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10MAT31

Third Semester B.E. Degree Examination, June/July 2013

Engineering Mathematics - III

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Obtain the Fourier series expansion of $f(x) = \begin{cases} x, & \text{if } 0 \le x \le \pi \\ 2\pi - x, & \text{if } \pi \le x \le 2\pi \end{cases}$ and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$ **(07 Marks)**

b. Find the half range Fourier sine series of $f(x) = \begin{cases} x, & \text{if } 0 < x < \pi/2 \\ \pi - x, & \text{if } \pi/2 < x < \pi \end{cases}$. **(06 Marks)**

c. Obtain the constant term and coefficients of first cosine and sine terms in the expansion of y from the following table: **(07 Marks)**

x	0	60°	120°	180°	240°	300°	360°
y	7.9	7.2	3.6	0.5	0.9	6.8	7.9

2 a. Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & |x| \le a \\ 0, & |x| > a \end{cases}$ and hence deduce $\int_0^\infty \frac{\sin x - x\cos x}{x^3} dx = \frac{\pi}{4}$. **(07 Marks)**

b. Find the Fourier cosine and sine transform of $f(x) = xe^{-ax}$, where $a > 0$. **(06 Marks)**

c. Find the inverse Fourier transform of e^{-s^2}. **(07 Marks)**

3 a. Obtain the various possible solutions of one dimensional heat equation $u_t = c^2 u_{xx}$ by the method of separation of variables. **(07 Marks)**

b. A tightly stretched string of length l with fixed ends is initially in equilibrium position. It is set to vibrate by giving each point a velocity $V_o \sin\left(\frac{\pi x}{l}\right)$. Find the displacement u(x, t). **(06 Marks)**

c. Solve $u_{xx} + u_{yy} = 0$ given u(x, 0) = 0, u(x, 1) = 0, u(1, y) = 0 and u(0, y) = u_0, where u_0 is a constant. **(07 Marks)**

4 a. Using method of least square, fit a curve $y = ax^b$ for the following data. **(07 Marks)**

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

b. Solve the following LPP graphically:
Minimize $Z = 20x + 16y$
Subject to $3x + y \ge 6$, $x + y \ge 4$, $x + 3y \ge 6$ and $x, y \ge 0$. **(06 Marks)**

c. Use simplex method to
Maximize $Z = x + (1.5)y$
Subject to the constraints $x + 2y \le 160$, $3x + 2y \le 240$ and $x, y \ge 0$. **(07 Marks)**

PART – B

5 a. Using Newton-Raphson method find a real root of $x + \log_{10} x = 3.375$ near 2.9, corrected to 3-decimal places. **(07 Marks)**

b. Solve the following system of equations by relaxation method:
$12x + y + z = 31, \quad 2x + 8y - z = 24, \quad 3x + 4y + 10z = 58$ **(07 Marks)**

c. Find the largest eigen value and corresponding eigen vector of following matrix A by power method

$$A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}.$$

Use $X^{(0)} = [1, 0, 0]^T$ as the initial eigen vector. **(06 Marks)**

6 a. In the given table below, the values of y are consecutive terms of series of which 23.6 is the 6^{th} term, find the first and tenth terms of the series. **(07 Marks)**

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

b. Construct an interpolating polynomial for the data given below using Newton's divided difference formula. **(07 Marks)**

x	2	4	5	6	8	10
f(x)	10	96	196	350	868	1746

c. Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by Weddle's rule taking 7-ordinates and hence find $\log_e 2$. **(06 Marks)**

7 a. Solve the wave equation $u_{tt} = 4u_{xx}$ subject to $u(0, t) = 0$; $u(4, t) = 0$; $u_t(x, 0) = 0$; $u(x, 0) = x(4 - x)$ by taking $h = 1$, $k = 0.5$ upto four steps. **(07 Marks)**

b. Solve numerically the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(0, t) = 0 = u(1, t)$, $t \geq 0$ and $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$. Carryout computations for two levels taking $h = \frac{1}{3}$ and $k = \frac{1}{36}$. **(07 Marks)**

c. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in Fig.Q7(c). **(06 Marks)**

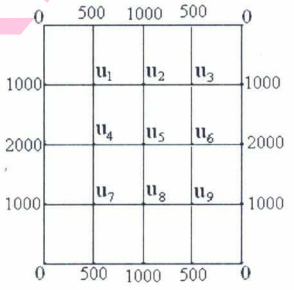

Fig.Q7(c)

8 a. Find the z-transform of: i) $\sin h\, n\theta$; ii) $\cos h\, n\theta$. **(07 Marks)**

b. Obtain the inverse z-transform of $\frac{8z^2}{(2z-1)(4z-1)}$. **(07 Marks)**

c. Solve the following difference equation using z-transforms:
$y_{n+2} + 2y_{n+1} + y_n = n$ with $y_0 = y_1 = 0$ **(06 Marks)**

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10ES32

Third Semester B.E. Degree Examination, June/July 2013
Analog Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the following terms with respect to semiconductor diode:
i) Diffusion capacitance
ii) Transition capacitance and
iii) Reverse recovery time. **(06 Marks)**

b. For the clipping circuit shown in Fig.Q.1(b). Obtain its transfer characteristics to the scale for a ramp input which varies from 0 to 50 volts. Indicate slopes at different levels and assume ideal diodes. **(10 Marks)**

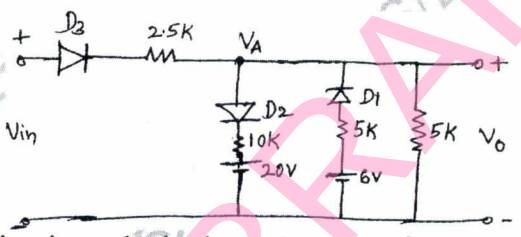

Fig.Q.1(b)

c. Design an ideal clamper circuit to obtain the output waveform as shown in Fig.Q.1(c) for the given input. **(04 Marks)**

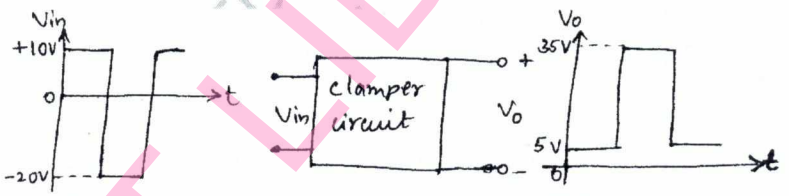

Fig.Q.1(b)

2 a. What is bias stabilization? Derive an expression for $S_{(I_{CO})}$ and $S_{(V_{BE})}$ for fixed bias configuration. **(06 Marks)**

b. For the voltage divider circuit shown in Fig.Q.2(b), calculate:
i) I_B, I_C and I_E; ii) V_E and V_B; iii) V_{CE} and V_C; iv) V_{CB} and $I_{C(sat)}$.
Assume silicon transistor with $\beta = 110$. **(08 Marks)**

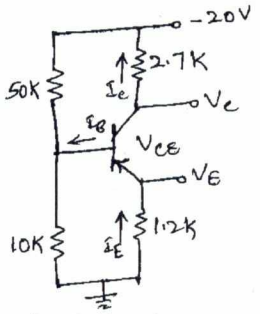

Fig.Q.2(b)

c. Design an emitter-bias network using the following data:
$I_{CQ} = 1/2\ I_{C(sat)}$, $V_{CEQ} = 1/2\ V_{CC}$, $V_{CC} = 20V$, $I_{C(sat)} = 10mA$, $\beta = 120$ and $R_C = 4R_E$. **(06 Marks)**

3 a. Define h-parameters and hence derive h-parameter model of a CE-BJT. **(06 Marks)**

b. State and prove Miller's theorem. **(04 Marks)**

c. For the circuit shown in Fig.Q.3(c), the transistor parameters are $h_{ib} = 22\Omega$, $h_{fb} = -0.98$, $h_{ob} = 0.49$ MA/V and $h_{rb} = 2.9 \times 10^{-4}$. Calculate: i) Input resistance; ii) Output resistance; iii) Current gain; iv) Voltage gain; v) Overall voltage and current gain. **(10 Marks)**

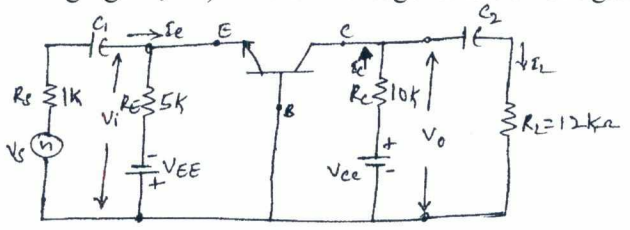

Fig.Q.3(c)

4 a. Explain the low frequency and high frequency response of a RC coupled amplifier. **(10 Marks)**

b. Describe Miller's effect and derive an equation for Miller input and output capacitance. **(06 Marks)**

c. Calculate the overall lower 3db and upper 3db frequency for a 3 stage amplifier having an individual frequency $f_1 = 40$ Hz and $f_2 = 2$ MHz. **(04 Marks)**

PART – B

5 a. Explain and analyze with the help of circuit a cascade BJT amplifier and list its advantages. **(10 Marks)**

b. What are the effects of negative feedback in amplifier? Show how bandwidth of an amplifier increases with negative feedback. **(10 Marks)**

6 a. Explain the operation of a class B push-pull amplifier and also show that its efficiency is 78.50% and max power dissipation condition. **(10 Marks)**

b. With a neat circuit diagram, explain the operation of a transformer coupled class A power amplifier. **(10 Marks)**

7 a. State Barkhausen criteria for sustained oscillations, apply this to a transistorized Weinbridge oscillator and explain its operation. **(10 Marks)**

b. Explain working of a Hartley oscillator. In a Hartley oscillator L1 = 20 MH, L2 = 2mH and C is a variable. Find the range of C for frequency is to be varied from 1MHz to 2.5 MHz. **(10 Marks)**

8 a. List the difference between: i) FET and BJT and ii) Enhancement and depletion MOSFET ; iii) JFET and MOSFET. **(10 Marks)**

b. For the circuit shown in Fig.Q.8(b) $V_{GSQ} = -2.5$V and $I_{DQ} = 2.5$ mA find: i) g_m; ii) r_d; iii) z_i iv) z_o and v) A_v. Assume $I_{DSS} = 8$mA, $V_P = -6$V and $Y_{OS} = 20$ m℧. **(10 Marks)**

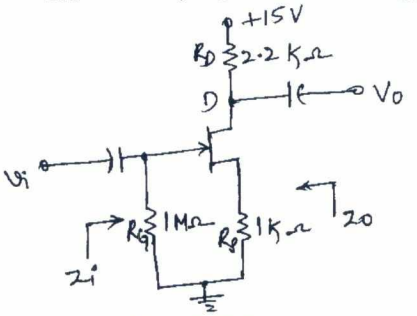

Fig.Q.8(b)

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10ES33

Third Semester B.E. Degree Examination, June/July 2013
Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Simplify the following expression using Karnaugh map. Implement the simplified expression using the gates as indicated.
f(a, b, c, d) = Σm(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15) using only NAND gates
f(A, B,C, D) = πm (0, 3, 4, 7, 8, 10, 12, 14) + Σd(2, 6) using only NOR gates. **(12 Marks)**

b. Design a logic circuit that has 4 inputs, the output will only be high, when the majority of the inputs are high, use K map to simplify. **(08 Marks)**

2 a. Simplify using the Quine – Mcclusky minimization technique. Implement the simplified expression using basic gates
V = f(a, b, c, d) = Σ(2, 3, 4, 5, 13, 15) + Σd(8, 9, 10, 11). **(12 Marks)**

b. Simplify the logic function given below using variable entered mappings (VEM) technique
f(A, B, C, D) = Σm(0, 1, 3, 5, 6, 11, 13) + Σd(4, 7). **(08 Marks)**

3 a. With the aid of block diagram, clearly distinguish between a decoder and encoder. **(04 Marks)**

b. Design a combinational logic circuit that will convert a straight BCD digit to an excess – 3 BCD digits
i) Construct the truth – table
ii) Simplify each output function using k map and write the reduced equations
iii) Draw the resulting logic diagram. **(12 Marks)**

c. Implement a full substractor using a decoder and NAND gates. **(04 Marks)**

4 a. Implement the following Boolean function using 4 : 1 multiplexer
F(A, B, C) = Σm (1, 3, 5, 6) **(04 Marks)**

b. Design a 2 bit comparator. **(08 Marks)**

c. What is a look ahead carry adder? Explain the circuit and operation of a 4 bit binary adder with look ahead carry. **(08 Marks)**

PART – B

5 a. Differentiate sequential logic circuit and combinational logic circuit. **(04 Marks)**

b. Explain with timings diagram the workings of a SR latch as a switch debouncer. **(08 Marks)**

c. Explain the workings of a master – slave JK flip flop with functional table and timings diagram. **(08 Marks)**

6 a. With the help of a diagram, explain the following with respect to shift register
i) Parallel in and serial out
ii) Ring counter and twisted rings counter. **(08 Marks)**

b. Explain the workings of 4 – bit asynchronous counter. **(04 Marks)**

c. Derive the characteristic equation of SR, JK, D and T flip – flops. **(08 Marks)**

7 a. With a suitable example, explain the mealy and Moore model of a sequential circuit. **(10 Marks)**

b. Design a synchronous counter using JK flip–flops to count the sequence 0, 1, 2, 4, 5, 6, 0, 1, 2 use static diagram and state table. **(10 Marks)**

8 a. Design a clocked sequential circuit that operates according to the state diagram shown. Implement the circuit using D – flip – flop. **(12 Marks)**

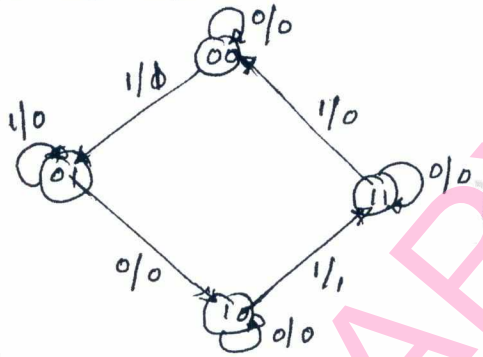

Fig. Q8(a)

b. With a suitable, example and appropriate state diagram, explain how to recognize a particular sequence. EX 1011. **(08 Marks)**

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10ES34

Third Semester B.E. Degree Examination, June/July 2013
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting atleast TWO questions from each part.***
2. Missing data, if any, may be suitable assumed.

PART – A

1 a. Find the voltage across resistance R in the networking Fig. Q1(a) by mesh analysis. **(08 Marks)**

b. For the network of Fig. Q1(b) determine the node voltage by nodal analysis. **(06 Marks)**

c. Determine V_{23} by mesh analysis in the network of Fig. Q1(c). **(06 Marks)**

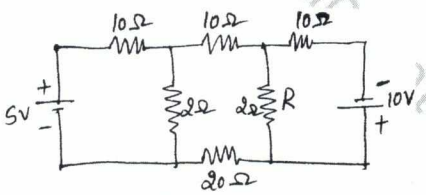

Fig. Q1(a)

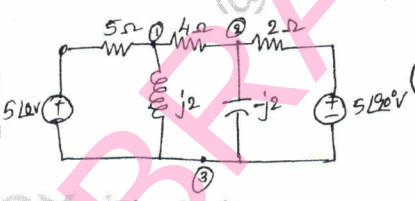

Fig. Q1(b)

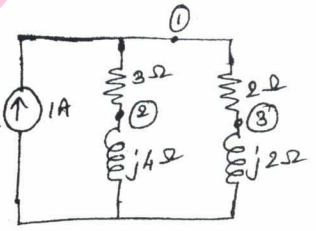

Fig. Q1(c)

2 a. Solve for loop and branch currents for the circuit of Fig. Q2(a) using tie set schedule and network equilibrium equations on the loop basis. Take OA, OB and OC as tree branches. **(10 Marks)**

b. Write the f-cut set matrix and solve for tree branch voltages. Take OA, OB and OC as the tree branches for the network of Fig. Q2(b). **(06 Marks)**

c. Draw the dual of the network of Fig. Q2(c). **(04 Marks)**

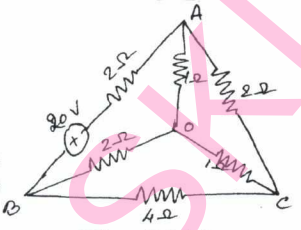

Fig. Q2(a)

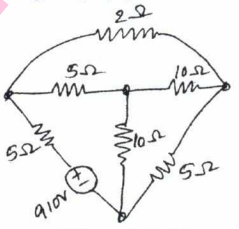

Fig. Q2(b)

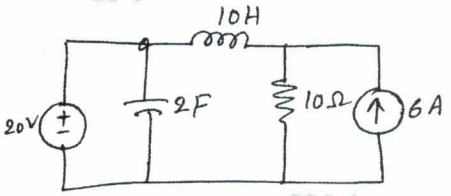

Fig. Q2(c)

3 a. State and explain super position theorem. **(06 Marks)**

b. Find the load current I in the circuit of Fig. Q3(b) by using Millman's theorem. **(06 Marks)**

c. Verify reciprocity theorem for the network of Fig. Q3(c) with response I_3. **(08 Marks)**

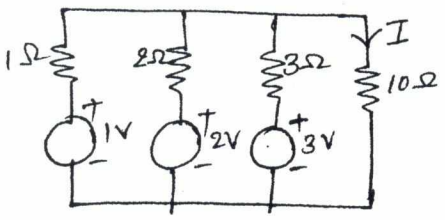

Fig. Q3(b)

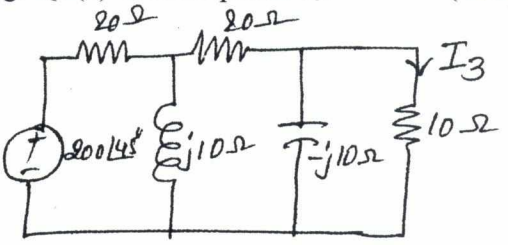

Fig. Q3(c)

4 a. State and explain Thevenin's theorem. **(07 Marks)**

b. Obtain Norton equivalent of the network of Fig. Q4(b) between terminals A and B. **(07 Marks)**

c. Find the value of Z_L for maximum power transfer through Z_L in the network of Fig. Q4(c). **(06 Marks)**

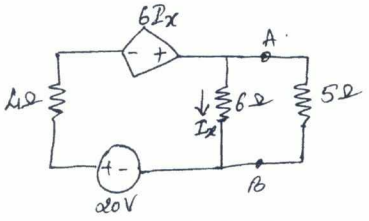

Fig. Q4(b)

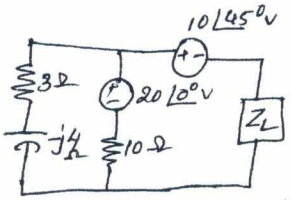

Fig. Q4(c)

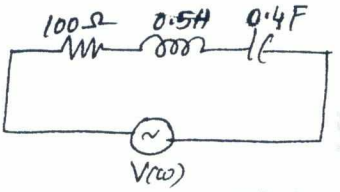

Fig. Q5(a)

PART – B

5 a. For the series RLC circuit of Fig. Q5(a) find the resonant frequency, half power frequencies, band width and quality factor. **(10 Marks)**

b. Derive expression for f_r, Q and bandwidth of a parallel resonant circuit with lossless capacitor in parallel with a coil of resistance R and inductance L. **(10 Marks)**

6 a. In the circuit of Fig. Q6(a), switch K is changed from position 1 to 2 at t = 0, steady state condition having reached before switching. Find i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(08 Marks)**

b. In the circuit of Fig. Q6(b), switch k is opened at t = 0. Find the values of v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at $t = 0^+$. **(06 Marks)**

c. In the circuit of Fig. Q6(c) switch k is closed at t = 0. Find the value of v_1, v_2 and v_3 at $t = 0^+$. The circuit is initially relaxed. **(06 Marks)**

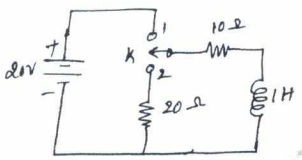

Fig. Q6(a)

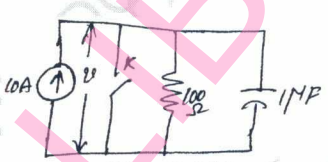

Fig. Q6(b)

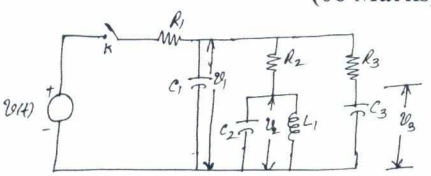

Fig. Q6(c)

7 a. Using Laplace transform obtain an expression for the current i(t) in the network of Fig. Q7(a). Assume zero critical conditions. **(06 Marks)**

b. For the critically related network of Fig. Q7(b) obtain expression for the current i(t). Use Laplace transform. **(06 Marks)**

c. Determine the Laplace transform of the periodic saw tooth waveform of Fig. Q7(c). Use gate function. **(08 Marks)**

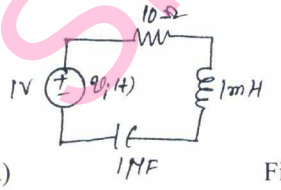

Fig. Q7(a)

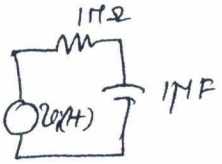

Fig.Q7(b)

$v_i(t) = \delta(t)$

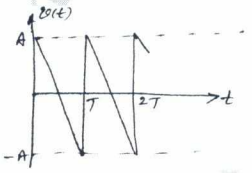

Fig. Q7(c)

8 a. For the network of Fig. Q8(a) obtain the Z – parameters. Also draw the Z – parameter equivalent circuit. **(12 Marks)**

b. Determine the transmission parameters of the network of Fig. Q8(b). **(08 Marks)**

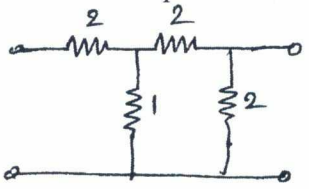

Fig. Q8(a)

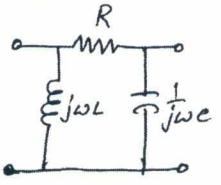

Fig. Q8(b)

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10EE35

Third Semester B.E. Degree Examination, June/July 2013
Electrical and Electronic Measurement and Instrumentation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Derive the dimensions of MMF, EMF and flux density in LMTI system. **(06 Marks)**

b. Show that the product $1/\sqrt{\mu t}$ has the dimensions of velocity when μ = permeability and t = permittivity. **(06 Marks)**

c. Derive the bridge balance equation for Kelvin double bridge. **(08 Marks)**

2 a. Explain the measurement of inductance using Anderson's bridge. Draw the phasor diagram at balance condition. **(12 Marks)**

b. A condenser bushing forms arm AB of a Schering bridge and a standard capacitor of 500pf capacitance and negligible loss, forms AD. Arm BC consists of a non-inductance resistance of 300Ω. When the bridge is balanced arm CD has a resistance of 72.6 Ω in parallel with capacitance of 0.148μF. The supply frequency is of 50Hz. Calculate the capacitance and dielectric loss angle of capacitor. **(08 Marks)**

3 a. A moving coil ammeter has the coil circuit resistance of 1000 ohm. The range of the ammeter is 0 – 500 μA. Calculate the value of shunt resistance to give a full scale deflection with a current of i) 10mA; ii) 75mA.
Find the value of shunt resistance if 40% deflection is obtained with a current of 100mA. **(06 Marks)**

b. Explain the theory and operation of the comparative deflection method of testing a C.T. by silsbeels method. **(10 Marks)**

c. Explain the current transformer with the help of an equivalent circuit diagram. **(04 Marks)**

4 a. Explain the construction and working principle of electrodynamometer Wattmeter for the measurement of power in the circuit. **(08 Marks)**

b. For a 20A, 230V energy meter, the revolutions per kilowatt-hour is 480. If upon test at full load upf the disc makes 40 revolutions in 66 seconds, calculate the error. **(06 Marks)**

c. With a neat block diagram, explain principle of working of electronic energy meter. **(06 Marks)**

PART – B

5 a. With a neat diagram, explain the construction and working of an electrodynamometer power factor meter. **(10 Marks)**

b. With a neat diagram, explain the working of an electronic multimeter. **(10 Marks)**

6 a. With neat block diagram, explain the working of dual trace oscilloscope. **(10 Marks)**
b. With a block diagram, explain the working of a digital storage oscilloscope. **(10 Marks)**

7 a. Classify electrical transducers. **(05 Marks)**
b. Explain the construction and working of LVDT. Also list the advantages and disadvantages. **(10 Marks)**
c. Explain photo voltaic cells. **(05 Marks)**

8 a. With neat block diagram, explain the digital data acquisition system. Mention the uses of data acquisition system. **(08 Marks)**
b. With the help of block diagram, describe a function generator. **(08 Marks)**
c. Write a note on any one display device. **(04 Marks)**

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10EE36

Third Semester B.E. Degree Examination, June/July 2013
Electric Power Generation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With a neat sketch, explain the working of a gas turbine power plant. **(08 Marks)**

b. With a neat block diagram, explain the working of a geothermal power plant. **(06 Marks)**

c. Explain the working of WECS, with a block diagram. **(06 Marks)**

2 a. Describe the working of a thermal power station with a neat schematic diagram? Briefly explain the function of each? **(10 Marks)**

b. Discuss the benefits of 'Co – generation'? **(05 Marks)**

c. What is 'distributed generation'? Explain. **(05 Marks)**

3 a. Mention the factors to be considered for the site selection of a hydro – electric power plant. **(06 Marks)**

b. Explain with a block diagram, working of a bio – generation power plant. **(06 Marks)**

c. Explain briefly the working of hydro – electric power plants, with a schematic diagram. **(08 Marks)**

4 a. Explain with a neat schematic diagram, working of a solar power plant? **(08 Marks)**

b. With a neat sketch, explain briefly working of a
   i) Liquid metal cooled reactor
   ii) Pressurized water reactor
   iii) Boiling water reactor. **(12 Marks)**

PART – B

5 a. The M.D of a power station is 500 MW and daily load details are as follows :

Time (hours)	6 – 8	8 – 12	12 – 14	14 – 18	18 – 22	22– 24	0 –6
Load (MW)	300	350	200	400	500	300	200

   i) Draw the load curve
   ii) Load duration curve
   iii) Determine load factor, load and energy supplied/ year. **(12 Marks)**

b. The yearly duration curve of a certain power plant is considered as a straight line from 140 MW to 30 MW. Power is supplied with one generating unit of 95 MW capacity and two units of 45 MW capacity each. determine :
   i) Installed capacity
   ii) Load factor
   iii) Plant capacity factor
   iv) Utilization factor. **(08 Marks)**

6 a. What is meant by tariff? Mention its objectives. **(06 Marks)**

b. A generating station has a M.D. of 100 MW. Calculate the cost/unit generated from the following data :

Capital cost	= Rs. 200×10^6
Annual load factor	= 40 %
Annual cost of fuel and oil	= RS 15×10^6
Taxes, wages, salaries etc	= Rs. 10×10^6
Interest and depreciation	= 15%.

(08 Marks)

Discuss the location of distribution substation. **(06 Marks)**

7 a. Explain :

i) Ungrounded neutral system

ii) Earthing transformer. **(10 Marks)**

b. With neat sketches, explain arc suppression coil grounding. **(10 Marks)**

8 a. List the merits and demerits of resistance grounding. **(06 Marks)**

b. Explain with neat sketches effectively grounded system. **(08 Marks)**

c. A 132 KV, 3 – ph, 50 Hz, overhead line, 50 km long has a capacitance to earth for each line of 0.0157 μF per km. determine the inductance and KVA rating of the arc suppression coil suitable for this system. **(06 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, June/July 2013

Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Find modulus and amplitude of $1+\cos\theta+i\sin\theta$. **(06 Marks)**

b. If n is positive integer, prove that $(\sqrt{3}+i)^n+(\sqrt{3}-i)^n=2^{n+1}\cos\left(\frac{n\pi}{2}\right)$. **(07 Marks)**

c. Find the cube root of $1+i$ and represent them in the Argand diagram. **(07 Marks)**

2 a. Find the n^{th} derivative of $e^{ax}\sin(bx+c)$. **(06 Marks)**

b. If $y=e^{m\cos^{-1}x}$, prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(n^2+m^2)y_n=0$. **(07 Marks)**

c. Find the n^{th} derivative of $\frac{x^2}{(x+2)(2x+3)}$. **(07 Marks)**

3 a. Prove that $\tan\phi=r\frac{d\theta}{dr}$ with usual notations. **(06 Marks)**

b. Find the pedal equation for the curve $r=a(1+\cos\theta)$. **(07 Marks)**

c. Expand $f(x)=\sqrt{1+\sin 2x}$ using Maclaurin's series upto 4^{th} term. **(07 Marks)**

4 a. If $u=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u$. **(06 Marks)**

b. If $u=f(x-y, y-z, z-x)$, prove that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$. **(07 Marks)**

c. If $u=\tan^{-1}x+\tan^{-1}y$ and $V=\frac{x+y}{1-xy}$, find the value of $\frac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

5 a. Obtain the reduction formula for $\int\cos^n x\,dx$ where n is a positive integer. **(06 Marks)**

b. Evaluate $\int_0^2 x^{5/2}\sqrt{2-x}\,dx$. **(07 Marks)**

c. Evaluate $\int_1^2\int_3^4(xy+e^y)dydx$. **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

6 a. Evaluate $\int_0^1\int_0^1\int_0^1 e^{x+y+z}dxdydz$. **(06 Marks)**

b. Prove that $\left\lceil\frac{1}{2}=\sqrt{\pi}\right.$. **(07 Marks)**

c. Show that $\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta \times \int_0^{\pi/2}\frac{1}{\sqrt{\sin\theta}}d\theta=\pi$ **(07 Marks)**

7 a. Solve $xy\frac{dy}{dx}=1+x+y+xy$. **(06 Marks)**

b. Solve $\left[x\tan\left(\frac{y}{x}\right)-y\sec^2\left(\frac{y}{x}\right)\right]dx+x\sec^2\left(\frac{y}{x}\right)dy=0$ **(07 Marks)**

c. Solve $\frac{dy}{dx}+y\cot x=4x\,\text{cosec}\,x$. **(07 Marks)**

8 a. Solve $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=2e^{3x}$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2}-\frac{dy}{dx}-2y=\sin 2x$. **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2}+4y=1+x^2$ **(07 Marks)**

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