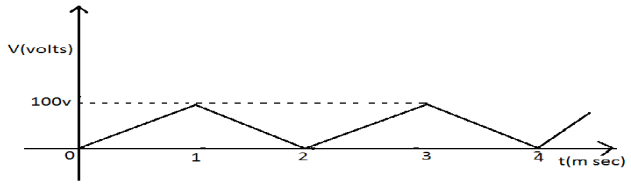
3

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.

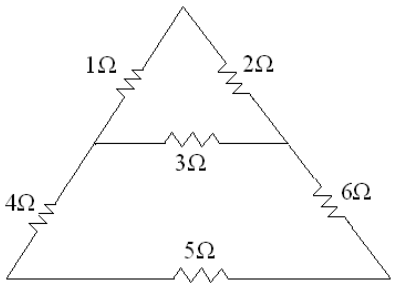
3 (a) Derive the expressions for ac through series RC circuit.
(b) Calculate the resistance and inductance or capacitance in series for each of the following impedances assume the frequency to be 60 Hz.
(i) 12+j30 ohms, (ii) –j60 ohms (iii) 20< 60degrees ohms

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.

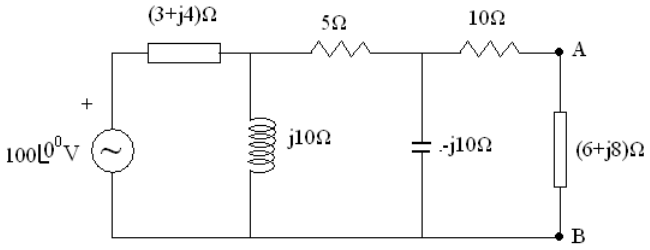
5 (a) Derive the expression for equivalent inductance of two coils connected in parallel opposing.
(b) Two coupled coils with respect to self inductances L_1=0.6H, L_2=0.4H having a k=0.4. coil 2 has 100 turns. The current in coil 1 is I_1=10sin200t A. determine the voltage at coil 2 and maximum flux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

Cont... Page 2

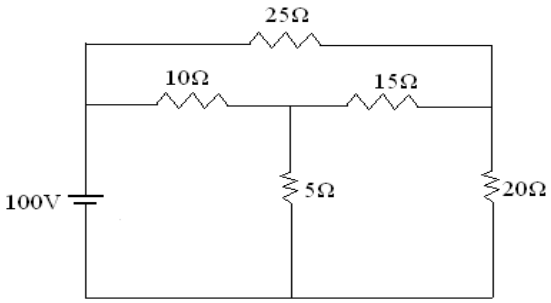
6 (a) Write the properties of tie-set matrix and cut-set matrix.
(b) For the network shown in figure, Obtain cut-set matrix.



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

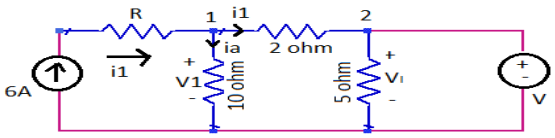
II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL CIRCUITS
(Common to EEE,EIE, E.Con.E, ECE, and ECC)

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.



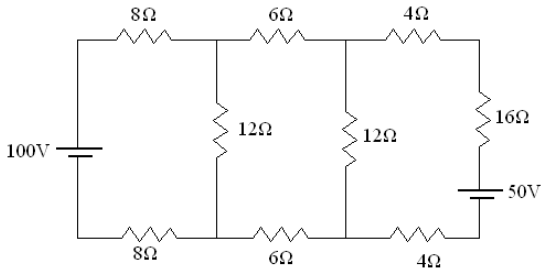
3 (a) a) Derive the expressions for ac through pure capacitance circuit.
(b) Define the concept of capacitive reactance.
(c) A 50 Hz alternating voltage of 150V RMS is applied independently to
(i) Resistance of 10 ohms. (ii) inductance of 0.2H. (iii) capacitance of 50 micro farads. Find the expressions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

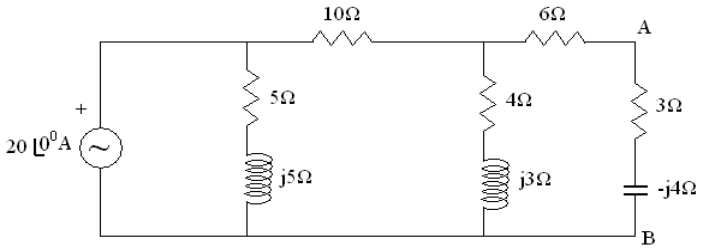
Cont... Page 2

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: 9A02308 **1**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) What is electromechanical energy conversion?
(b) Develop the block diagram of general electromechanical energy conversion device using energy balance equation.

2 (a) Prove that the laminated core reduces eddy current losses.
(b) A 6-pole, dc generator is running at 1500 rpm. It generates 230 V when the useful flux per pole is 0.02 Wb. If the armature has 60 slots, calculate the number of conductors per slot when the machine is (i) lap-wound and (ii) wave-wound.

3 Explain in detail the phenomenon of armature reaction in dc generators with the help of neat sketches of flux distribution and flux density waveforms before and after the armature reaction.

4 (a) Mention the reasons for compounding dc generator.
(b) A 4-pole, 250 V, dc long-shunt compound generator supplies a load of 10 kW at the rated voltage. The armature, series-field and shunt-field resistances are 0.1 Ω, 0.15 Ω and 250 Ω respectively. The armature is lap-wound with 50 slots each slot containing 6 conductors. If the flux per pole is 50 mWb, calculate the speed of the generator.

5 (a) Distinguish between external and internal characteristics of dc generators.
(b) Draw the load characteristics of a separately-excited dc generator and 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.

7 (a) Distinguish between 3-point and 4-point starters.
(b) Explain the functions of NVC, OLR and 'Copper Strip' in a 3-point starter.

8 A 500 V dc motor takes a current of 5 A on no-load. The resistance of the armature and field circuits are 0.22 Ω and 250 Ω respectively. Estimate the efficiency when the motor current is 100 A. What is the percentage change of speed between no-load and full-load?

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Code: 9A02308 **2**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 Show that the torque developed in a doubly-excited magnetic system is equal to the rate of increase of field energy with respect to displacement at constant currents.

2 (a) Show neat sketches of progressive and retrogressive simplex lap windings. Define the different winding pitches.
(b) The armature of a dc generator consists of 42 slots. Each slot consists of 8 conductors. If the poles of the machine are 6, find the resistance of the armature when the armature is (i) lap-wound and (ii) wave-wound.

3 What is commutation period? Discuss in detail the process of commutation in dc generators with help of relevant and neat diagrams.

4 Explain in detail how the emf builds-up in a self-excited dc generators with the help of neat diagrams. From the above discussion; narrate the basic requirements for building-up emf in the machine.

5 What is the necessity of parallel operation of dc generators?
(a)
(b) Two shunt generators are operating in parallel. Generator-1 has no-load emf of 400 V and terminal voltage of 375 V when supplying 80 A. Generator-2 has no-load emf of 400 V and a terminal voltage of 370 V when supplying 80 A. If total load is 120 A, find the currents supplied and terminal voltages of each machine.

6 (a) Derive an expression for gross torque produced by the armature of a dc motor.
(b) A dc motor having armature resistance of 0.24 Ω takes an armature current of 80 A at 300 De-magnetizing AT / pole. The machine has 8-poles and 800 lap-connected conductors. The flux per pole is 0.042 Wb. Calculate the speed and gross torque developed by the armature.

7 (a) What are the factors which affect the speed of the dc motor? Explain.
(b) Explain method of speed control which controls the speed above the rated speed of dc shunt motor.

8 List out the different tests that can be carried out on dc machines. Mention the purposes, advantages and disadvantages of each test.

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Code: 9A02308 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Prove that the energy and co-energy in a linear magnetic system are given by identical expressions.
(b) Two coupled coils have self and mutual inductances of 2/(1 + x) and (1 – x) respectively. If currents through the coils are 6 A and –3 A, find the input energy supplied to increase 'x' from 0 to 1 cm.

2 With the help of neat sketches show the constructional features of a dc machine and brief the function of each component of the machine.

3 Discuss the following methods of improving commutation in detail:
(a) Increasing the brush contact resistance.
(b) Shifting the brushes.

4 A 4-pole lap-wound long-shunt dc generator supplies 25 kW at terminal voltage of 500 V. The series field, shunt field and armature winding resistances are 0.04 Ω, 200 Ω and 0.03 Ω respectively. The total brush contact drop is 2 V. Neglect the armature reaction. Determine the emf generated and calculate the number of armature conductors is the speed is 1500 rpm. The flux per pole is assumed as 0.03 Wb.

5 What is the experimental procedure to obtain the load characteristics of a separately-excited dc generator? Explain.

6 (a) Mention the different applications of all types of dc motors.
(b) The flux per pole of a 4-pole dc motor is 22 mWb. What total number of ampere-conductors must be carried by the armature to produce a torque of 295 N-m?

7 A 400 V, dc shunt motor has rated current of 180 A, and an armature resistance of 0.05 Ω. It is to accelerate load whose torque is constant and of rated value. The starting current should not exceed twice the rated value. Calculate the value of starter resistance and the manner in which it to be divided among several sections.

8 (a) Discuss the various losses in dc machines in detail.
(b) Compare Swinburne's test and Hopkinson's test conducted on dc machines. List the advantages and limitations of both.

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Code: 9A02308 **4**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL MACHINES - I
(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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

1 Derive the expressions for field-energy and co-energy for both linear and non-linear singly-excited systems.

2 Explain with the help of neat and relevant diagrams, how the emf induced in the armature conductors of a dc generator can be made unidirectional.

3 (a) Explain the terms (i) Over-commutation, (ii) Flat-commutation and (iii) Under-commutation with the help of diagram.
(b) Enumerate the mechanical and electrical conditions which lead to poor commutation.

4 What are the different types of self-excited dc generators? Obtain the terminal voltage and current expressions from the equivalent circuit representations of them.

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.

6 (a) What are the different types of torques of dc motor? Relate them under load and no-load conditions.
(b) A dc shunt machine develops an open circuit emf of 200 V at 1500 rpm. Find its developed torque for an armature current of 18 A.

7 The maximum current during starting for a 500 V shunt motor is to be limited to 125 A. The resistance of the armature is 0.25 Ω. Find the resistance elements for 8-element starter.

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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