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06MAT31

Third Semester B.E. Degree Examination, June-July 2009
Engineering Mathematics-III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Obtain Fourier series for the function

$$f(x)=\begin{cases}\pi x & \text{for } 0\le x\le 1\\ \pi(2-x) & \text{for } 1\le x\le 2\end{cases}$$ and hence deduce that $\frac{\pi^2}{8}=\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}$ **(07 Marks)**

b. Obtain the half range cosine series for the function $f(x)=\sin x$ in $0\le x\le\pi$. **(07 Marks)**

c. Express y as a Fourier series up to first harmonics given

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

(06 Marks)

2 a. Find the Fourier transform of

$$f(x)=\begin{cases}1 & \text{for } |x|<1\\ 0 & \text{for } |x|>1\end{cases}$$ Hence evaluate $\int_0^{\infty}\frac{\sin x}{x}dx$ **(07 Marks)**

b. Find the Fourier cosine transform of $f(x)=\frac{1}{1+x^2}$ **(07 Marks)**

c. Solve the integral equation $\int_0^{\infty}f(\theta)\cos\alpha\theta\,d\theta=\begin{cases}1-\alpha, & 0\le\alpha\le 1\\ 0, & \alpha>1\end{cases}$ Hence evaluate $\int_0^{\infty}\frac{\sin^2 t}{t^2}dt$ **(06 Marks)**

3 a. Find the partial differential of all planes which are at constant distance from the origin. **(07 Marks)**

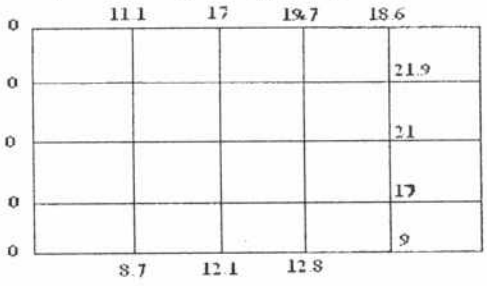
b. Using the method of separation of variables solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6e^{-3x}$ **(07 Marks)**

c. Solve $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$ **(06 Marks)**

4 a. Derive one dimensional heat equation. **(07 Marks)**

b. Obtain D'Alembert's solution of wave equation $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$ **(07 Marks)**

c. Solve the Laplace's equation $U_{xx}+U_{yy}=0$ given that



(06 Marks)

PART – B

5 a. Using Newton-Raphson method find the real root of the equation $3x = \cos x + 1$ **(07 Marks)**

b. Solve the following system of equations using Gauss-Jordon method

$$x + y + z = 9$$
$$2x - 3y + 4z = 13$$
$$3x + 4y + 5z = 40$$

(07 Marks)

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

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$ Take $(1, 0, 0)^T$ as initial eigen vector. Carry out four iterations. **(06 Marks)**

6 a. A slider in a machine moves along a fixed straight rod. Its distance x cm along the rod is given below for various values of the time t sec. Find the velocity and its acceleration when $t = 0.3$ sec.

t	0	0.1	0.2	0.3	0.4	0.5
x	30.13	31.62	32.87	33.64	33.95	33.81

(07 Marks)

b. Given the values of x and y

x :	1.2	2.1	2.8	4.1	4.9	6.2
y :	4.2	6.8	9.8	13.4	15.5	19.6

Find the value of x corresponding to $y = 12$ using Lagrange's technique. **(07 Marks)**

c. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Weddle's rule taking 7 ordinates. **(06 Marks)**

7 a. Find the extremal of the functional $\int_0^1 \left[(y')^2 + 12xy\right] dx$ with $y(0)=0$ and $y(1) = 1$. **(07 Marks)**

b. Find the curve passing through the points $(x_1\ y_1)$ and $(x_2\ y_2)$ which when rotated about the x-axis gives a minimum surface area. **(07 Marks)**

c. Show that the geodesics on a plane are straight lines. **(06 Marks)**

8 a. Find the Z-transform of the following:

i) $(n + 1)^2$

ii) $3^n (3n + 5)$ **(07 Marks)**

b. Find the inverse Z-transform of $\frac{z^3 - 20z}{(z-2)^3(z-4)}$ **(07 Marks)**

c. Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ using Z-transforms. **(06 Marks)**

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06ES32

Third Semester B.E. Degree Examination, June-July 2009
Analog Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least Two questions from each part.*
2. Make suitable assumptions if necessary.

PART - A

1 a. With respect to a semiconductor diode, explain the following:
i) Reverse Recovery time
ii) Diffusion capacitance. **(06 Marks)**

b. How does a clamping circuit differ from a clipping circuit? For the diode clipping circuit shown in Fig.1(b), draw the input and output waveforms for i) R = 100 Ω; ii) R = 1kΩ; iii) R = 10kΩ for V_i = 20 Sinwt and V_R = 10V. Assume Rf = 100Ω, Rr = ∞ and V_r = 0. **(08 Marks)**

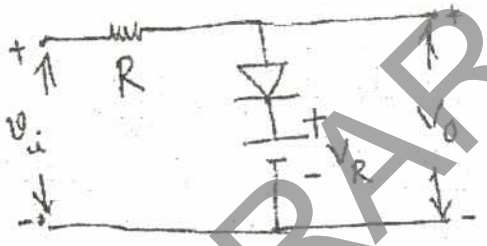

Fig.1(b).

c. Draw the circuit diagram of a full wave rectifier with capacitor filter. The circuit uses a capacitor of 1000 μF and provides a d.c. load current of 500 mA at 2% ripple. Assume f = 50Hz. Calculate i) D.C. output voltage; ii) Peak rectified voltage and % regulation. **(06 Marks)**

2 a. What is meant by transistor biasing? Compare different biasing methods used for transistor biasing with respect to stability. **(05 Marks)**

b. Find the operating point for the voltage divider bias circuit with β = 80 and V_{BE} = 0.6V. Find the new operating point when β changes to 100 and V_{BE} changes to 0.25. Given V_{cc} = 15V, R_1 = 100kΩ, R_2 = 18kΩ, R_c = 4.7kΩ, R_E = 1kΩ. **(07 Marks)**

c. With the help of a neat circuit diagram, explain the use of transistor as an inverter. **(08 Marks)**

3 a. What are the advantages of using hybrid model to represent the transistor? Explain how h-parameters can be obtained from the static characteristics of the transistor. **(06 Marks)**

b. For the Emitter follower circuit, derive expressions for A_V, A_I, R_{in} and R_o of an emitter follower. **(08 Marks)**

c. Compare the characteristics of CE, CC, CB configurations. A CE amplifier uses R_L = 200Ω. The h-parameters are h_{ie} = 1100Ω, h_{re} = 2.5 x 10^{-4}, h_{fe} = 50 and h_{oe} = 22 μA/V. Calculate i) Current gain; ii) Input impedance **(06 Marks)**

4 a. What is Miller effect? Draw the high frequency transistor a.c. equivalent circuit (π-Model) and explain the significance of each component in the model. **(08 Marks)**

b. What are the factors that influence the low frequency and high frequency response of a CE – BJT amplifier? **(06 Marks)**

c. Calculate the overall lower 3dB and upper 3dB frequencies for a 3 stage amplifier having an individual lower 3dB frequency of 30 Hz and upper 3dB frequency of 2.5 MHz. **(06 Marks)**

5 a. Why do we cascade amplifiers? State the various methods of cascading transistor amplifiers. A given amplifier arrangement has the following voltage gains. $Av_1 = 10$. $Av_2 = 20$ and $Av_3 = 40$. What is the overall voltage gain? Also express each gain in dB and determine the total voltage gain in dB. **(08 Marks)**

b. Explain the operation and characteristics of cascade and Darlington pair connections. **(04 Marks)**

c. Explain the concept of feedback amplifier. If an amplifier has a bandwidth of 200 kHz and a voltage gain of 80, what will be the new bandwidth and gain if a negative feedback of 5% is introduced? **(08 Marks)**

6 a. How are power amplifier classified? Explain. Show that the transformer coupled class A amplifier has a maximum efficiency of 50%. **(08 Marks)**

b. With circuit diagram, explain the working of class B push pull amplifier. Obtain an expression for the maximum conversion efficiency. **(07 Marks)**

c. What is harmonic distortion? A transistor supplies 0.85 Watts to a 4kΩ load. The zero signal d.c. collector current is 31 mA and the d.c. collector current with signal is 34 mA. Determine the percentage second harmonic distortion. **(05 Marks)**

7 a. State Barkhausen criteria for sustained oscillations and apply this to R.C phase shift oscillator and explain. Write the expression for the frequency of oscillation. Design the R.C. elements of a weinbridge oscillator for operation at $f_o = 10$kHz. **(08 Marks)**

b. With the help of a circuit diagram, explain the working of Hartely oscillator. A colpitt's oscillator is to generate a frequency of 800 kHz. The capacitors to be used to have capacitance $C_1 = 100$ pF and $C_2 = 10$pF. Find the value of inductance. **(06 Marks)**

c. What is frequency stability in oscillators? What factors affect the frequency stability? Explain how crystal oscillator provides good frequency stability. **(06 Marks)**

8 a. What is a JFET and how does it differ from BJT? Explain the different methods of biasing FET. **(07 Marks)**

b. Explain the operation of JFET amplifier. Draw the FET small signal model. Calculate the transconductance g_m of a JFET having values of $I_{DSS} = 12$ mA and $V_p = -4$V at bias points i) $V_{GS} = 0$V; ii) $V_{GS} = -1.5$V. **(06 Marks)**

c. Draw a diagram showing the constructional features of a MOSFET. From the diagram explain in brief how the voltage at the gate controls the flow of carriers. A depletion MOSFET has $I_{DSS} = 12$ mA and $V_P = -4.5$ V. Calculate the drain current at gate source voltages of i) 0V; ii) –2V; iii) –3V. **(07 Marks)**

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06ES33

Third Semester B.E. Degree Examination, June-July 2009
Logic Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Express the P. O. S. equations in a Maxterms list (decimal notations) form. **(04 Marks)**

i) $T = f(a, b, c) = (a + \overline{b} + c)(a + \overline{b} + c)(\overline{a} + \overline{b} + c)$

ii) $J = f(A,B,C,D) = (A+\overline{B}+C+D)(A+\overline{B}+C+\overline{D})(\overline{A}+B+C+D)(\overline{A}+\overline{B}+C+D)(\overline{A}+B+\overline{C}+D)(\overline{A}+\overline{B}+\overline{C}+D)$

b. Reduce the following function using K-map technique and implement using gates. **(10 Marks)**

i) $f(P, Q, R, S) = \Sigma m (0, 1, 4, 8, 9, 10) + d(2, 11)$

ii) $f(A, B, C, D) = \pi M (0, 2, 4, 10, 11, 14, 15)$

c. Design a logic circuit with inputs P, Q, R so that output S is high whenever P is zero or whenever Q = R = 1. **(06 Marks)**

2 a. Using Quine Mccluskey Method and simply the following function.

$f (a, b, c, d) = \Sigma m (0, 1, 2, 3, 8, 9)$ **(10 Marks)**

b. Write the Map entered variable K-map for the Boolean function.

$f (w, x, y, z) = \Sigma m (2, 9, 10, 11, 13, 14, 15)$ **(10 Marks)**

3 a. Implement following multiple output function using 74LS138 and extend gates.

$F_1(A, B, C) = \Sigma m (1, 4, 5, 7)$

$F_2(A, B, C) = \pi M (2, 3, 6, 7)$ **(06 Marks)**

b. Implement full subtractor using decoder and write a truth table. **(08 Marks)**

c. Write a note on encoders. **(06 Marks)**

4 a. Design 2-bit comparator using gates. **(12 Marks)**

b. Implement the following Boolean function using 8 : 1 multiplexer.

$F(A, B, C, D) = \overline{A}\overline{B}\overline{D} + ACD + \overline{B}CD + \overline{A}\overline{C}D$ **(08 Marks)**

PART – B

5 a. Clearly distinguish between

i) Synchronous and asynchronous circuits.

ii) Combinational and sequential circuits **(06 Marks)**

b. Explain the operation of clocked SR flip-flop. **(08 Marks)**

c. What is race around condition? Discuss in detail. **(06 Marks)**

6 a. Draw the logic diagrams for (i) SR latch (ii) Master – slave JK flip-flop (iii) Master-slave SR flip-flop. **(06 Marks)**

b. Explain the working of 4-bit asynchronous counter. **(06 Marks)**

c. Explain Johnson counter with its circuit diagram and timing diagram. **(08 Marks)**

7 a. Explain with suitable logic and timing diagram.

i) Serial-in serial-out shift register.

ii) Parallel-in parallel-out shift register. **(10 Marks)**

b. Explain the Meoly model and Moore model for clocked synchronous sequential network. **(10 Marks)**

8 a. Compare Moore and Meelay models. **(04 Marks)**

b. Design a synchronous counter using JK flip-flops to count in the sequence 0,1,2,4,5,6,0,1,2..... Use state diagram and state table. **(12 Marks)**

c. State the rules for state assignments. **(04 Marks)**

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06ES34

Third Semester B.E. Degree Examination, June-July 2009
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full question, selecting atleast two question from each part.***

Part A

1 a. Three impedances are connected in star. Obtain expressions for their delta connected equivalent. Also find the star equivalent of the following circuit shown in figure Q1 (b). **(09 Marks)**

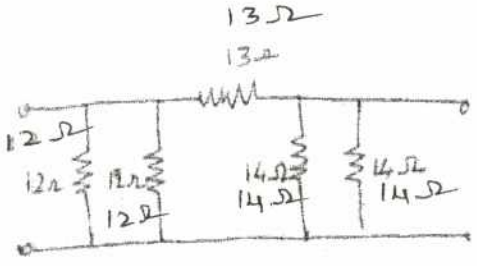

Fig. Q1 (a)

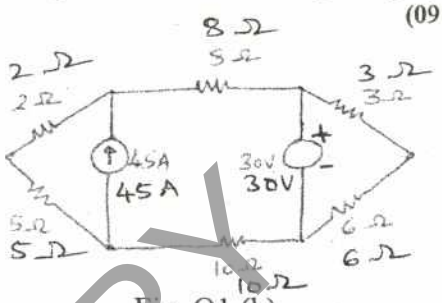

Fig. Q1 (b)

b. Reduce the network shown in figure Q1 (c) to a single voltage source in series with a resistance using source shift and source transformation. **(06 Marks)**

c. Solve for $i_0(t)$ using mesh analysis in the network shown in figure Q1 (c). **(05 Marks)**

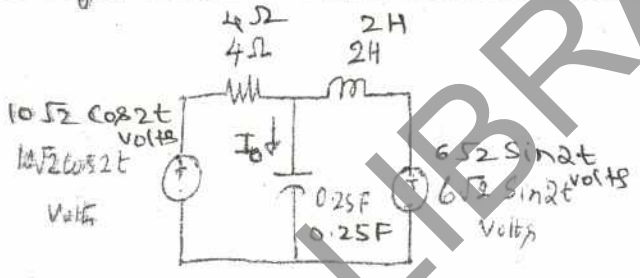

Fig. Q1 (c)

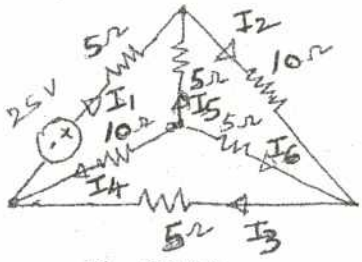

Fig. Q2 (c)

2 a. Define the following terms as applied to network topology with suitable examples,
i) tree and co-tree. ii) Planar and non-planar graphs. **(04 Marks)**

b. The reduced incidence matrix of a graph is given below. Draw the oriented graph corresponding to the same. **(03 Marks)**

$$\begin{bmatrix} -1 & 1 & 0 & 0 & 0 & -1 \\ 0 & -1 & -1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & -1 & 1 \end{bmatrix}$$

c. For the network shown in figure Q2 (c), write the tie-set schedule selecting center star as tree and find all branch currents by solving equilibrium equation. **(09 Marks)**

d. Define the term duality as applied to networks. Give suitable example. **(04 Marks)**

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

b. Find the current through load impedance $Z_L = 15\angle -30\Omega$ using Millmans theorem in the circuit shown in figure Q3 (b). **(06 Marks)**

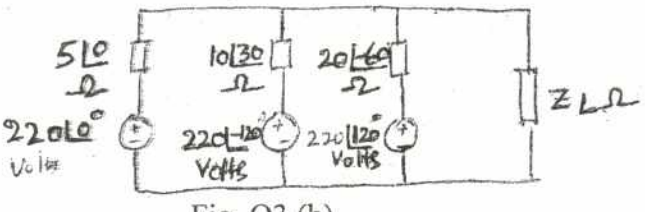

Fig. Q3 (b)

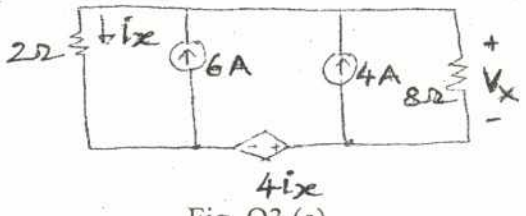

Fig. Q3 (c)

c. Use Superposition theorem to find Vx in the circuit shown in figure Q3 (c). **(08 Marks)**

4 a. State and prove Thevenins theorem. Show that Thevenins equivalent circuit is the dual of Nortons equivalent circuit. **(10 Marks)**

b. Find the value of R_L for which power transferred to the load is maximum and maximum power. Also establish the condition for maximum power transfer. **(10 Marks)**

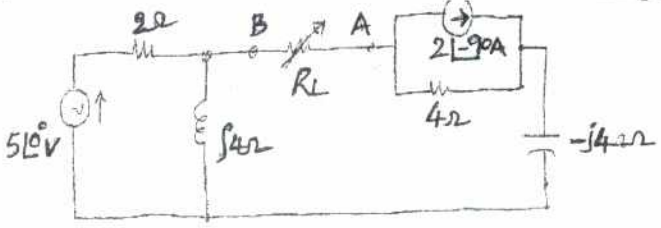

Fig. Q4 (b)

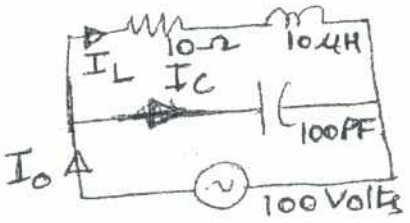

Fig. Q5 (c)

Part B

5 a. Explain the following terms with respect to series resonant circuit i) Selectivity and Band width ii) Q-factor. **(05 Marks)**

b. In a series resonant circuit, show that resonant frequency is equal to the geometric mean of half power frequencies. **(07 Marks)**

c. For the parallel resonant circuit shown in figure Q5 (c), find I_O, I_L, I_C, f_O and dynamic resistance. **(08 Marks)**

6 a. Explain the transient behaviour of the resistance, inductance and capacitance. Also explain the procedure for evaluating transient behaviour. **(08 Marks)**

b. For the circuit shown in figure Q6 (b), the switch 'K' is changed from position 1 to position 2 at t = 0, steady state condition having been reached in position 1. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0. **(07 Marks)**

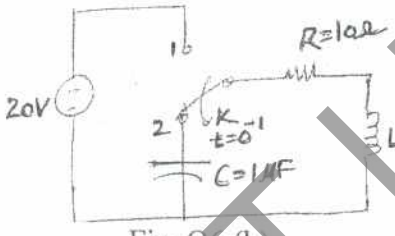

Fig. Q6 (b)

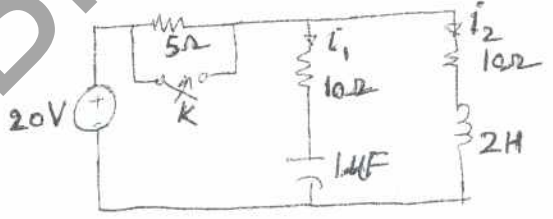

Fig. Q6 (c)

c. In the network shown in figure Q6 (c), the switch 'K' is opened at t = 0 after the network has attained steady state the switch is closed. Find i_1, i_2 at t = 0+ **(05 Marks)**

7 a. State and prove initial and final value theorem with suitable examples. **(08 Marks)**

b. Find the Laplace transform of the waveform shown in Fig. Q7 (b). **(06 Marks)**

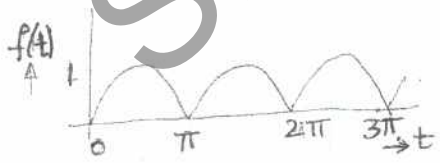

Fig. Q7 (b)

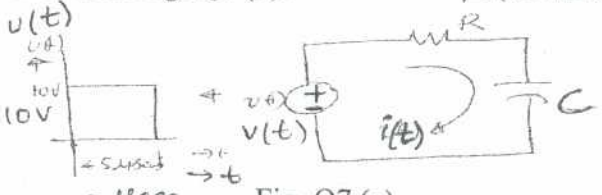

Fig. Q7 (c)

c. A voltage pulse of 10 V magnitude is applied to RC network shown in figure Q7 (c). Find the current i(t) of R = 10 Ω and C = 0.05 μF for the circuit. **(06 Marks)**

8 a. Express h – parameters in terms of z-parameters and establish the same. **(08 Marks)**

b. Explain symmetry and reciprocity property of two port networks. **(04 Marks)**

c. Find the z-parameters of the network shown in figure Q8 (c). **(08 Marks)**

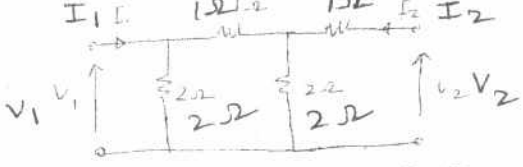

Fig. Q8 (c)

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06IT35

Third Semester B.E. Degree Examination, June-July 2009
Electronic Instrumentation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Write a note on Gross and Systematic errors. How these errors can be controlled? **(06 Marks)**

b. Component manufacturer constructs certain resistances to be between 1.33K and 1.47K. What tolerance should be stated? If the resistance values are specified at 25°C, calculate maximum resistance at 75°C if temperature coefficient is +500 ppm/°C. **(06 Marks)**

c. Explain the working of AC voltmeter using Full wave bridge rectifier. **(08 Marks)**

2 a. A 4½ digit DVM has an accuracy of ± 0.5% of reading ± 1 digit.
i) What is the possible error, in volts when the instrument is reading 5V on 200V range.
ii) What is the possible error, in volts when the instrument is reading 0.1V on 2V range? **(10 Marks)**

b. With the help of block diagram explain the working of Dual slope DVM. **(10 Marks)**

3 a. Explain the working of dual trace CRO. **(10 Marks)**

b. Compare alternate sweep with chopped-sweep. **(04 Marks)**

c. Write a note on following controls available on CRO panel:
i) Time-base ii) X – shift iii) Y – shift **(06 Marks)**

4 a. Explain the operation of Delayed time-base system. **(10 Marks)**

b. Sketch a diagram to show the construction of a variable persistence storage CRT. Explain its operation. **(10 Marks)**

PART – B

5 a. Draw the block diagram of function generator and explain the working of each block. **(10 Marks)**

b. Explain the working of frequency – synthesizer. **(10 Marks)**

6 a. Derive an expression for deflection current (I_g) of an unbalanced Wheatstone's bridge. **(10 Marks)**

b. A capacitance comparison bridge is used to measure a capacitive impedance at a frequency of 2 kHz. The bridge constant at balance are C3=100 μF, R_1 = 20 kΩ , R_2 = 50 kΩ, R_3=100kΩ. Find the equivalent series circuit of the unknown impedance. Show the bridge diagram. **(10 Marks)**

7 a. What is the difference between active and passive transducers? **(04 Marks)**

b. Explain how to use a bonded resistance wire strain gauge. **(06 Marks)**

c. Show the construction of LVDT. Explain its operation and list any three advantages. **(10 Marks)**

8 a. Describe the operation of photo electric transducer. **(08 Marks)**

b. Name any four display devices. **(04 Marks)**

c. What is a signal conditioner? Briefly explain the operation of DC signal conditioning system. **(08 Marks)**

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06ES36

Third Semester B.E. Degree Examination, June-July 2009
Field Theory

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. State and prove Divergence theorem. **(06 Marks)**

b. Define: i) Electric field intensity; ii) Electric flux density; iii) Volume charge density. **(06 Marks)**

c. Let $\vec{D} = 5r^2 \hat{a}_r$ mc/m^2 for $r \le 0.08$m and $\vec{D} = \frac{.205}{r^2}\hat{a}_r$ μc/m^2 for $r \ge 0.08$m. Find ρ_v for i) r = 0.06m; ii) r = 0.1m. **(08 Marks)**

2 a. Derive the expression for the energy stored in Electrostatic field having electric field intensity $\vec{E}$. **(06 Marks)**

b. A 15-nc point charge is at the origin in free space. Calculate V_1 if point P is located at (2, -3, -1). Also calculate V_1 at P if V = 0 at (6, 5, 4). **(08 Marks)**

c. Derive point form of continuity equation. **(06 Marks)**

3 a. Derive Laplace's equations. **(05 Marks)**

b. Using Laplace equations, derive the expression for the capacitance of a co-oxial cable. **(10 Marks)**

c. Calculate the numerical values for V and ρ_v in free space of $V = \frac{4yz}{x^2 + 1}$ at p: (1, 2, 3). **(05 Marks)**

4 a. Derive the expression for field at a point P due to an infinitely long filament carrying direct current I. **(08 Marks)**

b. Explain scaler and vector Magnetic Potential. **(08 Marks)**

c. Calculate the value of vector current density in cylindrical co-ordinates at P: (1.5, 90^0, 0.5) if $\vec{H} = \frac{2}{\rho}\cos 0.2\phi a_\rho$. **(04 Marks)**

PART – B

5 a. Define: i) Magnetization; ii) Permeability; iii) Torque. **(06 Marks)**

b. Obtain the boundary conditions at interface between two magnetic materials. **(06 Marks)**

c. Find Magnetization in magnetic material, where: **(08 Marks)**

i) $\mu = 1.8 \times 10^{-5}$ H/m and H = 120 A/m; ii) $\mu_r = 22$, there are 8.3×10^{28} atoms/m^3 and each atoms has a dipole moment of 4.5×10^{-27} A – m^2; iii) B = 300 μT and $X_m = 15$.

6 a. List Maxwell's equations in point form and integral form. **(08 Marks)**

b. Let $\mu = 10^{-5}$ H/m, $\epsilon = 4 \times 10^{-9}$ F/m, $\sigma = 0$ and $\rho_v = 0$. Find K so that each of he following pair of fields satisfies Maxwell's equation.

i) $\vec{D} = \left(6\hat{a}_x - 2y\hat{a}_y + 2z\hat{a}_z \text{ nc/m}^2\right)$, $\vec{H} = \left(kx\hat{a}_x + 10y\hat{a}_y - 25z\hat{a}_z\right)$ A/m.

ii) $\vec{E} = (20y - kt)\hat{a}x$ v/m, $\vec{H} = \left(y + 2x10^{6}t\right)\hat{a}_z$ A/m . **(06 Marks)**

c. Write a note on Retarded Potential. **(06 Marks)**

7 a. State and prove Poynting's theorem. **(10 Marks)**

b. Discuss the behaviour of good conductor when uniform ϕ line wove propagates through it. **(10 Marks)**

8 a. Discuss the problem of wave reflections from multiple interfaces. **(08 Marks)**

b. Define: i) Reflection coefficient; ii) Standing wave Ratios. **(04 Marks)**

c. Consider a 50 MHz uniform plane wave having Electric field amplitude 10 v/m. The medium is loss less having $\epsilon_r = \epsilon_{rl} = 9.0$ and μr = 1.0. The wave propagates in xy plane at 30^0 angle to x axis and is linearly polarized along z. Write the phasor expression for the electric field. **(08 Marks)**