III EC. EF (5)

CBCS Scheme

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15MAT31

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Express $f(x)=(\pi-x)^2$ as a Fourier series of period 2π in the interval $0<x<2\pi$. Hence deduce the sum of the series $1+\frac{1}{2^2}+\frac{1}{3^2}+.....$ **(08 Marks)**

b. The turning moment T units of the Crank shaft of a steam engine is a series of values of the crank angle θ in degrees. Find the first four terms in a series of sines to represent T. Also calculate T when $\theta = 75^\circ$. **(08 Marks)**

θ:	0°	30°	60°	90°	120°	150°	180°
T:	0	5224	8097	7850	5499	2626	0

OR

2 a. Find the Fourier Series expansion of the periodic function,

$$f(x)=\begin{cases} l+x, & -l\le x\le 0 \\ l-x, & 0\le x\le l \end{cases}.$$ **(06 Marks)**

b. Obtain a half-range cosine series for $f(x)=x^2$ in $(0, \pi)$. **(05 Marks)**

c. The following table gives the variations of periodic current over a period:

t sec:	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$
A amp:	1.98	1.30	1.05	1.30	-0.88	-0.25

Show that there is a direct current part 0.75 amp in the variable current and obtain the amplitude of the first harmonic. **(05 Marks)**

Module-2

3 a. Find the Fourier transform of $f(x)=\begin{cases} 1 & \text{for } |x|<1 \\ 0 & \text{for } |x|>1 \end{cases}$ and evaluate $\int_0^\infty \left(\frac{\sin x}{x}\right)dx$ **(06 Marks)**

b. Find the Fourier cosine transform of, $f(x)=\begin{cases} x & \text{for } 0<x<1 \\ 2-x & \text{for } 1<x<2 \\ 0 & \text{for } x>2 \end{cases}$. **(05 Marks)**

c. Obtain the inverse Z-transform of the following function, $\frac{z}{(z-2)(z-3)}$. **(05 Marks)**

OR

4 a. Find the Z-transform of $\cos\left(\frac{n\pi}{2}+\alpha\right)$. **(06 Marks)**

b. Solve $u_{n+2}-5u_{n+1}+6u_n=36$ with $u_0=u_1=0$, using Z-transforms. **(05 Marks)**

c. If Fourier sine transform of f(x) is $\frac{e^{-a\alpha}}{\alpha}$, $\alpha\neq 0$. Find f(x) and hence obtain the inverse Fourier sine transform of $\frac{1}{\alpha}$. **(05 Marks)**

Module-3

5 a. Calculate the Karl Pearson's co-efficient for the following ages of husbands and wives: **(06 Marks)**

Husband's age x:	23	27	28	28	29	30	31	33	35	36
Wife's age y:	18	20	22	27	21	29	27	29	28	29

b. By the method of least square, find the parabola $y = ax^2 + bx + c$ that best fits the following data: **(05 Marks)**

x:	10	12	15	23	20
y:	14	17	23	25	21

c. Using Newton-Raphson method, find the real root that lies near x = 4.5 of the equation $\tan x = x$ correct to four decimal places. (Here x is in radians). **(05 Marks)**

OR

6 a. In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate $\bar{x}$, $\bar{y}$ and the coefficient of correlation between x and y. **(06 Marks)**

b. Find the curve of best fit of the type $y = ae^{bx}$ to the following data by the method of least squares: **(05 Marks)**

x:	1	5	7	9	12
y:	10	15	12	15	21

c. Find the real root of the equation $xe^x - 3 = 0$ by Regula Falsi method, correct to three decimal places. **(05 Marks)**

Module-4

7 a. From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age of 46: **(06 Marks)**

Age:	45	50	55	60	65
Premium (in Rupees):	114.84	96.16	83.32	74.48	68.48

b. Using Newton's divided difference interpolation, find the polynomial of the given data: **(05 Marks)**

x	3	7	9	10
f(x)	168	120	72	63

c. Using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates. **(05 Marks)**

OR

8 a. Find the number of men getting wages below ₹ 35 from the following data: **(06 Marks)**

Wages in ₹ :	0 – 10	10 – 20	20 – 30	30 – 40
Frequency :	9	30	35	42

b. Find the polynomial f(x) by using Lagrange's formula from the following data: **(05 Marks)**

x:	0	1	2	5
f(x):	2	3	12	147

c. Compute the value of $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. **(05 Marks)**

Module-5

9 a. A vector field is given by $\vec{F} = \sin y\,\hat{i} + x(1+\cos y)\hat{j}$. Evaluate the line integral over a circular path given by $x^2 + y^2 = a^2$, $z = 0$. **(06 Marks)**

b. If C is a simple closed curve in the xy-plane not enclosing the origin. Show that $\int_C \vec{F}.d\vec{R} = 0$, where $\vec{F} = \frac{y\hat{i} - x\hat{j}}{x^2 + y^2}$. **(05 Marks)**

c. Derive Euler's equation in the standard form viz., $\frac{\partial f}{\partial y} - \frac{d}{dx}\left[\frac{\partial f}{\partial y'}\right] = 0$. **(05 Marks)**

OR

10 a. Use Stoke's theorem to evaluate $\int_C \vec{F}.d\vec{R}$ where $\vec{F} = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ over the upper half surface of $x^2 + y^2 + z^2 = 1$, bounded by its projection on the xy-plane. **(06 Marks)**

b. Show that the geodesics on a plane are straight lines. **(05 Marks)**

c. Find the curves on which the functional $\int_0^1 \left((y')^2 + 12xy\right)dx$ with $y(0) = 0$ and $y(1) = 1$ can be extremized. **(05 Marks)**

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15EE32

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Distinguish between :i) active and passive elements ii) ideal and practical sources. **(04 Marks)**

b. Determine the currents i_1, i_2 and i_3 in the circuit of Fig.Q1(b), using Mesh current method. **(06 Marks)**

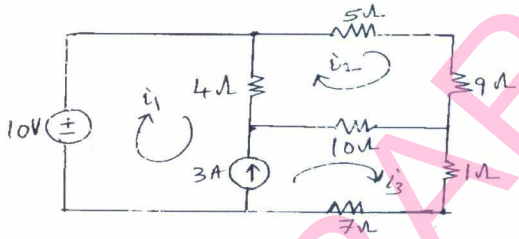

Fig.Q1(b)

c. Find the node voltages for the circuit of Fig.Q1(c) using nodal analysis. **(06 Marks)**

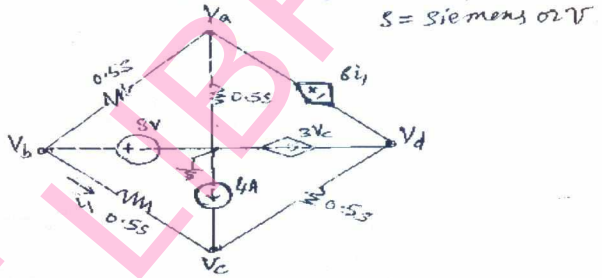

Fig.Q1(c)

OR

2 a. Find the equivalent resistance across a – b, of the circuit, of Fig.Q2(a) using delta –star conversion. **(04 Marks)**

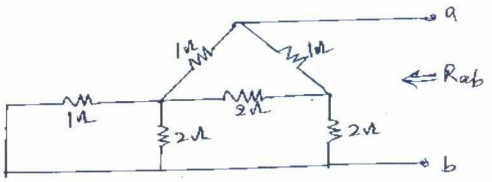

Fig.Q2(a)

b. A series resonance circuit has R = 10Ω, L = 5mH, and C = 20μF. Find the following : i) Resonant frequency ii) Q – factor and iii) Current at resonance condition, if the applied voltage is 100V. Hence derive the expressions for the same. **(08 Marks)**

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

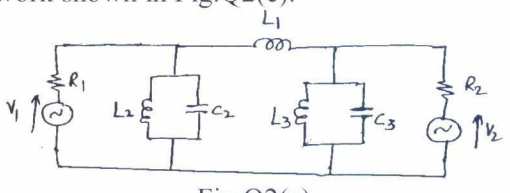

Fig.Q2(c)

Module-2

3 a. State and explain maximum power transfer theorem for DC circuit [resistive load]. **(06 Marks)**

b. Find the Thevenin's and Norton's equivalent circuit for the network shown in Fig.Q3(b), as seen from the terminals a – b. **(10 Marks)**

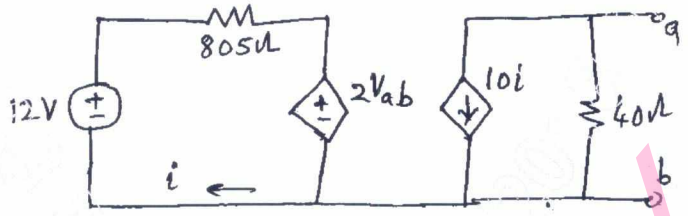

Fig.Q3(b)

OR

4 a. State and prove reciprocity theorem. **(06 Marks)**

b. Using super position theorem, find the current I in the network shown in Fig.Q4(b). **(10 Marks)**

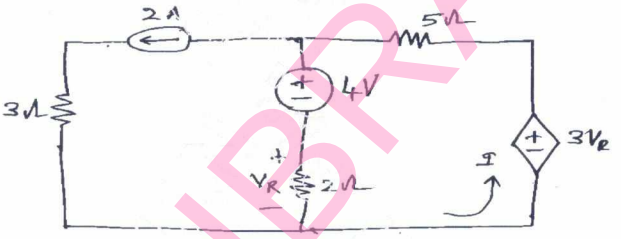

Fig.Q4(b)

Module-3

5 a. What are initial conditions and their use in network analysis? **(04 Marks)**

b. For the network elements R, L and C, write the equivalent circuits :

i) At $t = 0^+$ [initial condition]

ii) At $t = \infty$ [Final condition]. **(06 Marks)**

c. In the network shown in Fig.Q5(c), the switch K is closed at t = 0 with the capacitor uncharged. Find the values for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(06 Marks)**

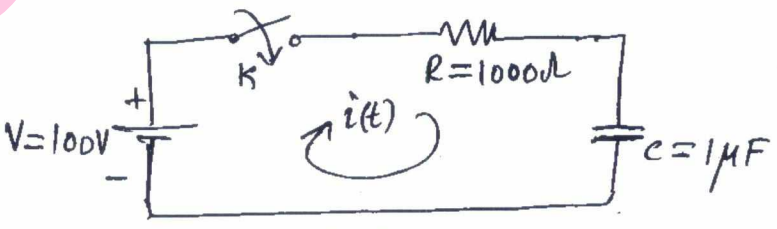

Fig.5Q(c)

OR

6 a. In the network of Fig.Q6(a), the switch K is changed from position a to b at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. Assume steady state condition for K in position 'a'. **(08 Marks)**

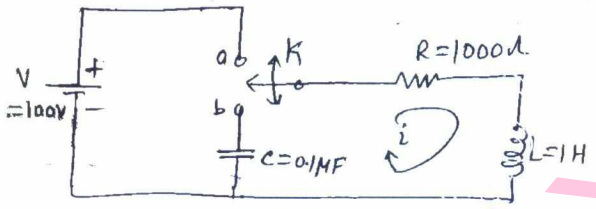

Fig.Q6(a)

b. The network shown in Fig.Q6(b), has the switch k opened at t = 0. Solve for V, $\frac{dV}{dt}$ and $\frac{d^2V}{dt^2}$ at $t = 0^+$. **(08 Marks)**

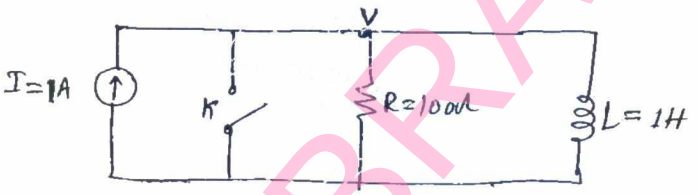

Fig.Q6(b)

Module-4

7 a. Obtain the Laplace transform of :
i) Ramp function t u(t)
ii) Exponential function $e^{-at}u(t)$
iii) Sinusoidal function sinωt u(t). **(06 Marks)**

b. Find the Laplace transform of
i) V(t) = 4s(t – 2) – 3t u(t)
ii) V(t) = u(t) u(t – 2). **(04 Marks)**

c. In a series RLC circuit, the capacitor is initially charged to voltage $V_0 = 1V$, with the switch K open. Find the circuit i(t) if the switch K is closed at t = 0, using Laplace transform method. Refer Fig.Q7(c). **(06 Marks)**

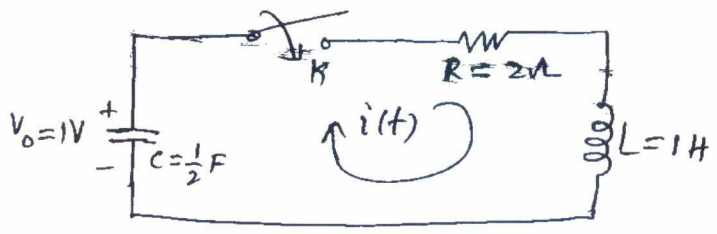

Fig.Q7(c)

OR

8 a. State and prove final value theorem. **(06 Marks)**

b. Determine the initial value f(0) and final value f(∞) for the function given by :

$$f(s) = \frac{5s^2 + 10}{2s[s^2 + 3s + 5]}$$. **(04 Marks)**

c. Find the Laplace transforms of the following waveforms (Refer Fig.Q8(c)). **(06 Marks)**

i) ii)

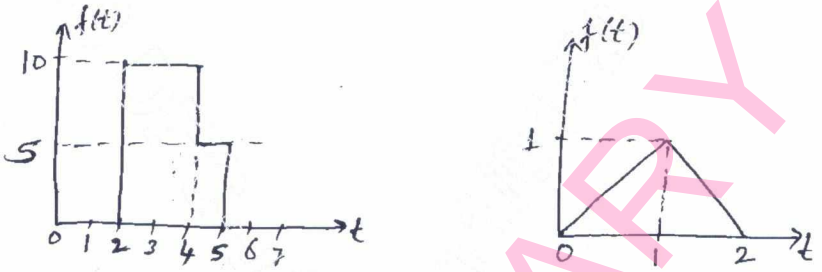

Fig.Q8(c)

Module-5

9 a. Define y-parameters and T-parameters of a two – port network. Write the conditions for symmetry and reciprocity. **(04 Marks)**

b. Obtain y-parameters in terms of T-parameters. **(06 Marks)**

c. Find y-parameters for the network shown in Fig.Q9(c). **(06 Marks)**

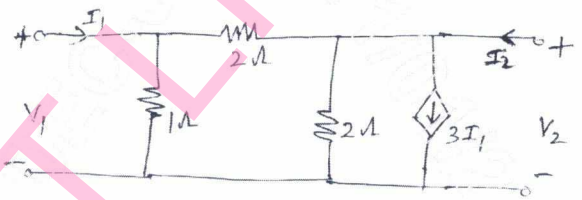

Fig.Q9(c)

OR

10 a. Find an expression for driving point impedance z(s) of the R-C ladder network shown in Fig.Q10(a). Also draw the pole-zero diagram. **(08 Marks)**

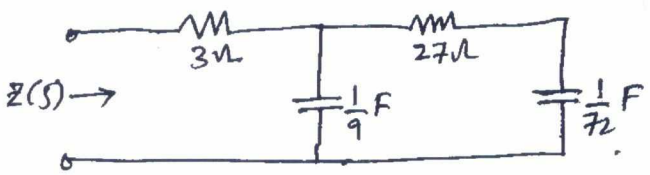

Fig.Q10(a)

b. Find the effective voltage, effective current and the average power supplied to a passive network if the applied voltage, V = 200 + 100 cos [500t + 30°] + 75 cos [1500t + 60°], volts and the resulting current is, i = 3.53 cos [500t + 75°] + 3.55 cos[1500t + 78.45°], Amps. **(08 Marks)**

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15EE33

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain operation of a practical transformer on load. Also draw the phasor diagram. **(06 Marks)**

b. Show that open delta connection has a kVA rating of 58% of the rating of the normal delta-delta connection. Also list the limitations of open-delta connection. **(06 Marks)**

c. A 20 kVA single phase transformer has voltage rating of 1100/110 V. During short circuit test it gives the following readings: 60V, 18 A, 560 W, LV side shorted. Find the power factor at which the regulation is (i) maximum, (ii) zero. **(04 Marks)**

OR

2 a. Define regulation of a transformer and obtain regulation of transformer by OC and SC tests. **(06 Marks)**

b. With the help of phasor diagram, explain how 2 phase supply can be obtained from 3 phase supply using Scott connection. **(06 Marks)**

c. A three phase step down transformer with per phase turns ratio 47.6:1 connected in delta/star and is supplying a load of 400 KW, 0.8 power factor lagging at 400 V. Sketch the connection diagram and show in it, the line voltages, phase currents and line currents. **(04 Marks)**

Module-2

3 a. List the conditions to be satisfied for satisfactory parallel operation of both single phase and three phase transformers. **(05 Marks)**

b. A 10 KVA 230/110 V transformer is to be used as a step up transformer to step up 230 V to 340 volts what will be the output rating of the autotransformer. **(04 Marks)**

c. What is the necessity of tertiary winding and explain its operation in star/star transformers. **(07 Marks)**

OR

4 a. Derive an expression for copper saving in autotransformer. **(05 Marks)**

b. Two transformers each of 80 kVA are connected in parallel. One has a resistance and reactance of 1% and 4% respectively and the other has resistance and reactance of 1.5% and 6% respectively. Calculate the load shared by each transformer and the corresponding power factor when the total load shared is 100 kVA at 0.8 power factor lagging. **(06 Marks)**

c. How do you obtain the equivalent circuit of a three winding transformer? Explain. **(05 Marks)**

Module-3

5 a. Explain in rush current phenomenon in transformers. **(05 Marks)**

b. A four pole lap wound armature running at 1400 rpm delivers a current of 100 A and has 64 commutator segments. The brush width is equal to 1.4 segments and inductance of each coil is 0.05 mH. Calculate the value of reactance voltage assuming (i) linear commutation, (ii) sinusoidal commutation. **(05 Marks)**

c. Explain any one method used to reduce the armature reaction effects in a dc machine. **(06 Marks)**

OR

6 a. What are the causes and effects of harmonics in a transformer? Explain. (05 Marks)

b. An 8 pole wave connected dc generator has 480 armature conductors. The armature current is 200 A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole if the brushes are shifted 6° electric from geometric neutral axis. Also calculate compensating turns per pole if the pole arc to pole pitch ratio is 0.75. (05 Marks)

c. Derive an expressions for distribution factor K_d and pitch factor K_p. (06 Marks)

Module-4

7 a. Explain slip tests on salient pole synchronous machine. (05 Marks)

b. Discuss the effect of change of excitation at constant load. (05 Marks)

c. Two identical 2000 kVA alternators operate in parallel. The governor of the prime mover of the first machine is such that the frequency drops uniformly from 50 Hz on no load to 48 Hz on full load. The corresponding uniform speed drop of the second machine is 50 Hz to 47.5 Hz. Find how will the two machines share a load of 3000 KW. (06 Marks)

OR

8 a. Derive an expression for synchronizing power. (05 Marks)

b. A 3 phase star connected synchronous generator supplies current of 10 A having phase angle of 20° lagging at 400 V. Find the load angle and components of armature current I_d and I_q, if $X_d = 10\ \Omega$ and $X_q = 6.5\ \Omega$. Assume armature resistance to be negligible. (06 Marks)

c. Derive an expression for the output power of cylindrical rotor altenator connected to infinite bus. Neglect armature resistance. (05 Marks)

Module-5

9 a. Differentiate between synchronous reactance, adjusted synchronous reactance and potier reactance. (06 Marks)

b. A 2300 V, 50 Hz, 3 phase star connected alternator has an effective armature resistance of 0.2 ohm. A field current of 35 A produces a current of 150 A on short circuit and an open circuit emf 780 V (line value). Calculate the voltage regulation at 0.8 pf lagging. The full load current is 25 A. (06 Marks)

c. Describe Hunting in alternator. (04 Marks)

OR

10 a. A 3.5 MVA, star connected altenator rated at 4160 volts at 50 Hz has open circuit characteristics as given by the following data:

I_f Amp	50	100	150	200	250	300	350
V_{oc} Volts	1620	3150	4160	4750	5130	5370	5550

A field current of 200 A is found necessary to circulate full load current on short circuit. Calculate by Ampere turn method full load voltage regulation at 0.8 pf lagging. (08 Marks)

b. Define short circuit ratio. What is the relation between short circuit ratio and synchronous reactance? (04 Marks)

c. List the advantages and disadvantages of synchronous impedance method of computing the regulation. (04 Marks)

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CBCS Scheme

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15EE34

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Analog Electronics Circuits

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Explain the different biasing circuits of BJT, for each circuit find an expression for stability factor. Also describe how to find the Q point of the circuit. **(09 Marks)**

b. Draw the circuit of voltage divider bias. Take the circuit parameters as, $V_{CC} = 10$ V, $R_2 = 17$ KΩ, $R_1 = 83$ KΩ, $R_C = 2$ KΩ, $R_E = 0.5$ KΩ, find Q point and terminal voltages. The transistor has $\beta = 100$ and $V_{BE} = 0.7$ V. **(07 Marks)**

OR

2 a. Explain the operation of transistor as a switch with the help of neat circuit diagram and waveforms. Also enumerate the design procedure. **(08 Marks)**

b. For the following circuit, find the Q point, **(08 Marks)**

Take $V_{CC} = 10$ V, $R_C = 1$ KΩ, $R_E = 0.5$ KΩ, $\beta = 50$, $V_{BE} = 0.7$ V

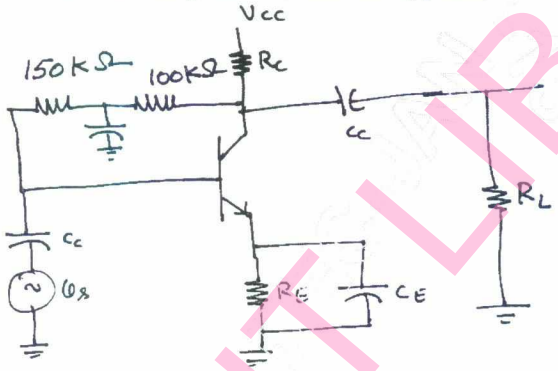
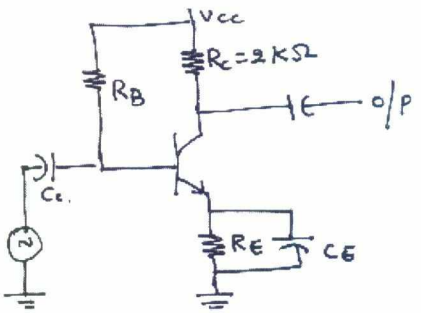


Fig. Q2 (b)

Module-2

3 a. Draw the circuit of emitter follower with voltage divider biasing and derive expressions for current gain, voltage gain input and output impedances. **(08 Marks)**

b. For the following circuit find current gain, voltage gain, input and output impedances. **(08 Marks)**



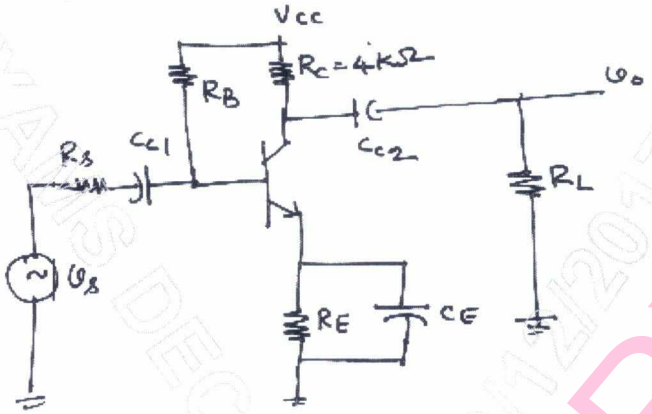
$R_B = 10$ KΩ
$h_{ie} = 1$ KΩ
$h_{re} = 10^{-4}$
$h_{fe} = 100$
$h_{oe} = 12$ μ℧

Fig. Q3 (b)

OR

4 a. With neat diagrams derive expressions for Miller capacitances (C_{MI} and C_{MO}). **(08 Marks)**

b. For the following circuit find the lower cut-off frequency, **(08 Marks)**



$R_B = 10\ K\Omega$
$R_L = 4\ K\Omega$
$R_E = 1\ K\Omega$
$R_S = 2\ K\Omega$
$h_{ie} = 1\ K\Omega$
$h_{fe} = 100$
$C_{C1} = 0.1\ \mu F$
$C_{C2} = 0.2\ \mu F$
$C_E = 47\ \mu F$

Fig. Q4 (b)

Module-3

5 a. Two amplifiers are cascaded. The load resistance $R_L = 20\ K\Omega$ and internal resistance of the voltage source is 2 KΩ. Find the

(i) Loaded voltage gain of each stage.
(ii) Total voltage gain of cascaded amplifier with R_S.
(iii) Current gain of cascaded amplifier.
(iv) Output impedance.

The first stage bias No load voltage gain = 1, Input impedance = 500 KΩ, Output impedance = 1 K, The second stage has a no load voltage gain of 300, input impedance of 1 KΩ and output impedance of 50 KΩ **(08 Marks)**

b. With neat diagrams explain cascade amplifier. **(08 Marks)**

OR

6 a. Derive suitable expression to explain the effect of negative feedback on, (i) Gain stability (ii) Distortion in amplifier. **(08 Marks)**

b. The open loop gain of an amplifier is subjected to variation of ±10% due to changes in temperature. Using such an amplifier design a feedback amplifier such that the closed loop gain of the amplifier is 150±1%. Find the value of open loop gain of the amplifier and feedback factor. **(08 Marks)**

Module-4

7 a. Draw the circuit of class-A transformed amplifier and explain its operation. Derive an expression for maximum efficiency of conversion with the help of neat waveforms. **(08 Marks)**

b. A transistor amplifier has zero signal collector current of 40 mA. When an a.c. source is connected, the dc collector current is 50 mA. The peak fundamental current in collector is 30 mA. Find second harmonic distortion and output ac power. **(08 Marks)**

OR

8 a. Draw the circuit of Wien bridge oscillator and explain its operation. Also derive an expression for frequency of oscillation. **(10 Marks)**

b. Explain with neat circuit diagram, the operation of crystal oscillator and write the expression for frequency of oscillation. **(06 Marks)**

Module-5

9 a. With neat diagrams, explain the construction, working and static characteristics of n-channel JFET. **(08 Marks)**

b. Draw the circuit of common source amplifier with bypass capacitor and derive an expression for voltage gain and output impedance. **(08 Marks)**

OR

10 a. With the help of neat diagrams, explain the construction, working and characteristics of n-channel depletion MOSFET. **(08 Marks)**

b. A common source amplifier without bypass capacitor has $R_D = 2\,K\Omega$, $R_S = 1\ K\Omega$, $R_G = 1\ M\Omega$, find voltage gain and output impedance $g_m = 2m\,\mho$. **(08 Marks)**

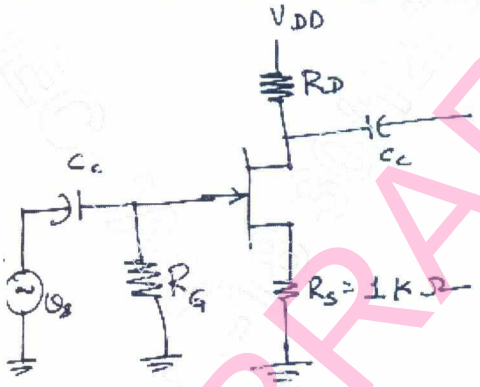


Fig. Q10 (b)

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CBCS Scheme

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15EE35

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Digital System Design

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. With basic block diagram, explain the combinational logic circuit. **(04 Marks)**

b. Reduce the following function using K-map technique and implement using basic gates

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

ii) $f(A, B, C, D) = \pi M(0, 2, 4, 10, 11, 14, 15)$ **(12 Marks)**

OR

2 a. Simplify using the Quine-Mcclusky minimization technique.
$Y = f(a, b, c, d) = \sum m(0, 2, 8, 10)$ **(08 Marks)**

b. Simplify the given function using MEV technique.
$f(a, b, c, d) = \sum(2, 3, 4, 5, 13, 15) + \sum d(8, 9, 10, 11)$. **(08 Marks)**

Module-2

3 a. With the aid of general structure, clearly distinguish between a decoder and encoder. **(05 Marks)**

b. Implement following multiple output function using one 74LS138 and external gates.
$F_1(A, B, C) = \sum m(1, 4, 5, 7)$
$F_2(A, B, C) = \pi M(2, 3, 6, 7)$ **(06 Marks)**

c. Draw the interfacing diagram of ten keypad interface to a digital system using decimal to BCD encoder (IC 74LS147: Decimal to BCD priority encoder). **(05 Marks)**

OR

4 a. Design a full adder by constructing the truth table and simplify the output equations. **(06 Marks)**

b. Write a truth table for two-bit magnitude comparator. Write the Karnaugh map for each output of two bit magnitude comparator and the resulting equation. **(10 Marks)**

Module-3

5 a. What is the difference between a flip-flop and a latch? With logic diagram and truth table, explain the operation of gated SR latch. **(08 Marks)**

b. Explain the operation of Master slave JK Flip-flop along with its circuit diagram. **(08 Marks)**

OR

6 a. Explain the working principle of four bit binary ripple counter, with the help of a logic diagram, timing diagram and counting sequence. **(10 Marks)**

b. With logic diagram and counting sequence explain Mod – 4 ring counters. **(06 Marks)**

Module-4

7 a. Distinguish between Moore and Mealy model with necessary block diagrams. **(08 Marks)**

b. Give output function, transition table and state diagram by analyzing the sequential circuit shown in Fig. Q7(b). **(08 Marks)**

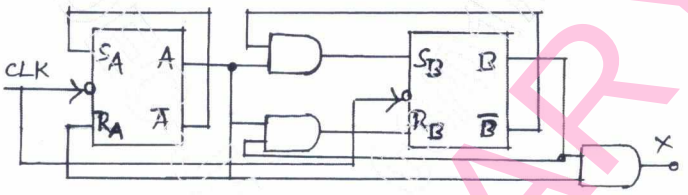

Fig. Q7(b)

OR

8 a. Write the basic recommended steps for the design of a clocked synchronous sequential circuit. **(06 Marks)**

b. Design a synchronous counter using J-K flip flops to count the sequence 0, 1, 2, 4, 5, 6, 0, 1, 2. Use state diagram and state table. **(10 Marks)**

Module-5

9 a. Explain brief history of HDL and structure of HDL module. **(06 Marks)**

b. List the classification of VHDL data types. Compare the VHDL data types and Verilog data types. **(10 Marks)**

OR

10 a. Explain signal declaration and signal assignment statements with relevant example. **(06 Marks)**

b. Write a data flow description VHDL for a system that has three 1-bit inputs a (1), a(2) and a(3) one 1-bit output b. The least significant bit is a(1) ; and b is 1, only when (a(1) a(2) a(3)) = 1, 3, 6 or 7 (all in decimal) otherwise b is 0. Derive a minimized Boolean function of the system and write the data flow description. **(10 Marks)**

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CBCS Scheme

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15EE36

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. All symbols and anonyms have their usual meaning.

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.

Module-1

1 a. Derive the dimensions of the following quantities with mass, length, time and current as the fundamental units :
i) Inductance ii) Capacitance iii) Electric Flux iv) Resistance v) Resistivity. **(06 Marks)**

b. Illustrate with neat sketch, Kelvin double bridge to measure the internal resistance of an ammeter accurately. **(06 Marks)**

c. The Thevenin's equivalent voltage of a Wheatstone bridge is 25mV and the galvanometer current is 20μA. The resistance of the galvanometer is 50Ω. The ratio arms have resistances of 1000Ω and 5000Ω respectively. Find the value of the standard resistance for which the above conditions are satisfied. The value of the resistance to be measured is 600Ω. **(04 Marks)**

OR

2 a. Discuss the fall of potential method of measurement of earth resistance. **(04 Marks)**

b. With the neat circuit diagram, describe the operation of Maxwell Wein Bridge. List its merits and demerits. **(06 Marks)**

c. Discuss the method of determining capacitance and dissipation factor using how voltage Schering bridge. **(06 Marks)**

Module-2

3 a. Discuss the errors and their compensating techniques used in dynamometer type Wattmeter. **(05 Marks)**

b. Discuss the constructional features and working principle of rotating type phase sequence indicator. **(06 Marks)**

c. A three phase induction motor draws a power input at a voltage of 250V, 20A and 0.8 power factor lag. Find percentage error in Wattmeter reading if :
i) Pressure coil is on supply side
ii) Current coil is on supply side
Assume current coil resistance and pressure coil resistance = 0.2 Ω and 5000Ω. **(05 Marks)**

OR

4 a. Discuss the construction and working principle of electrodynamometer type single phase power factor meter. **(06 Marks)**

b. Explain the errors in a LPF wattmeter and give the adjustments done to compensate for the errors. **(05 Marks)**

c. Explain the working principle of Weston frequency meter. **(05 Marks)**

Module-3

5 a. Discuss the procedure used to extend the range of DC ammeter and DC volt meter using shunts and multipliers. **(07 Marks)**

b. Describe the operation of a current transformer using a phasor diagram. Differentiate a current transformer from a potential transformer. **(09 Marks)**

OR

6 a. A moving coil instrument has a resistance of 50hm and gives a full scale reading of 50mA. Calculate :

i) The shunt resistance required to increase the range to 200A

ii) The series resistance required to use it as a voltmeter of range 0 – 750V

iii) Power consumed in both the cases. **(09 Marks)**

b. Describe the operation of potential transformer using equivalent circuit and phasor diagram. **(07 Marks)**

Module-4

7 a. Using a block diagram schematic, explain the working of an electronic energy meter. List the drawbacks of traditional energy meter. **(08 Marks)**

b. With a neat sketch explain the working of the following :

i) True rms reading voltmeter

ii) Q meter. **(08 Marks)**

OR

8 a. With neat sketch, explain the working of the following :

i) Integrating type DVM **(08 Marks)**

ii) Ramp type DVM. **(08 Marks)**

b. Explain the working of electronic multimeter.

Module-5

9 a. With a neat sketch explain the working of cathode ray tube. **(08 Marks)**

b. With a neat sketch explain the working of the following :

i) LED display

ii) LCD display. **(08 Marks)**

OR

10 a. With appropriate sketch explain the working of strip chart recorder. **(08 Marks)**

b. Write short notes on the following :

i) X – Y recorders

ii) LVDT type recorder. **(08 Marks)**

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CBCS SCHEME

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15MATDIP31

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Express complex numbers $\frac{(5-3i)(2+i)}{4+2i}$ in the form a + ib. **(06 Marks)**

b. If $x = \cos\theta + i\sin\theta$, then show that $\frac{x^{2n}-1}{x^{2n}+1} = i\tan\theta$ **(05 Marks)**

c. Prove that the area of the triangle whose vertices are A, B, C is $\frac{1}{2}[B\times C + C\times A + A\times B]$. **(05 Marks)**

OR

2 a. Find the cube root of $\sqrt{3} + i$. **(06 Marks)**

b. Find the modulus and amplitude of $\frac{3+i}{2+i}$ **(05 Marks)**

c. Prove that the vectors $i - 2j + 3k$, $-2i + 3j - 4k$ and $i - 3j + 5k$ are coplanar. **(05 Marks)**

Module-2

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

b. If $y = e^{a\sin^{-1}x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$ **(05 Marks)**

c. If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$. **(05 Marks)**

OR

4 a. Find the pedal equation $r = a(1 + \cos\theta)$. **(06 Marks)**

b. Expand $\tan x$ in ascending powers of x. **(05 Marks)**

c. If $u = x + y + z$, $v = y + z$, $w = z$ then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ **(05 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi/2}\sin^n x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^a \frac{x^3}{\sqrt{a^2-x^2}}dx$. **(05 Marks)**

c. Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$ **(05 Marks)**

OR

6 a. Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2yz\,dx\,dy\,dz$ **(06 Marks)**

b. Evaluate $\int_0^{\pi/6} \cos^4 3x\,dx$. **(05 Marks)**

c. Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}}\,dx$. **(05 Marks)**

Module-4

7 a. A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the velocity and acceleration at $t = 1$ in the direction $i - 3j + 2k$. **(06 Marks)**

b. Find the unit vector normal to the surface $x^2 - y^2 + z = 2$ at the point $(1, -1, 2)$. **(05 Marks)**

c. Show that the vector $f = (2x - 5y)i + (x - y)j + (3x - z)k$ is a solenoidal. **(05 Marks)**

OR

8 a. If $f(x, y, z) = 3x^2y - y^3z^2$ then find grad f at the point $(1, -2, -1)$. **(06 Marks)**

b. Evaluate (i) div R, (ii) curl R, if $R = xi + yj + zk$. **(05 Marks)**

c. Find a, if $(axy - z^2)i + (x^2 + 2yz)j + (y^2 - axz)k$ is an irrotational vector. **(05 Marks)**

Module-5

9 a. Solve $(x^2 + y^2)dx + 2xydy = 0$ **(06 Marks)**

b. Solve $(e^x + 1)\cos x\,dx + e^y \sin x\,dy = 0$ **(05 Marks)**

c. Solve $(1 + xy)ydx + (1 - xy)xdy = 0$ **(05 Marks)**

OR

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

b. Solve $(x + 2y^3)\frac{dy}{dx} = y$ **(05 Marks)**

c. Solve $(1 + e^{x/y})dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$ **(05 Marks)**

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