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Code No: R21026 **R10** SET - 1

II B. Tech I Semester Regular Examinations, March – 2014
ELECTRONIC DEVICES AND CIRCUITS
(Com. to EEE, ECE, EIE, ECC, CSE, IT, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. Compare the motion and trajectories of electron when placed
   i) Only in electric field
   ii) Only in Magnetic field
   iii) Combined electric and magnetic fields. (15M)

2. a) What is Fermi-level? Prove that the Fermi level in an 'n'-type material is much closer to conduction band.
   b) Explain the concept of Hall Effect. (9M+6M)

3. a) Compare the characteristics of a P-N Junction diode, and Zener diode.
   b) Explain the formation of depletion region in an open-circuited PN-junction with neat sketches. (7M+8M)

4. a) Define the terms as referred to FWR circuit.
   i) PIV ii) Average DC voltage iii) RMS current iv) Ripple factor.
   b) In a full wave rectifier the required DC voltage is 10V and the diode drop is 0.5V. Calculate AC r.m.s input voltage required in case of bridge rectifier circuit and centre tapped full wave rectifier circuit. (8M+7M)

5. a) With neat diagram explain the various current components in a PNP transistor.
   b) Explain the input and output characteristics of a transistor in CB configuration. (8M+7M)

6. a) Describe the operation of UJT. Draw its equivalent circuit and hence define the Intrinsic Standoff ratio. Draw its characteristic curve and explain the various Parameters.
   b) Write a note on Silicon-Controlled Rectifier. (9M+6M)

7. a) Derive the condition to avoid the thermal runway.
   b) Draw the circuit diagram of a fixed bias and self bias circuits and derive the expressions for stability factors. (7M+8M)

8. a) Write a short note on Miller's theorem.
   b) Analyze a single stage transistor amplifier using h - parameters. (6M+9M)
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) List out the advantages and disadvantages of both electrostatic and electromagnetic deflection systems
   b) Explain the terms:
   i) Potential ii) Electron Volt. iii) Charge density iv) Current density. (7M+8M)

2. a) What is Fermi-level? Prove that the Fermi level in a 'p'-type material is much closer to valency band.
   b) What do you mean by step graded junction? Derive the expression for diffusion capacitance. (8M+7M)

3. a) Explain the concept of tunneling with energy band diagrams.
   b) Explain the principle of operation of Varactor diode and photo diode. (7M+8M)

4. a) Define the following for a HWR:
   i) Ripple factor ii) PIV iii) TUF iv) Rectification efficiency
   b) Compare Full wave and Bridge rectifiers with respect to ripple factor, regulation, Rectification efficiency and PIV ratings. (8M+7M)

5. a) With neat diagram explain the various current components in a PNP transistor.
   b) Explain the input and output characteristics of a transistor in CE configuration. (8M+7M)

6. a) Define intrinsic standoff ratio and Draw the symbol and equivalent circuit of a UJT.
   b) Explain principle of the operation of UJT with the help of its V-I characteristics. (8M+7M)

7. a) Explain how self biasing can be done in a BJT, draw the equivalent circuit and find the stability factor for it.
   b) Explain the term "Thermal Runaway" and how to overcome it. (9M+6M)

8. With the help of exact and approximate hybrid model, derive expressions for current gain (A_I), input Impedance (Z_i), output impedance (Z_o) and voltage gain (A_V) of CE amplifier. (15M)
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(Com. to EEE, ECE, EIE, ECC, CSE, IT, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) List out the advantages and disadvantages of both electrostatic and electromagnetic deflection system?
   b) Explain the terms: (i) Potential (ii) Electron Volt (iii) Charge density (iv) Current density (7M+8M)
2. a) What is Fermi-level? Prove that the Fermi level in an 'n'-type material is much closer to conduction band
   b) Define Hall Effect, Diffusion and Continuity Equation. (9M+6M)

3. a) Explain the Zener diode characteristics in Reverse biased condition.
   b) Explain Zener diode as voltage regulator. (8M+7M)

4. a) Define the following terms of a rectifier and filter: i) Ripple Factor ii) Regulation iii) Rectification Efficiency iv) Form Factor v) Peak factor
   b) Explain full wave rectifier with capacitor filter with help of wave forms. (7M+8M)

5. a) With neat sketches explain the cut off region, active region and saturation region of CE output characteristics.
   b) The current gain of transistor in CE circuit is 49. Calculate CB current gain and find the base current where the emitter current is 3 mA. (8M+7M)

6. a) Explain MOSFET V-I characteristics in Enhancement and depletion mode.
   b) What are the advantages JFET over BJT? (8M+7M)

7. a) Define stability factors S, S' and S''' and determine stability factor for collector to base bias
   b) Explain the term "Thermal Runaway" and suggest methods to overcome it. (9M+6M)

8. With the help of exact and approximate hybrid model. Derive the expressions for current gain, input Impedance, output impedance and voltage gain of a CB amplifier. (15 M)
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II B. Tech I Semester Regular Examinations, March – 2014
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(Com. to EEE, ECE, EIE, ECC, CSE, IT, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. Compare the motion and trajectories of electron when placed (15M)
   i) Only in electric field ii) Only in Magnetic field iii) Combined electric and magnetic fields.

2. a) What is Fermi-level? Prove that the Fermi level in an 'p'-type material is much Closed to conduction band
   b) Explain the concept of tunneling with energy band diagrams. (9M+6M)

3. a) Explain how a variable capacitance can be built using a Varactor diode.
   b) Explain the principle and operation of photo diode with help of neat diagram. Also draw the V-I characteristics. (7M+8M)

4. a) Derive the expression for ripple factor, regulation, rectification efficiency for half wave rectifier.
   b) Define the terms as referred to FWR circuit: i) PIV ii) Average DC voltage iii) RMS current iv) Ripple factor. (7M+8M)

5. a) With neat diagram explain the various current components in an NPN transistor.
   b) Explain the input and output characteristics of a transistor in CB configuration. (8M+7M)

6. a) Describe the operation of UJT. Draw its equivalent circuit and hence define the intrinsic standoff ratio. Draw its characteristic curve and explain the various Parameters.
   b) Explain principle of operation of SCR using its V-I characteristics. (8M+7M)

7. a) Derive the expressions for stability factors in the case of self bias of a CE mode transistor.
   b) Explain biasing compensation techniques. (8M+7M)

8. a) Write a short note on Miller's theorem.
   b) Analyze a single stage transistor amplifier using h - parameters. (7M+9M)
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Code No: R21041 **R10** SET - 1

II B. Tech I Semester Regular Examinations, March – 2014
ELECTRICAL TECHNOLOGY
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Draw a neat sketch of a DC generator and explain the function of each part.
   b) A short-shunt compound d.c generator delivers 100 A to a load at 250 V. The generator has shunt field, series field and armature resistance of 130 Ω, 0.1 Ω and 0.1 Ω respectively. Calculate the voltage generated in armature winding. Assume 1V drop per brush. (8M+7M)

2. a) Discuss different methods of speed control of a DC shunt motor.
   b) A 4-pole, 250 V, wave-connected shunt motor gives 10kW when running at 1000 r.p.m. and drawing armature and field currents of 60 A and 1 A respectively. It has 560 conductors. Its armature resistance is 0.2 Ω. Assuming a drop of 1 V per brush, determine: i) Total Torque; ii) Useful Torque; iii) Useful flux per pole; iv) Rotational Losses; v) Efficiency. (7M+8M)

3. a) Describe the operation of a single-phase transformer, explaining clearly the functions of the different parts. Why are the cores laminated?
   b) A 230/110 V single-phase transformer takes an input of 350 V A at no load and at rated voltage. The core loss is 110 W. Find i) the iron-loss component of no-load current, ii) the magnetizing component of no-load current and iii) no-load power factor. (7M+8M)

4. a) A transformer is rated at 100 kVA. At full load its copper loss is 1200 W and its iron loss is 960 W. Calculate i) The efficiency at full load, unity power factor, ii) The efficiency at half load, 0.8 power factor, iii) The efficiency is 75% full load, 0.7 power factor, iv) The load kVA at which maximum efficiency will occur, v) The maximum efficiency at 0.85 power factor.
   b) Define voltage regulation of a transformer and derive the conditions for i) zero regulation ii) maximum regulation (7M+8M)
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5. a) Compare and contrast between squirrel-cage and slip-ring motors with respect to construction, operation, and performance..
   b) The frequency of emf in the stator of a 4-pole induction motor is 50 Hz, and that in the rotor is 1.5 Hz. Compute i) slip ii) rotor speed (8M+7M)

6. a) Explain the Synchronous Impedance Method to predetermine the regulation of an alternator.
   b) A 4-pole, 50 Hz star-connected alternator has a flux per pole of 0.12 Wb. It has 4 slots per pole per phase, conductors per slot being 4. If the winding coil span is 150^0, find the induced emf. (8M+7M)

7. a) Describe the constructional features and operating characteristics of a shaded-pole motor. Discuss its uses.
   b) Explain the principle of operation of a single phase induction motor. (7M+8M)

8. Sketch and describe the construction of a Moving Coil Ammeter and give the principle of operation. Also discuss its advantages and disadvantages. (15M)

Code No: R21041 **R10** SET - 2

II B. Tech I Semester Regular Examinations, March – 2014
ELECTRICAL TECHNOLOGY
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain why the external characteristic of a dc shunt generator is more drooping than that of a separately excited generator.
   b) A long-shunt compound generator delivers a load current of 50 A at 500 V, and the resistances of armature, series field and shunt fields are 0.05 Ω, 0.03 Ω and 250 Ω respectively. Calculate the generated e.m.f and the armature current. Allow 1.0 V per brush for contact drop. (8M+7M)

2. a) Describe Swinburne's test with the help of a neat diagram to find out the efficiency of a d.c. machine. What are the main advantages and disadvantages of this test?
   b) A Series motor, with an unsaturated magnetic circuit and 0.5 Ω total resistance, when running at a certain speed takes 60 A at 500 V. If the load torque varies as the cube of the speed, calculate the resistance required to reduce the speed by 25%. (7M+8M)

3. a) Develop the exact equivalent circuit of a 1-phase transformer. From this derive the approximate and simplified equivalent circuits of the transformer. State the various assumptions made.
   b) A single –phase 240/20 V, 50 Hz transformer has the secondary full-load current of 180 A. It has 45 turns on its secondary. Calculate i) the voltage per turn, ii) the number of primary turns iii) the full-load primary current; and iv) the kVA output of the transformer. (7M+8M)

4. a) Describe the tests on a 1-phase transformer that gives its ohmic losses and core losses. Give the determination of the equivalent circuit parameters which can be determined from these tests.
   b) A single –phase transformer working at unity power factor has an efficiency of 90% at both half load and at the full-load of 500 W. Determine the efficiency at 75% full load and the maximum efficiency. (7M+8M)
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5. a) Discuss the principle of operation of 3-phase Induction Motor.
   b) A 3-phase, 6-pole, 50 Hz induction motor has a slip of 1% at no load, and 3% at full load. Determine i) synchronous speed ii) No-load speed iii) full-load speed iv) frequency of rotor current at stand still v) frequency of rotor current at full load. (8M+7M)

6. a) State the advantages and disadvantages of using short-pitched winding and distributed winding in an alternator.
   b) Derive the emf equation of an alternator and explain the effect of coil span factor and distribution factor on the induced emf. (8M+7M)

7. a) Explain the construction, working and applications of a stepper motor.
   b) Draw the connection diagram of capacitor-start and capacitor-run single phase induction motor and explain its operation. (7M+8M)

8. a) What are the basic requirements of indicating instruments? Briefly discuss them.
   b) Explain the principle of operation of Permanent Magnet Moving Coil Instruments (15M)

Code No: R21041 **R10** SET - 3

II B. Tech I Semester Regular Examinations, March – 2014
ELECTRICAL TECHNOLOGY
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Distinguish between self-excited and separately excited d.c. generators. How are self-excited d.c. generators classified? Give their circuit diagrams
   b) A 4-pole d.c. generator has 1200 armature conductors and generates 250 V on open circuit when running at a speed of 500 r.p.m. The diameter of the pole-shoe circle is 0.35 m and the ratio of pole arc to pole pitch is 0.7 while the length of the pole shoes is 0. 2 m. Find the mean flux density in the air gap. Assume lap-connected armature winding. (8M+7M)

2. a) What is the necessity of a starter for a d.c. motor. Explain, with a neat sketch, the working of a 3-point d.c. shunt motor starter, bringing out the protective features incorporated in it.
   b) A 500 V shunt motor takes 4 A on no load. The armature resistance including that of brushes is 0.2 Ω and the field current is 1 A. Estimate the output and the efficiency when the input current is i) 20 A and, ii) 100 A. (7M+8M)

3. a) Develop the phasor diagram of a single-phase transformer under load condition. Assuming lagging power factor load.
   b) A single-phase transformer has a no-load voltage ratio of 400/3300 V. The low-voltage winding has 80 turns and the net cross-sectional area of the core is 200 cm^2. The frequency of the applied voltage is 50 Hz. Calculate the maximum value of the flux density and the number of turns on the secondary. (7M+8M)

4. a) Define voltage regulation of a transformer. For which type of load the voltage regulation is negative? Derive the expression using the equivalent circuit.
   b) The maximum efficiency of a 500 kVA, 3300/500 V, 50 Hz, 1-phase transformer is 0.97 per unit and occurs at 75% full load and unity power factor. If the leakage impedance is 10%, calculate the voltage regulation at full load, power factor 0.8 lagging. (7M+8M)
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5. a) Derive the expression of rotor frequency in terms of main supply frequency and slip.
   b) Describe the constructional details of squirrel cage induction motor? Explain the constructional difference between squirrel cage and slip ring induction motors. (8M+7M)

6. a) Explain the constructional details and principle of operation of a synchronous machine.
   b) Calculate the r.m.s value of the induced emf per phase of a 10-pole, 3-phase, 50 Hz alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150^0 and the flux per pole is 0.12 Wb. (8M+7M)

7. a) Explain the principle of operation of an AC servomotor. Discuss its applications.
   b) Explain why single phase induction motor is not self starting. (7M+8M)

8. a) A dc voltmeter has a resistance of 28600 ohm. When connected in series with an external resistor across a 480V dc supply, the instrument needs 220V. What is the value of the external resistance?
   b) Give the constructional details of moving iron instruments. (7M+8M)

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II B. Tech I Semester Regular Examinations, March – 2014
ELECTRICAL TECHNOLOGY
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain the open circuit characteristics of a dc generator and explain its significance.
   b) A 110 V d.c. shunt generator delivers a load current of 50 A. The armature resistance is 0.2 Ω, and the field circuit resistance is 55 Ω. The generator, rotating at a speed of 1800 r.p.m., has 6 poles, lap-wound, and a total of 360 conductors. Calculate the no-load voltage at the armature and the flux per pole. (7M+8M)

2. a) Explain the speed-current, torque-current and speed-torque characteristics of d.c. shunt motor.
   b) A 200 V d.c. series motor runs at 1000 r.p.m. and takes 20 A. Combined resistance of armature and field is 0.4 Ω. Calculate the resistance to be inserted in series so as to reduce the speed to 800 r.p.m., assuming torque to vary as square of the speed and linear magnetization curve. (7M+8M)

3. a) Explain briefly the action of a transformer and show that the voltage ratio of the primary and secondary windings is the same as their turns ratio.
   b) A single-phase transformer has 400 primary and 1000 secondary turns. The net cross-sectional area of the core is 60 cm^2. If the primary winding be connected to a 50 Hz supply at 500 V, calculate i) the peak value of the flux density in the core, and ii) the voltage induced in the secondary winding. (7M+8M)
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4. a) Describe the various losses in a transformer. Explain how each loss varies with the load current, supply voltage and frequency.
   b) Open-circuit and short-circuit tests on a 5 kVA, 220/400 V, 50 Hz, single-phase transformer gave the following results:

O.C. test	220 V	2 A	100 W (i.v. side)
S.C. test	40 V	11.4 A	200 W (h.v side)

   Determine the efficiency and approximate regulation of the transformer at full load 0.9 power factor lagging. (8M+7M)

5. a) Explain briefly different starting methods of an induction motor?
   b) Draw the torque-speed characteristics of a poly phase induction motor and clearly indicate the effect of changing the rotor resistance? (7M+8M)

6. a) Explain the OC and SC tests on an alternator. How the regulation can be calculated by the use of their results.
   b) A 3-phase, 8-pole, 750 rpm star connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is short chorded by 2 slots. Find the induced emf between the lines, given the flux per pole is 0.06 Wb. (7M+8M)

7. a) Explain the principle of operation of an AC tachometer. Discuss its applications.
   b) Write a short notes on synchros. (7M+8M)

8. a) Differentiate between PMMC and moving iron instruments.
   b) Explain the basic principle involved in indicating instruments and classify them. (7M+8M)

Code No: R21022 **R10** SET - 1

II B. Tech I Semester Regular Examinations, March – 2014
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Com. to EEE, ME, ECE, EIE, CSE, IT, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain the exceptions to the law of demand.
   b) Discuss various determinants of demand for electronic gadgets. (8M+7M)

2. a) Explain how to forecast demand for new products.
   b) Explain point and arc elasticity of demand. (8M+7M)

3. a) Explain law of variable proportions.
   b) Discuss briefly managerial significance of break even analysis. (8M+7M)

4. Explain Price-Output determination in Perfect Competition. (15M)

5. What is business cycle? What are the various phases of business cycles? (15M)
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6. From the following Trial Balance, prepare a Trading, Manufacturing and Profit and Loss Account and balance sheet as on 31st December 2012: (15M)

TRIAL BALANCE as on 31st December 2012

Particulars	Amount Rs.	Amount Rs.
Stock on 1.1.2012		
Raw materials	20,000/-	
Work-in progress	50,000/-	
Finished Goods	100,000/-	
Manufacturing wages	100,000/-	
Purchasing of Raw materials	300,000/-	
Factory Rent	50,000/-	
Carriage of Raw materials	30,000/-	
Salary of the Works Managers	20,000/-	
Office Rent	20,000/-	
Printing and Stationery	10,000/-	
Bad Debts	10,000/-	
Sales		600,000/-
Land and Buildings	300,000/-	
Plant and machinery	200,000/-	
Depreciation on Plant	20,000/-	
Sundry Debtors	50,000/-	
Sundry Creditors		300,000/-
Cash in Hand	50,000/-	
Capital		430,000/-
Total		**13,30,000**
	13,30,000/-	

7. From the following particulars, prepare the Funds Flow Statement: (15M)

Liabilities	1 JAN Rs.	31 Dec Rs.	Assets	1 Jan Rs.	31 Dec Rs.
Creditors	36,000	41,000	Cash	4,000	3,600
Bank Loan	30,000	45,000	Debtors	35,000	38,400
Capital	1,48,000	1,49,000	Stock	25,000	22,000
			Land	20,000	30,000
			Building	50,000	55,000
			Machinery	80,000	86,000
	2,14,000	**2,35,000**		**2,14,000**	**2,35,000**

8. a) Discuss the need for Capital Budgeting.
   b) Explain i) ARR ii) NPV (7M+8M)

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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Explain the basic economic tools in Managerial Economics.
   b) What is Law of Demand? (8M+7M)

2. Explain: a) survey Method of demand forecasting b) Trend Projection Method
   c) Delphi method (5M+5M+5M)

3. a) Explain Least cost Combination of Inputs.
   b) Distinguish between Explicit costs and implicit costs. (8M+7M)

4. a) Explain the features of Monopolistic Competition.
   b) What is Peak Load Pricing and Transaction based Pricing? (8M+7M)

5. Discuss characteristic features of Industrial organization and also business cycles. (15 M)

6. From the following balance extracted from the books of RKC Co. pass the necessary closing entries, prepare a trading and Profit and Loss account and Balance Sheet. (15 M)

Particulars	Rs.	Particulars	Rs.
Opening Stock	1,250	Plant and machinery	6,230
Sales	11,800	Returns Outwards	1,380
Depreciation	667	cash in hand	895
Commission(cr.)	211	Salaries	750
Insurance	380	Debtors	1,905
Carriage Inwards	300	Discount (Dr.)	328
Furniture	670	Bills receivable	2,730
Printing Charges	481	Wages	1,589
Carriage Outwards	200	Returns Inward	1,659
Capital	9,228	bank Overdraft	4,000
Creditors	1,780	Purchases	8,679
Bills Payable	541	Petty cash in Hand	47
		Bad Debts	180

The value of stock on 31st December 2012 was Rs.3,700
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7. From the following Balance sheets as on 31st December 2011 and 31 December 2012 , prepare a Schedule of Changes in the Working capital and a funds flow statement taking:
   i) the provision for tax and proposed dividends as non-current liabilities.
   ii) the provision for tax and proposed dividends as current liabilities. (15 M)

Balance sheet as on 31 December

Liabilities	2011 Rs.	2012 Rs.	Assets	2011 Rs.	2012 Rs.
Share capital	10,000	15,000	Fixed Assets	10,000	20,000
Profit & Loss account	4,000	6,000	Current assets	13,000	14,500
Provision for Tax	2,000	3,000			
Proposed Dividends	1,000	1,500			
Sundry Creditors	4,000	6,000			
Outstanding Expenses	2,000	3,000			
	23,000	**34,500**		**23,000**	**34,500**

Additional Information
Tax paid during 2011 Rs.2,500
Dividends paid during 2011 Rs.1,000

8. A Project initial investment is 10 lakhs and cash inflows for five years are as follows.

Year	**Cash inflows**
2008	2,00,000
2009	2,40,000
2010	3,00,000
2011	3,60,000
2012	4,00,000

The cost of Capital is 12%. Compute NPV and IRR of the Project. (15 M)

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1. Discuss the multidisciplinary nature of Managerial economics. Explain the scope of managerial economics. (15 M)

2. Explain types of income elasticity of demand with suitable examples. (15 M)

3. Discuss the Cobb Douglas Production function. What is opportunity cost? (15 M)

4. What is kinked Demand Curve? Explain price output determination in oligopolistic market. (15 M)

5. Outline the features of Sole Proprietorship. (15 M)

6. From the following balances, taken from the Trial Balance of SCo Ltd. Prepare a trading and Profit and Loss account for the year ending 31st December 2012 (15 M)

Particulars	Dr. Rs	Cr. Rs.
Stock on1.1.2011	2,000	
Purchases and sales	20,000	30,000
Returns	2,000	1,000
Carriage	1,000	
Cartage	1,000	
Rent	1,000	
Interest received		2,000
Salaries	2,000	
General Expenses	1,000	
Discount		500
Insurance	500	

The closing stock on 31st December 2011 is Rs.5, 000.
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7. From the following Profit and Loss account, you are required to compute cash from operations (15 M)

Profit and Loss account for the ending 31 December 2010

Particulars	Rs	Particulars	Rs
To Salaries	5,000	By Gross Profit	25,000
To Rent	1,000	By Profit on sale of Land	5,000
To Depreciation	2,000	By income tax refund	3,000
To loss on sale of Plant	1,000		
To Goodwill written off	4,000		
To Proposed Dividends	5,000		
To Provisions for Taxation	5,000		
To Net Profit	10,000		
	33,000		**33,000**

8. Explain Net Present value and payback methods of capital budgeting. (15 M)

Code No: R21022 **R10** SET - 4

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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. Explain discounting principle, incremental concept and equi-marginal concept. (15 M)

2. Discuss various forecasting demand for new products with suitable examples. (15 M)

3. Discuss the production function with all inputs variables. (15 M)

4. Explain Skimming Price policy, Marginal cost pricing and Limit Pricing. (15 M)

5. Discuss the various phases of business cycles. Explain its features. (15 M)

6. Enter the following transactions in proper subsidiary books of Ram; (15 M)

2010		
January 1	Sold goods to Ramesh	5250
January1	Bought from hari ram	7800
January2	Ramesh returned oods	750
January2	Sold to Dev	5500
January2	Purchased goods from Mangal	7000
January4	return goods to Mangal	1000
January4	Bought from Devi dayal	3250
January4	Sold to Zakeer	3500
January5	zakeer returned goods	450
January6	Sold to ram saran	5000
January6	sold to Gyan	3000
January7	ram saran returned goods	500
January7	Bought from Devi dayal	7000
January8	Return goods to Devi dayal	750
January9	Purchased goods from raghuSubject	
	To trade discount of 10%	10,000
January10	Sold to rajaram goods subject to	
	Trade discount of 5%	5,000
~~~~~~~~~~~~~~~~~~~~~~~~~~

7. From the following ratios draw the balance sheet of the company for the year 2012 (15 M)

Current Ratio	2.5
Liquidity Ratio	1.5
Net Working Capital	Rs.3,00,000
Stock Turnover Ratio (Cost of Sales/closing stock)	6 times
Gross Profit Ratio	20 per cent
Fixed assets Turnover ratio(on cost of sales)	2 times
Debt Collection Period	2 months
Fixed assets to shareholders net worth	0.80
Reserve and Surplus to Capital	0.50

8. Initial Investment for a project is 20 lakh. The Project life is 6 years and the cash inflows for six is as given below

Year	Cash inflow Rs.
1	3,50,000
2	4,00,000
3	5,00,000
4	5,50,000
5	6,00,000
6	5,00,000

The cost of capital of is 13%. Compute NPV, IRR and Payback period. (15 M)

Code No: R21042 **R10** SET - 1

II B. Tech I Semester Regular Examinations, March – 2014
NETWORK ANALYSIS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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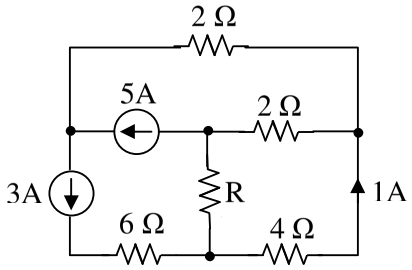
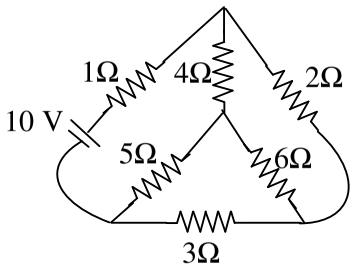
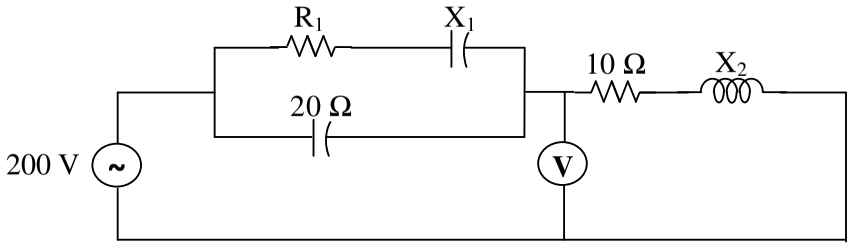
1. a) Compare the ideal and practical voltage sources.
   b) In the circuit shown below, find the value of R using mesh analysis. (7M+8M)



2. a) Define average value, RMS value, form factor and peak factor.
   b) Draw the oriented graph and obtain the tie-set matrix (Consider 4Ω, 5Ω and 6Ω branches as tree branches). (8M+7M)

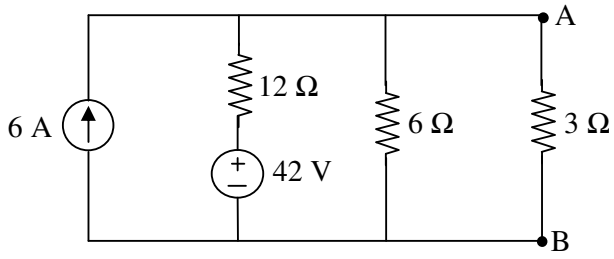


3. a) Derive an expression for power in a series RL circuit excited by a sinusoidal voltage $v(t)=V_m \sin \omega t$.
   b) The circuit shown below takes 12A at a lagging power factor and dissipates 1800 W. The reading of the voltmeter is 200V. Find R_1, X_1 and X_2. (7M+8M)



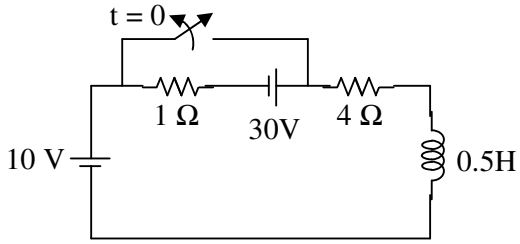
4. a) Explain the concept of dot convention for coupled circuits.
   b) A RLC series circuit of 8Ω resistance should be designed to have a band width of 50Hz. Determine the values of L and C so that the system resonates at 250Hz. (7M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) State and explain the Millman's theorem.
   b) In the circuit shown below, find the current in the 3 ohms resistor using Thevenin's theorem. (7M+8M)



6. a) Express Z-parameters in terms of ABCD-parameters for a two-port network.
   b) Find the condition for reciprocity and condition for symmetry of a two-port network in terms of ABCD parameters. (7M+8M)

7. a) Derive the equation for the transient current i(t) in a series RC circuit excited by a DC input of V volts at time t=0. Assume zero initial conditions.
   b) In the circuit shown below, the switch is initially in closed position for a long time and opened at time t=0. Find the current i(t) for t>0. (7M+8M)



8. a) Briefly explain the important properties of filters?
   b) Design an m-derived low pass filter having cutoff frequency of 1 kHz, resonant frequency 1100 Hz and design impedance of 400 Ω. (7M+8M)

Code No: R21042 **R10** SET - 2

II B. Tech I Semester Regular Examinations, March – 2014
NETWORK ANALYSIS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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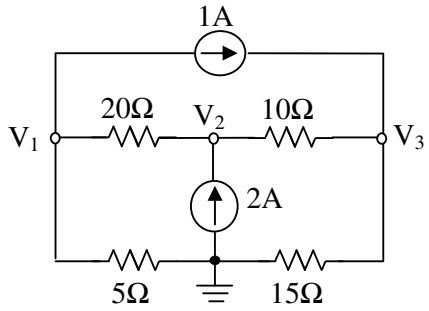
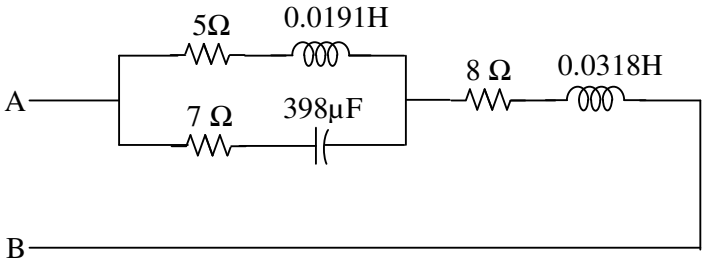
1. a) Explain the source transformation technique with an example.
   b) Find the nodal voltages and the power delivered by the 2A current source in the circuit shown below, using the nodal analysis. (7M+8M)



2. a) Explain the terms: Node, Subgraph, Graph, Tree and Co-tree.
   b) Explain the procedure to obtain dual of a circuit. (8M+7M)

3. a) Derive the expression for power in a single phase AC circuit.
   b) In the circuit shown below, what 50 Hz voltage must be applied across terminals A and B to have 10 A current in the capacitor. (7M+8M)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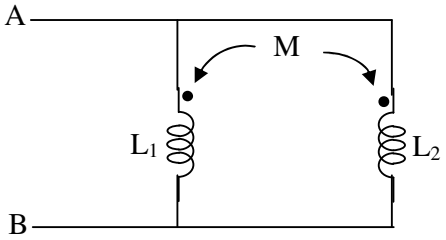
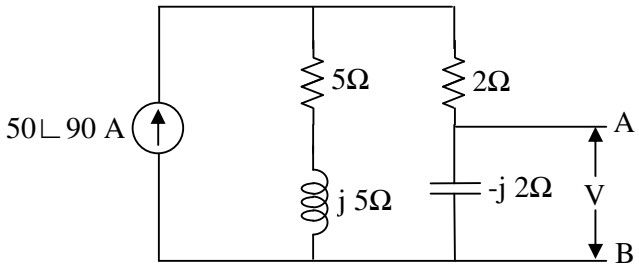
4. a) Define the Q-factor and derive an equation showing the relation between Q-factor, Band width and selectivity at resonance.
   b) Obtain the equivalent inductance of the circuit shown below between the terminals A and B. (7M+8M)



5. a) State and explain the Norton's theorem
   b) Verify the Reciprocity theorem by finding the voltage V across the terminals A and B of the network shown below. (7M+8M)



6. a) Find the condition for reciprocity and condition for symmetry of a two-port network in terms of Z parameters.
   b) Explain the cascade connection of two 2-port networks. (8M+7M)

7. a) Derive the equation for the transient current i(t) in a series RC circuit excited by a sinusoidal input of $v(t)=V_m \sin \omega t$, at time t=0. Assume zero initial conditions.
   b) A series RLC circuit with R=10 ohms, L=0.1 henries and C=20 microfarads has a constant voltage of 100 Volts applied at time t=0. Determine the transient current i(t) using Laplace transform techniques. Assume zero initial conditions. (7M+8M)

8. a) Explain the constant-K Low Pass Filter in detail.
   b) Design a m-derived High Pass Filter with a cut-off frequency of 10 KHz. Design impedance of 500Ω and m = 0.4 (7M+8M)

Code No: R21042 **R10** SET - 3

II B. Tech I Semester Regular Examinations, March – 2014
NETWORK ANALYSIS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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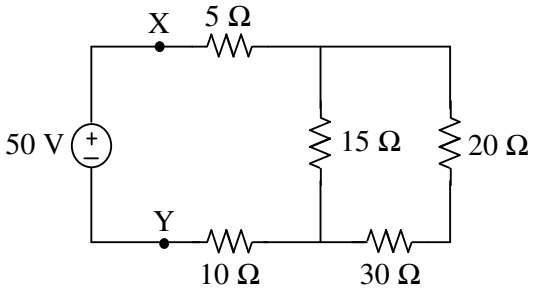
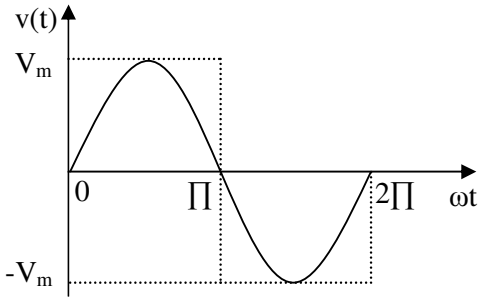
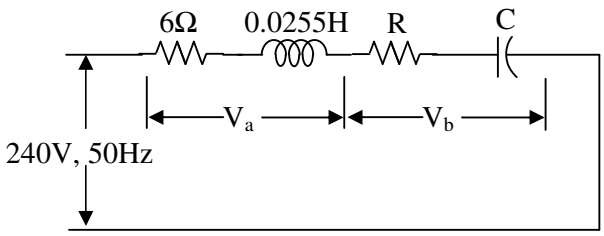
1. a) Explain the terms: Unilateral and bilateral elements; Active elements and Passive elements.
   b) Find the resistance across the terminals X-Y and hence find the current in each branch of the circuit shown below. (8M+7M)



2. a) Explain the terms: Graph, Tree, Co-tree and Incidence matrix with an example.
   b) Find the ratio of R.M.S. values of the two voltage wave forms of equal peak value, one sinusoidal and the other rectangular in shape as shown below. (8M+7M)



3. a) Derive the equations to transform star connected impedances into delta connected impedances
   b) Find the values R and C so that $V_a=3V_b$, V_a and V_b are in quadrature. (7M+8M)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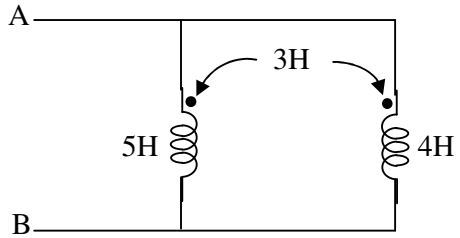
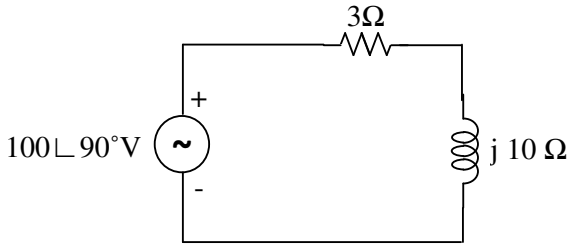
4. a) Show that the resonant frequency is the geometric mean of two half power frequencies.
   b) Derive the necessary equation and obtain the equivalent inductance L_{eq} between terminals A and B in the network shown below. (7M+8M)

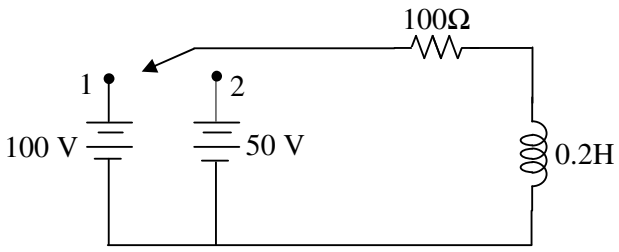


5. a) State and explain the Superposition theorem.
   b) In the circuit shown below, find the change in current using Compensation theorem when the j10Ω reactance is changed to j5Ω. (7M+8M)



6. a) Express h-parameters in terms of Z-parameters for a two-port network.
   b) Explain the series connection of two 2-port networks. (7M+8M)

7. a) Derive the equation for the transient current i(t) in a series RL circuit excited by a sinusoidal input of $v(t)=V_m \sin \omega t$ at time t=0. Assume zero initial conditions.
   b) In the circuit shown below, the switch is closed on position 1 at t=0 there by applying the 100V source to the R-L branch, and at t=500 microseconds, the switch is moved to position 2.Obtain the equations for the current in both intervals. (7M+8M)



8. a) Briefly explain the various types of filters?
   b) Design an m-derived Low Pass Filter having cutoff frequency of 1.5 kHz, resonant frequency of 1600 Hz and design impedance of 600 Ω. (7M+8M)

Code No: R21042 **R10** SET - 4

II B. Tech I Semester Regular Examinations, March – 2014
NETWORK ANALYSIS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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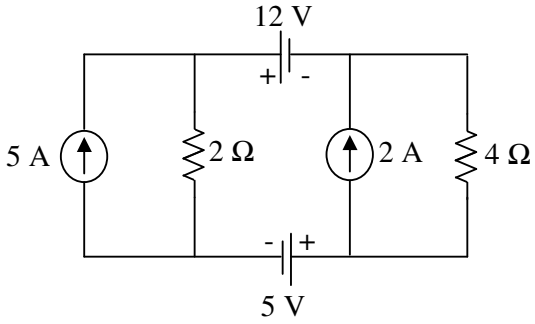
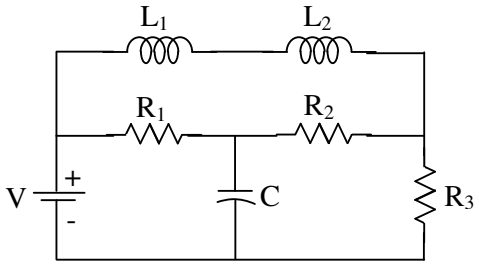
1. a) State and explain the Kirchhoff's laws.
   b) Find the current in the 4 ohms resistor using source transformation techniques. (7M+8M)



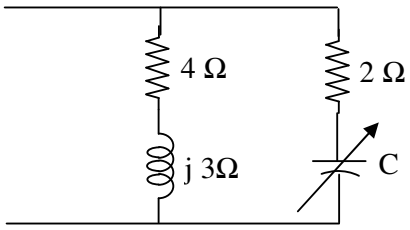
2. a) Obtain average value, RMS value, form factor and peak factor of a sinusoidal voltage $v(t)=V_m \sin \omega t$.
   b) Draw the dual circuit for the circuit shown below. (8M+7M)



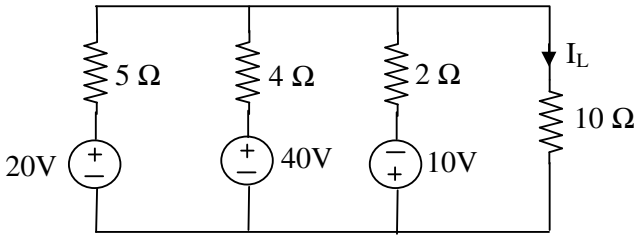
3. a) Derive the equations to transform delta connected impedances into star connected impedances
   b) The current in a circuit is given by I= (3+j5) A when the applied voltage is V= (150+j150)V. Determine the impedance, power factor and the real power. (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21042 **R10** SET - 4

4. a) Define coefficient of coupling K and derive the relation between self inductances L_1, L_2, mutual inductance M and coefficient of coupling K.
   b) Find the value of C at which the circuit shown below resonates at a frequency of 1000 radians/sec. (7M+8M)



5. a) State and explain Reciprocity theorem.
   b) Find the current I_L using Millman's theorem. (7M+8M)



6. a) Express Y-parameters in terms of Z-parameters for a two-port network.
   b) Explain the Parallel connection of two 2-port networks. (7M+8M)

7. a) Derive the equation for the transient current i(t) in a series RL circuit excited by a DC input of V volts at time t=0. Assume zero initial conditions.
   b) A series RLC circuit with R=10 ohms, L=0.1 henries and C=0.25 farads has a constant voltage of 50 Volts applied at time t=0. Determine the transient current i(t). Assume zero initial conditions. (7M+8M)

8. a) What is constant k-Filter? What is the difference between constant k-filter and m-derived filter? What are the limitations of constant 'K' filters?
   b) Design a m-derived High Pass Filter with a cut-off frequency of 10 KHz. Design impedance of 600Ω and m = 0.3 (7M+8M)

Code No: R21043 **R10** SET - 1

II B. Tech I Semester Regular Examinations, March – 2014
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Give the definition and Axioms of probability.
   b) Using Venn diagrams prove the Demorgan's laws:
   i) $(\overline{A \cup B}) = \overline{A} \cap \overline{B}$ ii) $(\overline{A} \cap \overline{B}) = \overline{A} \cap \overline{B}$) (7M+8M)

2. a) If the function $G_x(x) = K \sum_{n=1}^{N} n^3 u(x-n)$ to be a valid distribution function, find the value of 'K'.
   b) State and prove any four properties of probability density function. (7M+8M)

3. a) Find the skew for Gaussian distributed random variable.
   b) Explain about the monotonic transformations for a continuous random variable. (7M+8M)

4. a) State and prove central limit theorem for equal distributions.
   b) The joint density function of random variables X and Y is
   $f_{xy}(x, y) = \frac{1}{a} e^{-|x|-|y|}$, $-\infty < x < \infty$, $-\infty < y < \infty$.
   i) Are X and Y statistically independent variables.
   ii) Calculate the probability of $x \leq 1$ and $y \leq 0$. (7M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Three random variables X_1, X_2, and X_3 represent samples of random noise voltage taken at three times. Their covariance matrix is defined by

$$[C_x] = \begin{bmatrix} 3.0 & 1.8 & 1.1 \\ 1.8 & 3.0 & 1.8 \\ 1.1 & 1.8 & 3.0 \end{bmatrix}$$

The transformation matrix

$$[T] = \begin{bmatrix} 4 & -1 & -2 \\ 2 & 2 & 1 \\ -3 & -1 & 3 \end{bmatrix}$$

Convert the variable to new random variables Y_1, Y_2 and Y_3. Find the covariance matrix of the new random variables.

b) State and prove any two properties of joint characteristic function. (8M+7M)

6. a) Consider a random process X(t) = $\cos(\omega t + \theta)$ where ω is a real constant and θ is a uniform random variable in $(0, \frac{\pi}{2})$. Find the average power in the process.

b) Derive the condition for a random process to be mean Ergodic. (8M+7M)

7. a) State and prove any three properties of Cross correlation function.

b) Derive the relation between Auto Correlation Function and PSD. (7M+8M)

8. a) Derive the relation between PSD of input & Cross PSD of input and output.

b) A WSS process X(t) has $R_{xx}(\tau) = Ae^{-a|\tau|}$ where A and 'a' are real constants is applied to input of LTI system with $h(t) = e^{-bt}\,u(t)$, where 'b' is a real positive constant. Find the PSD of the output of system. (7M+8M)

Code No: R21043 **R10** SET - 2

II B. Tech I Semester Regular Examinations, March – 2014
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State the following and explain
   i) Baye's Theorem ii) Conditional probability.
   b) What is the probability of picking an ace and a king from a 52 card deck? (9M+6M)

2. a) For a real constant b>0, c>0 and any 'a' find the condition on constant 'a' such that

$$f_X(x) = \begin{cases} \left[1 - \frac{x}{b}\right], & 0 \le x \le c \\ 0 & elsewhere \end{cases}$$ is a valid pdf.

   b) State and explain the properties of conditional density function. (8M+7M)

3. a) Find the mean and variance of 'X + a', in terms of mean and variance of 'X'.
   b) Derive the relation between moment generating function and moments. (7M+8M)

4. a) Let X and Y are two independent random variables with
   $f_x(x) = \alpha e^{-\beta x} u(x)$ and
   $f_y(y) = \beta e^{-\beta y} u(y)$
   Find the density function of Z = X + Y for i) $\alpha \neq \beta$ ii) $\alpha = \beta$
   b) Write the properties of Joint distribution. (8M+7M)

5. Zero mean Gaussian random variables X_1, X_2 and X_3 having covariance matrix.

$$[C_x] = \begin{bmatrix} 4 & 2.05 & 1.05 \\ 2.05 & 4 & 2.05 \\ 1.05 & 2.05 & 4 \end{bmatrix}$$

   Are transformed to new random variable Y_1, Y_2, Y_3.
   i) Find the covariance matrix of Y_1, Y_2 and Y_3.
   ii) Write expression for joint density function of Y_1, Y_2 and Y_3. (15 M)
~~~~~~~~~~~~~~~~~~~~~~~~~

6. a) A random process X(t) = A Cos ($w_c t + \theta$) where θ is a random variable uniformly distributed in the range $(0, 2\pi)$. Show that the process is ergodic in mean and correlation sense.
   b) Define covariance function and explain its properties. (8M+7M)

7. a) If the Auto Correlation Function of a WSS process is $R(\tau) = Ke^{-k|\tau|}$. Find its PSD.
   b) Check whether the following functions are valid PSDS or not. (8M+7M)
   i) $\frac{w^2}{w^6 + 3w^2 + 3}$ ii) $\frac{w^2}{w^2 + 16}$

8. a) Compute the overall Noise figure of a four stage cascaded system with following data:
   $F_1 = 10$, $F_2 = 5$, $F_3 = 8$, $F_4 = 12$
   $ga_1 = 50$, $ga_2 = 20$ and $ga_3 = 10$.
   b) State and prove any three properties of Narrow band Noise processes. (8M+7M)

Code No: R21043 **R10** SET - 3

II B. Tech I Semester Regular Examinations, March – 2014
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Using Venn diagram and proof, prove that
   $P(A \cup B/C) = P(A/C) + P(B/C) - P(A \cap B/C)$.
   b) Define probability in terms of relative frequency.
   c) Explain independent events. (7M+3M+5M)

2. a) A random variable X is Gaussian with mean $m_x = 0$ and $\sigma_x = 1$.
   i) What is the probability that $|X|>2$. ii) What is the probability that $X>2$.
   b) Draw the pdf of Rayleigh density function by giving its expression and find the value and X where it is maximum. (8M+7M)

3. a) Let X be a random variable which can take values 1, 2, 3 with probabilities $\frac{1}{3}, \frac{1}{6} and \frac{1}{2}$ respectively. Find the 3rd moment about the mean.
   b) If X is the number scored in a throw of a fair die, show that Chebyshev's inequality gives $P\{|x-m|>2.5\}<0.4$, where 'm' is mean of X, while actual probability is zero. (7M+8M)

4. a) The joint density function of three random variables X, Y and Z is
   $f_{xyz}(x, y, z) = 24xy^2z^3$, $0<x<1, 0<y<1, 0<z<1$
   $= 0$, otherwise.
   i) Find the maginal densities $f_x(x)$, $f_y(y)$ and $f_z(z)$. ii) Find $P(X>1/2, y<2, z>1/2)$
   b) State and prove any four properties of joint density function. (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~~~~

5. For the joint characteristic function

$$Q_{xy}(w_1, w_2) = \exp\left[-\frac{1}{2}\left[\sigma_x^2 w_1^2 + 2\rho\sigma_x\sigma_y w_1 w_2 + \sigma_y^2 w_2^2\right]\right]$$

Find the Marginal characteristic functions of X and Y. (15M)

6. a) Consider a random process X(t) = 10cos (100t + φ) where φ is uniformly distributed random variable in the internal (-π,π). Show that the process is correlation ergodic.

b) State and prove any four properties of Auto Correlation Function. (7M+8M)

7. a) Derive the relation between PSD of x(t) and PSD of $\frac{dx(t)}{dt}$.

b) For a random process X(t) = Acos (wt + θ)+B sinwt where A and B are two uncorrelated random variables with zero mean and equal variances and w is a real constant. Find the ACF of X(t) and hence its PSD. (7M+8M)

8. a) Derive the relation between input and output ACF of an LTI system with impulse response h(t).

b) An amplifier with g_a = 40 dB and B_N = 20 kHz is found to have $T_0 = 10^0$ K. Find T_e and Noise figure. (8M+7M)

Code No: R21043 **R10** SET - 4

II B. Tech I Semester Regular Examinations, March – 2014
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) State and prove Baye's Theorem.
   b) If A and B are two mutually exclusive events show that
   i) $P(A/B) = \frac{P(A)}{1 - P(B)}$ ii) $P(A/AUB) = \frac{P(A)}{P(A)+P(B)} if P(AUB) \neq 0$ (7M+8M)

2. a) Find the constant 'b' such that
   $f_x(x) = \begin{cases} \frac{e^{3x}}{4}, & 0 \le x \le b \\ 0, & elsewhere \end{cases}$ Is a valid density function.
   b) State and prove any four properties of CDF. (7M+8M)

3. a) If X has density function
   $f_x(x) = \exp(-x), \; x > 0$
   $= 0, \quad x \le 0$
   Find the density function of $Y = X^2$
   b) Find the mean of a Gaussian distribution. (8M+7M)

4. a) State and prove the central limit theorem.
   b) If X and Y are two Gaussian random variables with zero mean find the pdf of a new random variable Z = X+Y. (7M+8M)

5. a) State and explain the properties of jointly Gaussian random variables.
   b) Random variables X and Y has joint density.
   $f_{xy}(x,y) = \frac{8}{3}u(x-2)u(y-1)xy^2 \exp(4-2xy)$ undergo a transformation
   $T = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ to generate new random variables Y_1 and Y_2. Find joint density of Y_1 and Y_2.
   (7M+8M)
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6. a) Consider a random process X(t) = A coswt where 'w' is a constant and A is uniformly distributed over (0, 1). Find the ACF and Auto covariance of X(t).
   b) Explain mean Ergodic processes in brief. (8M+7M)

7. a) The PSD of a random process is $S_{xx}(w) = \begin{cases} \pi, & |w| < |\\ 0, & otherwise \end{cases}$. Find its ACF.
   b) State and prove any three properties of Power Spectral Density. (8M+7M)

8. a) A random process X(t) has ACF $R_{xx}(\tau) = A^2 + Be^{-|\tau|}$
   where A, B are positive constants. Find the mean value of the system having impulse response
   $h(t) = \begin{cases} e^{-wt}, & t > 0 \\ 0, & t < 0 \end{cases}$
   b) Derive the equation for Noise figure of Cascaded system in terms of individual Noise figures (8M+7M)

Code No: R21044 **R10** SET - 1

II B. Tech I Semester Regular Examinations, March – 2014
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain about complex exponential function and show that the complex exponential functions are orthogonal functions.
   b) Derive the relation between unit step function and signum function along with their appropriate definitions. (8M+7M)

2. a) A function *x(t)* is given by $x(t)=\begin{cases} e^{-t} & 0 \le t \le 1 \\ 0 & else\ where \end{cases}$ and the function is repeated every T = 1 sec. With unit step function u(t), if $y(t)=\sum_{n=-\infty}^{\infty} a(t-n)u(t-n)$ then find the exponential Fourier series for y(t).
   b) Explain about the Dirichlet's condition for Fourier series. (8M+7M)

3. a) Find the Fourier Transform of a signal given by $10\sin^2(3t)$.
   b) State and prove the following properties of Fourier transform
   i) Multiplication in time domain ii) Convolution in time domain (7M+8M)

4. a) What is poly-wiener criterion and explain how it is related to physical reliability of a system
   b) Find the impulse response h(t) of an LTI system with the input and output related by the equation $y(t)=\int_{-\infty}^{\infty} e^{-(t-\tau)}x(\tau-2)$. (8M+7M)

5. a) Compute the auto correlation function of the following signal shown in Figure 1 below:

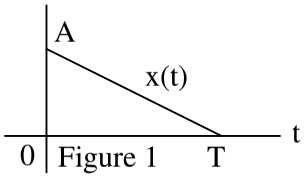

Figure 1

   b) Prove that the auto-correlation function and energy density spectrum form a Fourier transform pair. (8M+7M)
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6. a) Explain sampling theorem for Band limited signals with a graphical example
   b) Derive the expression for transfer function of flat top sampled signal. (8M+7M)

7. a) Find the Laplace transform of $\left[4e^{-2t}\cos 5t - 3e^{-2t}\sin 5t\right]u(t)$ and its region of convergence.
   b) Find the inverse Laplace transform of $x(s) = \frac{1+e^{-2s}}{3s^2+2s}$. (8M+7M)

8. a) Find the Z-transform of $x(n) = \left(\frac{1}{4}\right)^n u(n) + \left(\frac{1}{3}\right)^n u(-n-1)$.
   b) Find the inverse Z-transform of $x(z) = \frac{z}{z(z-1)(z-2)^2}$ for $|z| > 2$. (8M+7M)

Code No: R21044 **R10** SET - 2

II B. Tech I Semester Regular Examinations, March – 2014
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Verify the orthogonality of the following functions: $S_1(t) = 1$ and $S_2(t) = c(1-2t)$ in the interval [0 1].
   b) Find whether the following signals are even or odd
   i) $x(n) = \sin(-2\pi n)$ ii) $x(n) = \cos(2\pi n)$ (7M+8M)

2. a) Find the exponential Fourier series of a signal $x(t) = \cos 5t \sin 3t$.
   b) Find the trigonometric Fourier series of $f(x) = 3x$ and $x \in (-\pi, \pi)$. (8M+7M)

3. a) Find the Fourier Transform of $Ae^{-|at|} \sin c2wt$ by applying convolution theorem.
   b) Find Fourier transform of a burst of N cycles of a sine wave of period T_0 seconds. A burst of sine wave can be modeled as an infinite duration signal multiplied by a rectangular window, and then employ the convolution property of the Fourier transform for the product of two signals. Sketch the spectrum of the signal. (7M+8M)

4. a) For an LTI system described by the transfer function $H(s) = \frac{s+3}{(s+2)^2}$. Find the response to
   The following inputs i) $\cos(2t + 60)$ ii) e^{j3t}
   b) Derive the relationship between bandwidth and rise time. (9M+6M)

5. a) Find the auto correlation function of a signal $R(z) = e^{-2\alpha|\tau|}$ and also determine the spectral density of the process.
   b) Find the energy in the signal $f(t) = e^{-at}u(t)$ and find the bandwidth ω such that 95% of the energy is contained in frequency below ω. (8M+7M)
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6. a) The Fourier transform of a sampled signal is given by $x(f) = \sum_{m=0}^{N-1} x(m) e^{-j2\pi fm}$

   Using the above equation, prove that the spectrum of a sampled signal is periodic, and hence state the sampling theorem.

   b) Explain the effects of under sampling with suitable examples. (8M+7M)

7. a) Find the Laplace transforms of the following function using the time-shifting property where ever it is appropriate

   i) $u(t) - u(t-1)$ ii) $e^{-t}u(t-\tau)$

   b) Find inverse Laplace transform of the following function $e^{-2s}\left(\frac{2s+5}{s^2+5s+6}\right)$. (8M+7M)

8. a) Compare Laplace transform and Fourier transform in detail.

   b) Find the inverse z transform of $\frac{z(22-5z)}{(z+1)(z-2)^2}$. (7M+8M)

Code No: R21044 **R10** SET - 3

II B. Tech I Semester Regular Examinations, March – 2014
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Define mean square error and derive the equation for evaluating mean square error.
   b) Derive the condition for orthogonality of two signals and also prove that $\sin(nw_0t)$ and $\cos(mw_0t)$ are orthogonal to each other for all integer values of m and n. (7M+8M)

2. a) Represent the Fourier series of the signal $x(t) = 3\cos\left(\frac{\pi}{4} + \frac{\pi t}{2}\right)$ using the method of inspection.
   b) Find the Fourier series of a triangular function given by the equation $g(x) = \pi + x$ for $-\pi \le x \le 0$ else $g(x) = \pi - x$ for $0 \le x \le \pi$ (8M+7M)

3. a) Find the Fourier Transform of the following
   i) Impulse function δ(t) ii) Unit step function.
   b) Find Inverse Fourier Transform of $x(\omega) = \frac{1}{\sqrt{1+\omega^2}} e^{\left(-j\tan^{-1}(\omega)\right)}$ (8M+7M)

4. a) Describe and compare all the ideal characteristics of low pass, high pass and band pass filters
   b) Define signal bandwidth and obtain the conditions for the distortion less transmission through a system. (8M+7M)

5. a) Explain how a signal is extracted from a noisy environment by using filtering technique.
   b) Distinguish between Energy spectral density and power spectral density and also state and prove Parseval's theorem for energy signal. (7M+8M)

6. a) Consider the analog signal $x_a = 3\cos(100\pi t)$ then i) determine the minimum sampling rate required to avoid aliasing ii) suppose the signal is sampled at two different sampling rates of $f_s = 200HZ$ and $f_s = 75HZ$, then find the discrete time signals obtained after sampling in each case separately
   b) Explain about band pass sampling. (6M+9M)

7. a) Find the Laplace transform of $f(t) = \cos t$ for $0 < t < 2\pi$ and $f(t) = 1 - \sin t$ for $t \ge 2\pi$
   b) Find the inverse Laplace transform of $F(s) = \frac{e^{-s}(s-2)}{(s^2 - 4s + 3)}$. (8M+7M)

8. a) Find the Z-Transform of $x[n] = 7\left(\frac{1}{3}\right)^n \cos\left(\frac{\pi}{4} + \frac{2n\pi}{6}\right)u[n]$.
   b) Find the inverse Z-Transform of $x(z) = \frac{2z(3z+17)}{(z-1)(z^2 - 6z + 25)}$. (8M+7M)
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Code No: R21044 **R10** SET - 4

II B. Tech I Semester Regular Examinations, March – 2014
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Prove that sinusoidal functions and complex exponential functions are orthogonal functions.

   b) A rectangular function defined as $f(t)=\begin{cases} A & 0<t<\frac{\pi}{2} \\ -A & \frac{\pi}{2}<t<\frac{3\pi}{2} \\ A & \frac{3\pi}{2}<t<2\pi \end{cases}$. Approximate the above rectangular function by $A\cos t$ between the intervals (0, 2π) such that mean square error is minimum. (7M+8M)

2. a) Calculate the Fourier series coefficients of the following continuous-time signal

   $x(t)=\begin{cases} 1 \ for \ 0\le t\le 1 \\ -1 \ for \ 1\le t\le 2 \end{cases}$ With a fundamental period of 2.

   b) Determine the Fourier series coefficients for the signal $x(t)$ shown in below figure 1. (8M+7M)

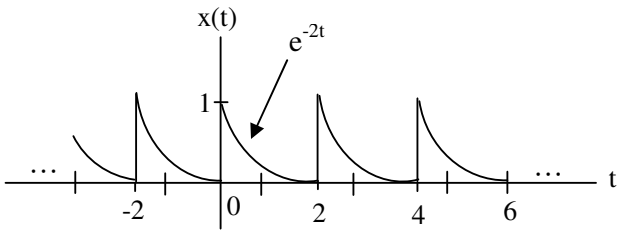

Figure 1

3. a) A system has the output $y[n]=\left(\frac{1}{2}\right)^n u(n)+\frac{1}{2}\left(\frac{1}{4}\right)^n u(n)$ for the input $x[n]=\left(\frac{1}{4}\right)^n u(n)$

   i) Find the Fourier transforms of both $x[n]$ and $y[n]$

   ii) Find the frequency response $H\left(e^{jw}\right)$

   b) Explain about Hilbert Transform with appropriate equations. (9M+6M)

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4. a) For an input signal $x(t)=\delta(t)+e^{-t}u(t)$ and a LTI system with an impulse response $h(t)=e^{t}u(-t)$ Find the output y(t)

   b) Derive the relationship between bandwidth and rise time of a low pass filter. (8M+7M)

5. a) Find the total energy of the signal $x(t)=\frac{\sin(10t)}{\pi t}$ using the Parseval's equation

   b) Prove that the auto-correlation function and energy density spectrum form a Fourier transform pair. (8M+7M)

6. a) A complex signal $x(t)$ with a Fourier transform $X(j\omega)$ is zero everywhere except for the interval $-5<\omega<2$. Using $X_p(j\omega)=\frac{1}{T}\sum_{K=-\infty}^{\infty}X(j(w-k\omega_s))$, determine the minimum sampling frequency ω_s to ensure a reconstruction of the original signal $x(t)$ without losing information

   b) Explain the effect of under sampling with an example and neat diagrams. (8M+7M)

7. a) Solve the following differential equation using Laplace transform $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=u_2(t)$ with the initial conditions $y(0)=0$ and $y(0)'=1$

   b) Find the inverse Laplace transform of $F(s)=\frac{(2s-3)}{(s^2+2s+10)}$. (8M+7M)

8. a) Find the Z-Transform of $u[nT]e^{-\alpha nT}\sin\omega nT$

   b) Find the inverse Z-Transform of $x(z)=\frac{z\left(2z^2-11z+12\right)}{(z-1)(z-2)^3}$. (8M+7M)