Code: 9A04301

R09

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

**ELECTRONIC DEVICES & CIRCUITS**

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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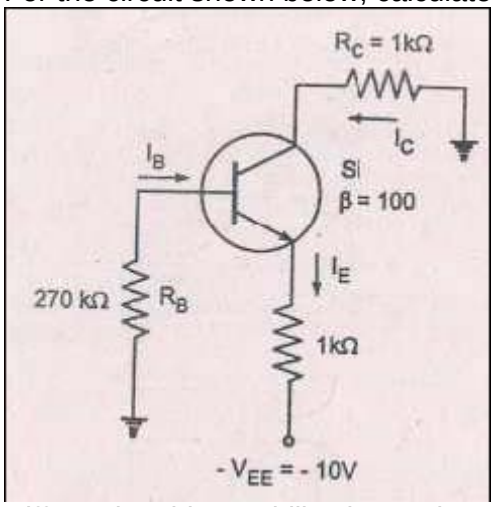
1 (a) What are the various applications of p-n junction diode? Explain them.
(b) What are the specifications of p-n junction diode? Explain how reverse saturation current varies with temperature both in Silicon and Germanium diodes.

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

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

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




(b) Differentiate bias stabilization and compensation techniques.

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

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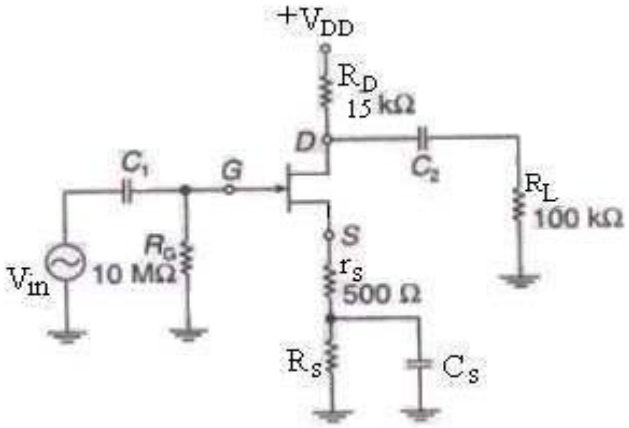
6 (a) The figure shown below is a swamped FET amplifier. Determine the voltage gain when $R_L$=100 K. Neglect the FET output resistance ($r_d$). Take $g_m$ = 4mS.




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

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

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

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

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**Code: 9ABS302** **R09**

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

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

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

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

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

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

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

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

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

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

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

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

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Code: 9ABS303

**R9**

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

**ENVIRONMENTAL SCIENCE**

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

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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

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

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

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

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

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

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

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

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Code: 9A01308

R09

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

**FLUID MECHANICS & HYDRAULIC MACHINERY**

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) State and explain Newton's law of viscosity with a neat sketch and give examples of its application.
(b) In a stream of glycerin in motion, at a certain point the velocity gradient is 0.25 meter per sec per meter. The mass density of fluid is 1268.4 kg per cubic meter and kinematic viscosity is 6.30 ×10−4 square meter per second. Calculate the shear stress at the point.

2 (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 meters 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) What do you mean by equivalent pipe? Obtain an expression for equivalent pipe.
(b) A pipe of diameter 300 mm and length 1000 m connects two reservoirs, having difference of water levels as 15 m. Determine the discharge through the pipe. If an additional pipe of diameter 300 mm and length 600 m is attached to the last 600 m length of the existing pipe, find the increase in the discharge. Take f = 0.02 and neglect minor losses.

4 (a) Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of the jet, when the jet strikes at the center of the semi-circular plates is two times the force exerted by the jet on the fixed vertical plate.
(b) A jet of water of diameter 50 mm strikes a fixed plate in such way that the angle between the plate and the jet is $30^0$. The force exerted in the direction of the jet is 1471.5 N. Determine the rate of flow of water.

5 (a) What do you mean by intake structure? What are the functions of it? Explain different types of intake structures with neat sketches.
(b) The average annual yield of a river at a dam site is 2000 ha-m. Assuming that the entire yield is available for power generation, estimate the water power potential. The average net head available is 52 m. Also estimate the available energy. Take efficiency of turbine as 80% and the efficiency of the generator as 90%.

6 An outward flow reaction turbine has internal and external diameters of the runner as 0.5 m and 1.0 m respectively. The guide blade angle is 15° and velocity of flow through the runner is constant and equal to 3 m/s. If the speed of the turbine is 250 r.p.m., head on turbine is 10 m and discharge at outlet is radial, determine : (i) The runner vane angles at inlet and outlet (ii) Work done by the water on the runner per second per unit weight of water striking per second and (iii) Hydraulic efficiency.

7 (a) Define the specific speed of a turbine. Derive an expression for the specific speed. What is the significance of the specific speed?
(b) An inward flow reaction turbine has external and internal diameters as 1.2 m and 0.6m respectively. The velocity of flow through the runner is constant and is equal to 1.8 m/s. Determine: (i) Discharge through the runner, and (ii) Width at outlet if the width at inlet = 200 mm.

8 (a) Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches.
(b) The internal and external diameters of the impeller of a centrifugal pump are 300 mm and 600 mm respectively. The pump is running at 1000 r.p.m. The vane angles at inlet and outlet are 200 and 300 respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.

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Code: 9A02305

R09

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

**ELECTRICAL CIRCUITS**

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

Time: 3 hours Max Marks: 70

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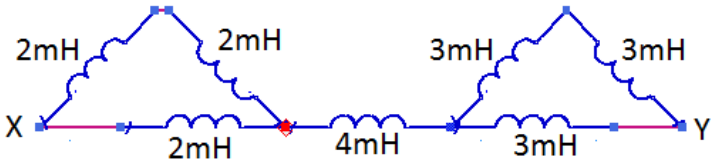
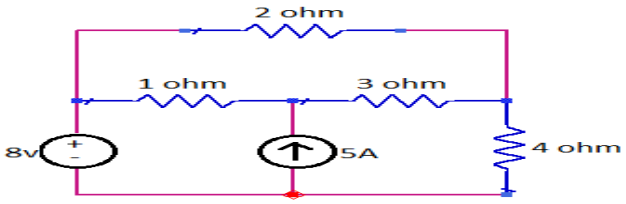
1 (a) State and explain the voltage current relationship for:
(i) Resistance. (ii) Inductance. iii) Capacitance.
(b) Find the equivalent inductance between terminals x-y in the inductive network of figure below.




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




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

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

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

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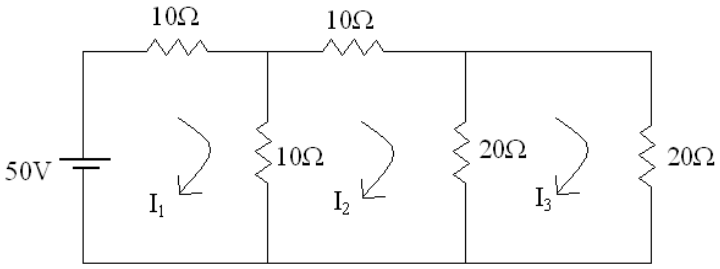
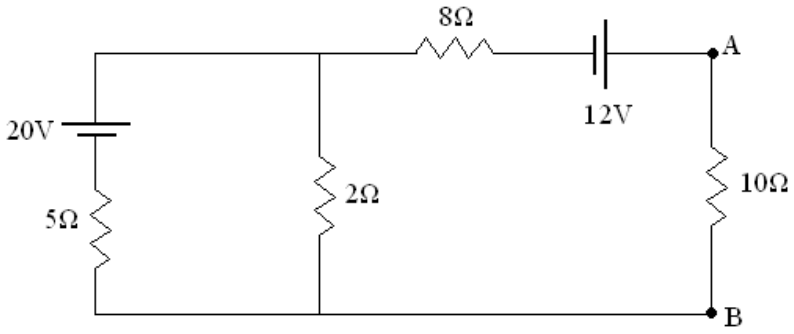
6 Draw the graph of the network shown, select a suitable tree to write tie-set schedule. Then find the loop currents.




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




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

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Code: 9A02308

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 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) What is electromechanical energy conversion?
(b) Develop the block diagram of general electromechanical energy conversion device using energy balance equation.

2 Explain the various pitches related to armature winding of a dc machine. Derive the relation between each for lap and wave windings.

3 A 1500 kW, 550 V, 16-pole generator runs at 150 rpm. What must be the useful flux per pole if there are 2500 lap-connected conductors and full-load copper losses are 25 kW? Calculate the area of the pole-shoe if the gap flux density has a uniform value of 0.9 T and the no-load terminal voltage, neglecting armature reaction and change in speed.

4 What is the significance of critical values of field resistance and speed? Explain how they can be calculated graphically for a dc generator.

5 Two dc compound generators are operating in parallel with an equalizer-bar connection. Both machines are supplying a load of 1000 A. The machines have armature resistances of 0.06 Ω and 0.04 Ω, series-field resistances of 0.07 Ω and 0.05 Ω and induced emfs of 420 V and 440 V respectively. Calculate:
(a) Current in each armature. (b) Current in each series-field winding.
(c) Current in the equalizing-bar. (d) Bus-bar voltage.

6 A 5 kW, 250 V, dc shunt motor takes no-load armature current of 4 A at rated voltage and runs at 1200 rpm. The armature circuit resistance is 0.4 Ω and the field resistance is 250 Ω. At rated load and rated voltage, the motor takes 26 A and the armature reaction weakens the field flux by 4%. Calculate the full-load speed and the corresponding electromagnetic torque of the motor.

7 The speed of a 50 kW dc series motor working on 500 V supply is 750 rpm at full-load and at 85 % efficiency. If the load torque is made 370 N-m and a 2 Ω resistance is connected in series with the machine, calculate the speed at which the machine will run. Assume that the magnetic circuit is unsaturated and the total resistance of armature and field circuits is 0.5 Ω.

8 Two shunt machines loaded for the Hopkinson's test take 15 A at 200 V from the supply. The motor current is 100 A and the shunt currents are 3 A and 2.5 A. If the resistance of each armature is 0. 05 Ω, calculate the efficiency of each machine for its particular conditions of loading.

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