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10MAT31

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
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 in $(-\pi, \pi)$ for $f(x) = x\cos x$. **(07 Marks)**

b. Obtain the Fourier half range sine series,

$$f(x) = \begin{cases} \frac{1}{4} - x & \text{in } 0 < x < \frac{1}{2} \\ x - \frac{3}{4} & \text{in } \frac{1}{2} < x < 1 \end{cases}.$$ **(07 Marks)**

c. Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. **(06 Marks)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

2 a. Find the Fourier transforms of $f(x) = \begin{cases} 1 - x^2 & \text{for } |x| < 1 \\ 0 & \text{for } |x| \geq 1 \end{cases}$ and hence evaluate

$$\int_0^\infty \frac{x\cos x - \sin x}{x^3}\cos\frac{x}{2}\,dx.$$ **(07 Marks)**

b. Find the Fourier sine transform of $e^{-|x|}$. **(07 Marks)**

c. Find the inverse Fourier sine transform of $\hat{f}_s(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $a > 0$. **(06 Marks)**

3 a. Solve the wave equation $u_{tt} = c^2 u_{xx}$ given that $u(0,t) = 0 = u(2l,t)$, $u(x, 0) = 0$ and $\frac{\partial u}{\partial t}(x,0) = a\sin^3\frac{\pi x}{2l}$ **(07 Marks)**

b. Solve the boundary value problem $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ $0 < x < l$, $\frac{\partial u}{\partial x}(0,t) = 0$, $\frac{\partial u}{\partial x}(l,t) = 0$, $u(x, 0)=x$. **(07 Marks)**

c. Obtain the D'Almbert's solution of the wave equation, $u_{tt} = C^2 u_{xx}$ subject to the conditions $u(x,0) = f(x)$ and $\frac{\partial u}{\partial t}(x,0) = 0$. **(06 Marks)**

4 a. Fit a parabola $y = a + bx + cx^2$ for the data: **(07 Marks)**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

b. Solve by using graphical method the L.P.P.
Minimize $z = 30x + 20y$
Subject to the constraints: $x - y \leq 1$
$x + y \geq 3$, $y \leq 4$
and $x \geq 0$, $y \geq 0$ **(07 Marks)**

c. Maximize $z = 3x + 4y$
subject to the constraints $2x + y \leq 40$, $2x + 5y \leq 180$,
$x \geq 0, y \geq 0$ using simplex method. **(06 Marks)**

PART – B

5 a. Find the fourth root of 12 correct to three decimal places by using regula Falsi method. **(07 Marks)**

b. Solve $9x-2y+z=50$, $x+5y-3z=18$, $-2x+2y+7z=19$ by relaxation method obtaining the solution correct to two decimal places. **(07 Marks)**

c. Find the largest eigen value and the corresponding eigen vector of, $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ by using power method by taking initial vector as $[1 \quad 1 \quad 1]^T$. **(06 Marks)**

6 a. The table gives the values of tan x for $0.10 \le x \le 0.30$ **(07 Marks)**

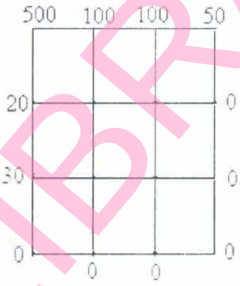
x	0.10	0.15	0.20	0.25	0.30
tanx	0.1003	0.1511	0.2027	0.2553	0.3093

b. Using Newton's forward and backward interpolation formula, calculate the increase in population from the year 1955 to 1985. The population in a town is given by, **(07 Marks)**

Year	1951	1961	1971	1981	1991
Population in thousands	19.96	39.65	58.81	77.21	94.61

c. Evaluate $\int_0^1 \frac{dx}{1+x}$ taking seven ordinates by applying Simpson's $\frac{3}{8}^{th}$ rule. Hence deduce the value of $\log_e 2$. **(06 Marks)**

7 a. Solve the Laplace's equation $u_{xx}+u_{yy}=0$, given that **(07 Marks)**



b. Solve $\frac{\partial^2 u}{\partial t^2}=4\frac{\partial^2 u}{\partial x^2}$ subject to $u(0,t)=0$; $u(4,t)=0$; $u(x,0)=x(4-x)$. Take h = 1, K = 0.5 upto Four steps. **(07 Marks)**

c. Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ subject to the condition $u(x, 0) = \sin \pi x$, $0 \le x \le 1$, $u(0,t)=u(1,t)=0$ using Schmidt's method. Carry out computations for two levels, taking $h=\frac{1}{3}$, $K=\frac{1}{36}$. **(06 Marks)**

8 a. Find the z-transform of, (i) $\cosh n\theta$ (ii) $\sinh n\theta$ **(07 Marks)**

b. Obtain the inverse z-transform of, $\frac{4z^2-2z}{z^3-5z^2+8z-4}$. **(07 Marks)**

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

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10ES32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
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 static and dynamic resistance of the diode. **(04 Marks)**

b. For the circuit shown in Fig. Q1 (b). Find I_D, V_1, V_2 and V_0. Assume silicon diode. **(08 Marks)**

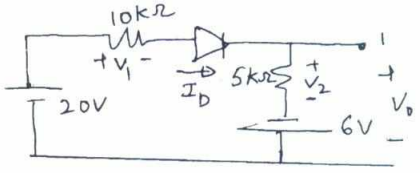

Fig. Q1 (b)

c. For the clipping circuit shown in Fig. Q1 (c). Draw the transfer characteristics and output voltage waveforms. Assume silicon diodes. **(08 Marks)**

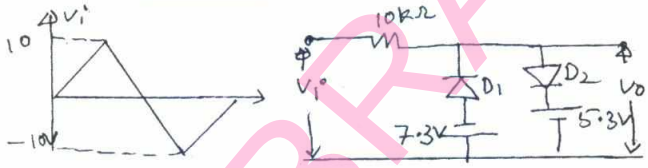

Fig. Q1 (c)

2 a. For a emitter bias circuit shown in Fig. Q2 (a). Find

i) Quiescent values of base and collector currents. ii) Quiescent values of V_{CE}.

iii) Voltage at base to ground and collector to ground. iv) Base to collector voltage.

Assume $V_{BE} = 0.7$ V, $\beta = 60$ **(10 Marks)**

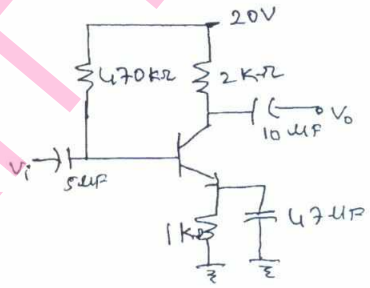

Fig. Q2 (a)

b. For the voltage divider bias configuration. Derive expression for I_C and V_{CE} and expression for collector current when it is in saturation. Comment on stability factor. **(10 Marks)**

3 a. Describe how transistor behaves as switch. Also describe transistor switching time. **(06 Marks)**

b. For common base npn transistor configuration with $I_E = 4$ mA, $\alpha = 0.98$ and ac signal of 2 mV applied between base and emitter terminals. Determine:

i) Input impedance ii) The voltage gain of load 0.56 KΩ is connected to output terminals.

iii) Output impedance. iv) Current gain. **(06 Marks)**

c. Explain common emitter fixed bias configuration. Derive expression for the input impedance, output impedance, voltage gain and current gain. **(08 Marks)**

4 a. Explain low frequency response of BJT amplifier. Derive the expression for lower cut-off frequency considering the effect of input coupling capacitor C_S. **(10 Marks)**

b. For the circuit shown in Fig. Q4 (b). Calculate (i) f_{Hi} and f_{Ho}. (ii) f_β and f_T

Take $C_{be} = 35$ P.F, $C_{bc} = 5$ P.F, $C_{ce} = 1$ PF, $C_{Wi} = 6$ PF, $C_{WO} = 10$ P.F, $\beta = 100$ and $V_0 = \infty$. **(10 Marks)**

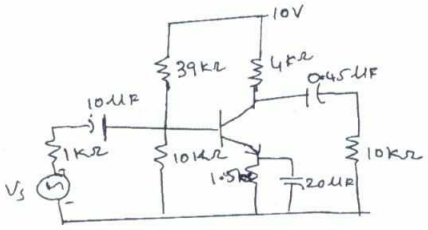

Fig. Q4 (b)

PART – B

5 a. Explain Darlington emitter follower. Draw the equivalent circuit. Derive expression for input impedance (Z_I), current gain (A_I), Voltage gain A_V and output impedance (Z_0). **(10 Marks)**

b. Determine the voltage gain, input and output impedance with voltage series feedback having $A = -100$, $R_i = 10$ KΩ, $R_0 = 20$ KΩ for feedback factor β = -0.1. **(06 Marks)**

c. Discuss the advantages of negative feedback. **(04 Marks)**

6 a. Describe FET amplifier with voltage series feedback. Derive the expression for gain. **(10 Marks)**

b. Explain the principles of class B amplifier operation. Derive expression for
(i) input dc power (ii) Output ac power (iii) η-efficiency
(iv) power dissipated by output transistor. **(10 Marks)**

7 a. Write the basic principle of oscillator. Also state the conditions for oscillation. **(04 Marks)**

b. Describe any one type of tunned oscillator with relevant diagram. Write expression for frequency of oscillations. **(08 Marks)**

c. RC phase shift oscillator $R_C = 5$ kΩ and $R = 3.3$ kΩ. Find the range of values of capacitor if it is required to vary frequency from 100 Hz to 20 kHz. **(08 Marks)**

8 a. Explain common gate JFET configuration with relevant circuit diagram. Draw equivalent circuit. Derive expression for Z_i, Z_0 and A_V. **(08 Marks)**

b. The self biased configuration of JFET has operating point defined by $V_{GSQ} = -2.6$ V and $I_{DQ} = 22.6$ mA and $I_{DSS} = 8$ mA and $V_P = -6$ V the value of $Y_{OS} = 20\,\mu$S as shown in Fig.Q8 (b). Find (i) g_m (ii) r_d (iii) Z_i (iv) Z_0 **(06 Marks)**

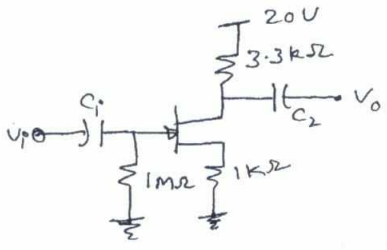

Fig. Q8 (b)

c. Differentiate depletion type MOSFET and enhancement type MOSFET. **(06 Marks)**

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10ES33

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Logic Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. A logic circuit has 4 inputs P, Q, R, S and 2 outputs Y_1, Y_2.
i) Y_1 is '1' when majority of inputs are '1' (equal numbers of '0' and '1' are treated don't care)
ii) Y_2 is '1' when two adjacent inputs are '1' (P and S are treated adjacent)
Design the circuit using NAND gates only. **(12 Marks)**

b. Determine minimal POS and SOP for $f(E, F, G, H) = \pi (0, 1, 2, 7, 11, 13) \cdot d(4, 5, 8, 10, 14)$. **(08 Marks)**

2 a. Using Quine – McCluskey technique simplify the Boolean expression.
$f(A, B, C, D) = \Sigma(0, 5, 7, 8, 9, 10, 11, 14, 15)$. **(10 Marks)**

b. Simplify and realize the given function using MEV technique taking lest significant variable as map entered variable.
$f(a, b, c, d, e) = \Sigma(1, 3, 4, 6, 9, 11, 12, 14, 17, 19, 20, 22, 25\ 27, 28, 30)$. **(10 Marks)**

3 a. With the help of logic diagram, truth table and circuit diagram, explain 3–to–8 line decoder with active low outputs. Using the same implement the functions :
$f_1 = \pi(0, 3, 5, 6)$
$f_2 = \pi(2, 3, 4, 5, 7)$. **(10 Marks)**

b. What are the limitations of basic encoder? Design a 4–2 priority encoder with validity output. **(10 Marks)**

4 a. Explain how look Ahead carry adder speeds up operation of addition over basic parallel adder. **(10 Marks)**

b. Implement $f(A, B, C, D) = \Sigma m(0, 1, 3, 4, 8, 9, 15)$ using i) 74151 (8–1 MUX) ii) 74153 (dual 4–1 mux). **(06 Marks)**

c. Define Dmux, design 1–4 Dmux. **(04 Marks)**

PART – B

5 a. Explain the application of SR Latch as switch de-bouncer. **(06 Marks)**

b. Explain the operation of asynchronous inputs of flip-flop with waveforms. **(06 Marks)**

c. Write the logic circuit and truth table of D and T FFS. Draw the output waveforms for the input shown for :
i) D latch ii) Gated D latch iii) +ve edge TFF iv) –ve edge TFF. **(08 Marks)**

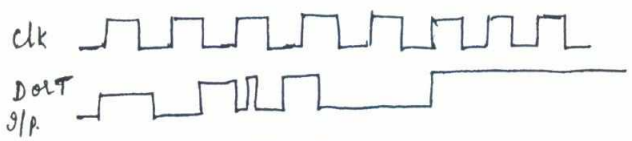

Fig. Q5(c)

6 a. Design a mod16 asynchronous down counter using D flip–flops. **(10 Marks)**

b. Explain the operation of : i) parallel in serial out shift register ii) twisted ring counter. **(10 Marks)**

7 a. Differentiate between Moore and Mealy models. **(05 Marks)**

b. Construct the transition table, state table and state diagram for the Moore sequential circuit shown. **(15 Marks)**

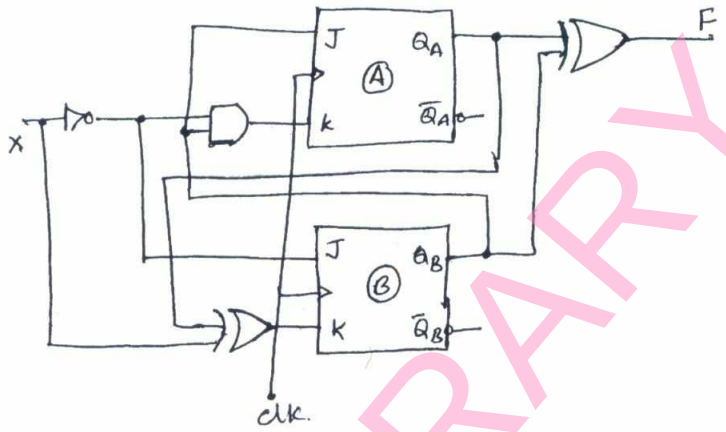

Fig. Q7(b)

8 a. Explain lockout condition. How do you eliminate it? Design a synchronous counter for : $4 \rightarrow 6 \rightarrow 7 \rightarrow 3 \rightarrow 1 \rightarrow 4$.
Avoid lockout condition. Use JK flip-flop. **(12 Marks)**

b. A sequential circuit has one input and one output. The state diagram is as shown in Fig. Q8(b). Design the circuit using D FF. **(08 Marks)**

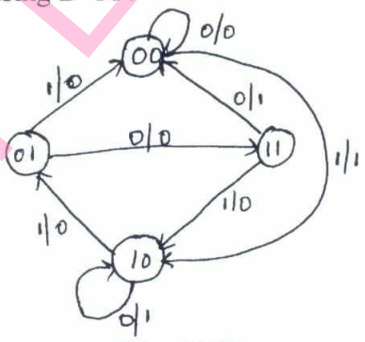

Fig. Q8(b)

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10ES34

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Network Analysis

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Using source transformation and shifting, obtain the power consumed in 8Ω resistance of the network shown in Fig.Q1(a). **(06 Marks)**

b. Determine all the node voltages of the circuit shown in Fig.Q1(b) using nodal analysis. **(06 Marks)**

c. Find the value of Vs such that the current in –j11Ω is zero, use mesh analysis assuming all the loop currents are in clockwise directions. Refer Fig. 1(c). **(08 Marks)**

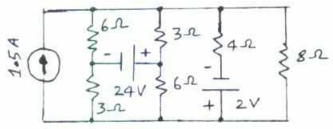

Fig. Q1(a)

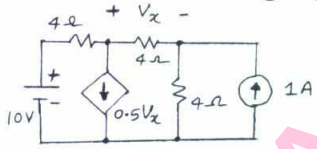

Fig. Q1(b)

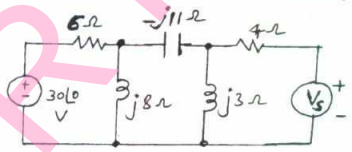

Fig. Q1(c)

2 a. Draw the dual of the network shown in Fig. 2(a). Write the corresponding equations for both networks. **(08 Marks)**

b. Draw the graph of the network shown in Fig. Q2(b), select links as the branches containing voltage sources. Write tie-set schedule and there from obtain all the branch currents and voltages. **(12 Marks)**

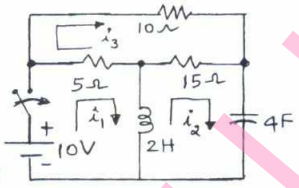

Fig.Q2(a)

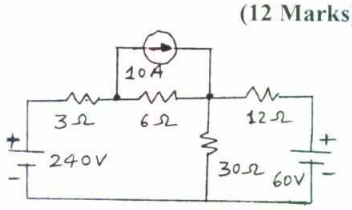

Fig. Q2(b)

3 a. Determine the current and voltage across 4Ω resistance of the network shown in Fig. Q3(a), using superposition theorem. **(06 Marks)**

b. Apply Millman's theorem to find V_0 and I_0 for the circuit shown in Fig. 3(b). **(08 Marks)**

c. State and explain the reciprocity theorem. **(06 Marks)**

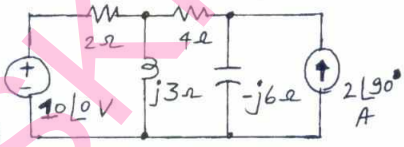

Fig.Q3(a)

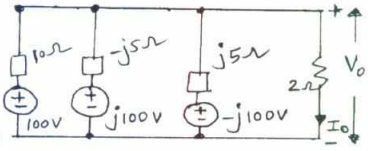

Fig.Q3(b)

4 a. A linear bilateral network consisting of passive elements is shown in Fig. 4(a), with $V_s = 10V$, V_{ab} is 5V. If 'ab' is shorted, $I_{ab} = 1A$ for $V_s = 15V$. Determine the current when $R_{ab} = 2.5\Omega$ with $V_s = 12V$. **(04 Marks)**

b. Determine the Norton's equivalent of the circuit shown in Fig. 4(b). **(08 Marks)**

c. What value of impedance Z_L results in maximum power transfer condition for the network shown in Fig. Q4(c)? Also determine the corresponding power. **(08 Marks)**

Fig. Q4(a)

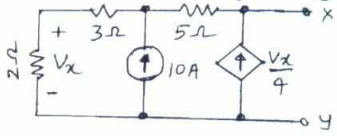

Fig. Q4(b)

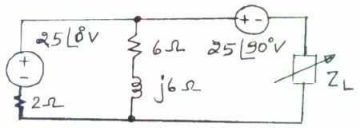

Fig. Q4(c)

PART – B

5 a. A series R – L – C circuit is fed with 50 V rms supply. At resonance, the current through the circuit is 25A and the voltage across inductor is 1250 volts. If G = 4 μF, determine the values of R, L Q, resonant frequency, bandwidth and half power frequencies. **(12 Marks)**

b. Obtain the condition for resonance of elements as shown in Fig. 5(b). Derive the expression for total impedance at resonance. **(08 Marks)**

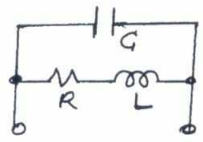

Fig. Q5(b)

6 a. The switch 'K' in the circuit shown in Fig. 6(a) is in open position for a long time and at time t = 0, it is closed. Determine the values of i_1 and i_2 along with their first and second derivatives at t = 0+. **(10 Marks)**

b. The switch 'S' is changed from position 1 to 2 at time t = 0. The circuit was under steady state before this action. Determine the value of v and i at t = 0+ and their first and second derivatives also. Refer Fig. 6(b). **(10 Marks)**

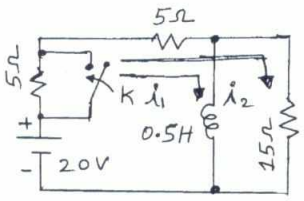

Fig. Q6(a)

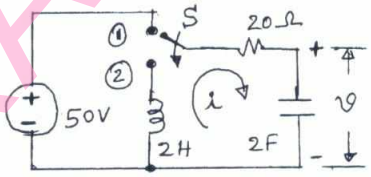

Fig. Q6(b)

7 a. Using Laplace transformation method obtain the expression for i(t). The capacitor charge is zero initially. Also obtain the expression for capacitor voltage in 'S' domain, refer Fig. 7(a). **(10 Marks)**

b. Using standard waveforms, express the waveform given (periodic) in Fig. 7(b) and obtain its Laplace transform. **(10 Marks)**

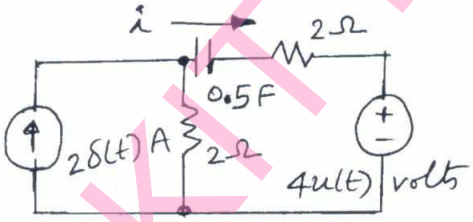

Fig. Q7(a)

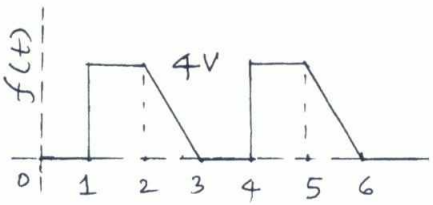

Fig. Q7(b)

8 a. Determine the Y–parameters of the network shown in Fig. Q8(a), **(10 Marks)**

b. Replace the circuit shown in Fig. 8(b) with its hybrid parameter equivalent network. **(10 Marks)**

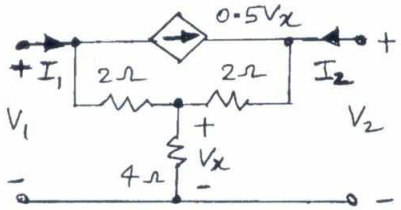

Fig. Q8(a)

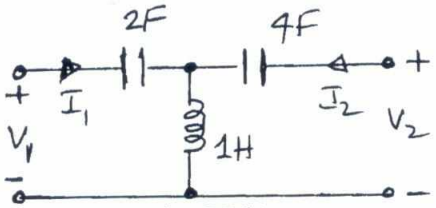

Fig. Q8(b)

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10EE35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electrical and Electronic Measurements 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 dimensional equations for pole strength, current, mmf in the e.m. system of units. **(06 Marks)**

b. Draw the circuit of a Kelvin's double bridge used for the measurement of low resistances. Derive the condition for balance. **(07 Marks)**

c. Describe the working of a megger. **(07 Marks)**

2 a. Describe the working of Schering bridge. Derive the equation for capacitance and dissipation factor. Draw the phasor diagram of the bridge under conditions of balance. **(12 Marks)**

b. A Maxwell's inductance comparison bridge is shown in Fig.Q.2(b). Arm ab consists of a coil with inductance L_1 and resistance r_1 in series with a non-inductive resistance R. Arm bc and ad are each a non-inductive resistance of 100Ω. Arm ad consists of standard variable inductor L of resistance 32.7Ω. Balance is obtained when L_2 = 47.8 mH and R = 1.36Ω. Find the resistance and inductance of the coil in arm ab. **(08 Marks)**

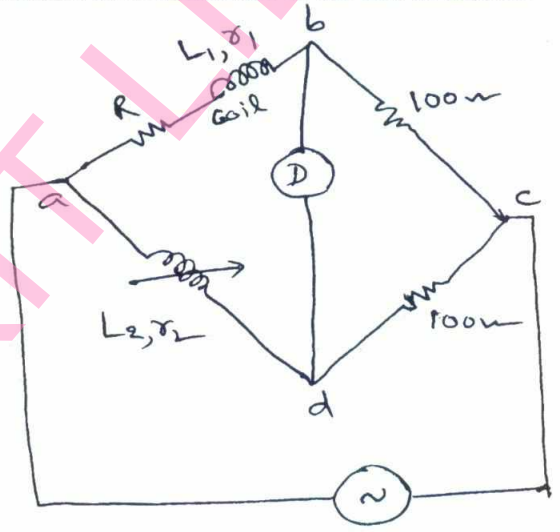

Fig.Q.2(b)

3 a. Explain Silsbees's method of testing of C.T. Derive necessary equations. **(12 Marks)**

b. A 1000/5 A, 50Hz current transformer has a secondary burden comprising a non inductive impedance of 1.6Ω. The primary winding has one turn. Calculate the flux in the core and ratio error at full load. Neglect leakage reactance and assume the iron loss in the core to be 1.5W at full load. The magnetizing mmf is 100A. **(08 Marks)**

4 a. With the help of sketch, explain principle and working of dynamometer wattmeter. **(10 Marks)**

b. Explain construction and working of induction type energy meter. **(10 Marks)**

PART – B

5 a. Explain construction and working of Weston frequency meter. **(10 Marks)**

b. Explain construction and working of electronic multimeter. **(10 Marks)**

6 a. Explain the method of Lissajous patterns used for frequency measurement. **(10 Marks)**

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

7 a. Explain working principle of LVDT with the help of neat sketch and characteristics. **(12 Marks)**

b. Explain different strain gauges with their principle of operation. **(08 Marks)**

8 a. Explain with block diagram the essential functional operation of a digital data acquisition system. **(10 Marks)**

b. What is a X-Y recorder? Explain with neat diagram the working of X-Y recorder. **(10 Marks)**

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10EE36

Third Semester B.E. Degree Examination, June/July 2015
Electrical Power Generation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the working of wind energy conversion system with neat block diagram. **(08 Marks)**
b. Explain the concept of cogeneration plant and discuss its merits. **(06 Marks)**
c. With a neat block diagram, explain the working of geothermal plant. **(06 Marks)**

2 a. What are the points to be considered for selection site for diesel power plant? **(06 Marks)**
b. Explain gas turbine plant with a neat sketch. **(08 Marks)**
c. Explain with a diagram working of a bio generation plant. **(06 Marks)**

3 a. Mention the factors to be considered for selection of hydro electric plants. **(06 Marks)**
b. Classify the hydro electric plants based on :
i) water flow regulation
ii) head
iii) load. **(04 Marks)**
c. Describe the schematic arrangement of a thermal power plant. Briefly explain the functions of each. **(10 Marks)**

4 a. Explain with a neat diagram, the basic components of a nuclear power plant. **(10 Marks)**
b. Explain the operation of a fast breeder reactor. **(05 Marks)**
c. Discuss some of the safety measures incorporated in nuclear power plant. **(05 Marks)**

PART – B

5 a. Explain the following terms :
i) Demand factor ii) diversity factor iii) plant use factor
iv) plant utilization factor v) load factor **(05 Marks)**
b. Write a short note on load curve and load duration curve. **(05 Marks)**
c. A generating station supplies the following loads 15 MW, 12MW, 8.5MW, 6MW and 0.45 MW. The annual load factor of the power station is 45%. Calculate :
i) number of units supplied annually
ii) diversity factor
iii) Demand factor if the station has a maximum demand of 22 MW. Take connected load is 41.95 MW. **(10 Marks)**

6 a. What is meant by tariff? Mention the types of tariff. Explain any one type of tariff. **(06 Marks)**

b. What is power factor? Explain any one method to improve the power factor. **(06 Marks)**

c. Explain with a neat sketch :

i) Single bus bar with sectionalisation

ii) Double bus bar with sectionalisation. **(08 Marks)**

7 a. What is the necessity of current limitting reactors in power system? Explain with neat sketch feeder reactor scheme. **(06 Marks)**

b. Discuss the necessity of neutral grounding. **(06 Marks)**

c. What are the different methods of neutral grounding? Explain solid grounding method. **(08 Marks)**

8 a. With a neat diagram, explain the following :

i) Voltage transformer earthing

ii) Resistance earthing. **(08 Marks)**

b. Explain with a neat sketch the resonant earthing. **(06 Marks)**

c. A 33KV, 50Hz networks has a capacitance to neutral of 0.1 μF per phase. Calculate the inductances of an arc – suppression coil suitable for the system to avoid arcing ground effect. **(06 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Advanced Mathematics - I

Time: 3 hrs. Max. Marks:100

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

1 a. Express the $\frac{3}{1+i}-\frac{1}{2-i}+\frac{1}{1-i}$ in the form of a + ib. **(06 Marks)**

b. Find the cube roots of 1 - i. **(07 Marks)**

c. Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i \sin n\theta$. **(07 Marks)**

2 a. Find the nth derivative of $e^{ax}\cos(bx + c)$. **(07 Marks)**

b. Find the nth derivative of $\frac{x}{(x-1)(2x+3)}$. **(06 Marks)**

c. If $y = a\cos(\log x) + b\sin(\log x)$ prove that $x^2y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0$. **(07 Marks)**

3 a. With usual notations P.T $\tan\phi = \frac{rd\theta}{dr}$. **(06 Marks)**

b. Find the angle between the pairs of curves

$r = a\log\theta \quad r = \frac{a}{\log\theta}$. **(07 Marks)**

c. Find the Pedal equation to the curve $r = a(1+\sin\theta)$. **(07 Marks)**

4 a. State and prove Euler's theorem of Homogeneous functions. **(06 Marks)**

b. If $u = f(x-y, y-z, z-x)$

P.T $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$. **(07 Marks)**

c. If $u = \tan^{-1}x + \tan^{-1}y$, $V = \frac{x+y}{1-xy}$

S.T $\frac{\partial(u,v)}{\partial(x,y)}=0$. **(07 Marks)**

5 a. Obtain the Reduction formula for $\int \sin^m x \cos^n x\, dx$. Where m, n are positive integers. **(07 Marks)**

b. Evaluate $\int_1^2\int_0^{2-y} xy\, dx\, dy$. **(06 Marks)**

c. Evaluate $\int_0^3\int_0^2\int_0^1 (x+y+z)\, dz\, dx\, dy$. **(07 Marks)**

6 a. Prove that $\left[\left(\frac{1}{2}\right)\right] = \sqrt{\pi}$. **(06 Marks)**

b. Prove that $\int_0^\infty x^2e^{-x^4}dx \times \int_0^\infty e^{-x^4}dx = \frac{\pi}{8\sqrt{2}}$. **(07 Marks)**

c. Evaluate the Integral $\int_0^1 x^5(1-x)^6\,dx$. **(07 Marks)**

7 a. Solve $(D^3 - 3D - 2)y = 0$. **(06 Marks)**

b. Solve $(y'' + y) = e^{-x} + \cos x + x^3$. **(07 Marks)**

c. Solve $y'' - 2y' + y = xe^x \sin x$. **(07 Marks)**

8 a. Solve $\frac{dy}{dx} = \frac{x(2\log x + 1)}{\sin y + y\cos y}$. **(06 Marks)**

b. Solve $x \log x \frac{dy}{dx} + y = 2 \log x$. **(07 Marks)**

c. Solve $(2xy + y - \tan y)\,dx + (x^2 - x\tan^2 y + \sec^2 y)\,dy = 0$. **(07 Marks)**

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