CBCS SCHEME

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15MAT31

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. An alternating current after passing through a rectifier has the form, $I = \begin{cases} I_0 \sin x & \text{for } 0 < x < \pi \\ 0 & \text{for } \pi < x < 2\pi \end{cases}$

where I_0 is the maximum current and the period is 2π. Express I as a Fourier series. **(08 Marks)**

b. Determine the constant term and the first cosine and sine terms of the Fourier series expansion of y from the following data: **(08 Marks)**

x^0	0	45	90	135	180	225	270	315
y	2	1.5	1	0.5	0	0.5	1	1.5

OR

2 a. Obtain the Fourier series expansion of the function, $f(x) = |x|$ in $(-\pi, \pi)$ and hence deduce that,

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{\pi^2}{8}$$ **(06 Marks)**

b. Find the Fourier series expansion of the function,

$$f(x) = \begin{cases} \pi x & \text{in } 0 \le x \le 1 \\ \pi(2-x) & \text{in } 1 \le x \le 2 \end{cases}$$ **(05 Marks)**

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

t(sec)	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
A(amplitude)	1.98	1.30	1.05	1.3	−0.88	−0.25	1.98

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

Module-2

3 a. Find the complex Fourier transform of the function $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$. Hence evaluate

$$\int_0^\infty \frac{\sin x}{x} dx .$$ **(06 Marks)**

b. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$. **(05 Marks)**

c. Compute the inverse z-transforms of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$. **(05 Marks)**

OR

4 a. Find the z-transform of $e^{-an}n + \sin n\frac{\pi}{4}$. **(06 Marks)**

b. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ using z-transform. **(05 Marks)**

c. Find the Fourier cosine transform of, $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4 - x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$. **(05 Marks)**

Module-3

5 a. Find the Correlation coefficient and equations of regression lines for the following data:

x	1	2	3	4	5
y	2	5	3	8	7

(06 Marks)

b. Fit a straight line to the following data:

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

(05 Marks)

c. Find a real root of the equation $xe^x = \cos x$ correct to three decimal places that lies between 0.5 and 0.6 using Regula-falsi method. **(05 Marks)**

OR

6 a. The following regression equations were obtained from a correlation table.
$y = 0.516x + 33.73$
$x = 0.516y + 32.52$
Find the value of (i) Correlation coefficient (ii) Mean of x's (iii) Mean of y's. **(06 Marks)**

b. Fit a second degree parabola to the following data:

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

(05 Marks)

c. Use Newton-Raphson's method to find a real root of $x\sin x + \cos x = 0$ near $x = \pi$, carry out three iterations. **(05 Marks)**

Module-4

7 a. The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in °C and P is the percentage of lead in the alloy:

P%	60	70	80	90
t	226	250	276	304

Find the melting point of the alloy containing 84% of lead, using Newton's interpolation formula. **(06 Marks)**

b. Apply Lagrange's interpolation formula to find a polynomial which passes through the points $(0, -20)$, $(1, -12)$, $(3, -20)$ and $(4, -24)$ **(05 Marks)**

c. Find the approximate value of $\int_0^{\frac{\pi}{2}} \sqrt{\cos\theta}\, d\theta$ by Simpson's $\frac{3}{8}^{th}$ rule by dividing it into 6 equal parts. **(05 Marks)**

OR

8 a. From the following table :

x°	10	20	30	40	50	60
cos x	0.9848	0.9397	0.8660	0.7660	0.6428	0.5

Calculate $\cos 25^\circ$ using Newton's forward interpolation formula. **(06 Marks)**

b. Use Newton's divided difference formula and find f(6) from the following data:

x :	5	7	11	13	17
f(x) :	150	392	1452	2366	5202

(05 Marks)

c. Evaluate $\int_0^1 \frac{dx}{1+x}$ using Weddle's rule by taking equidistant ordinates. **(05 Marks)**

Module-5

9 a. Find the area between the parabolas $y^2 = 4x$ and $x^2 = 4y$ with the help of Green's theorem in a plane. **(06 Marks)**

b. Solve the variational problem $\delta\int_0^1 (12xy + y'^2)dx = 0$ under the conditions $y(0) = 3$, $y(1) = 6$. **(05 Marks)**

c. Prove that the shortest distance between two points in a plane is along the straight line joining them. **(05 Marks)**

OR

10 a. A cable hangs freely under gravity from the fixed points. Show that the shape of the curve is a catenary. **(06 Marks)**

b. Use Stoke's theorem to evaluate for $\vec{F} = (x^2 + y^2)i - 2xyj$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$. **(05 Marks)**

c. Evaluate $\iint_S (yzi + zxj + xyk).\hat{n}ds$ where S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ in the first octant. **(05 Marks)**

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15EE32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Find 'I_a' shown in the circuit in Fig Q1(a) using mesh analysis. **(08 Marks)**

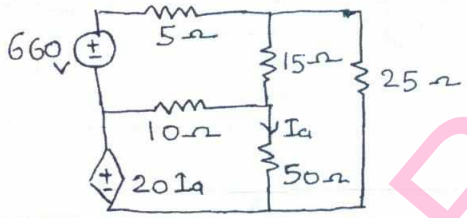

Fig Q1(a)

b. Find the I_x in the circuit show in Fig Q1(b) using source transformation.

Fig Q1(b) **(08 Marks)**

OR

2 a. Find V_1 in the circuit shown in Fig Q2(a) using node analysis,. When V_2 = 20 volts.

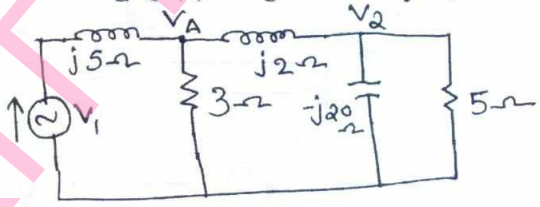

Fig Q2(a) **(06 Marks)**

b. A series RLC circuit consist of R = 50Ω, L = 0.2H, C = 10μF, with an applied voltage of 20V. Determine resonant frequency half power frequencies, Q – factor and B.W of the circuit. **(05 Marks)**

c. Find the current I in the circuit show in Fig Q2(c). Using star delta transformation. **(05 Marks)**

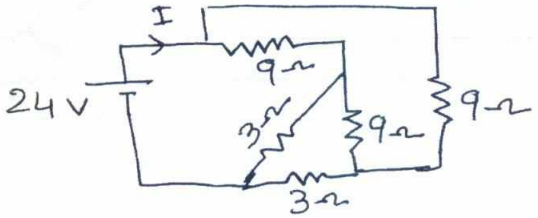

Fig Q2(c)

Module-2

3 a. State maximum power transfer theorem. **(03 Marks)**

b. For the circuit shown in Fig Q3(b). Find current 'I' using super position theorem. **(05 Marks)**

c. Find V_x in the circuit shown in Fig Q3(c) and hence verify reciprocity theorem.

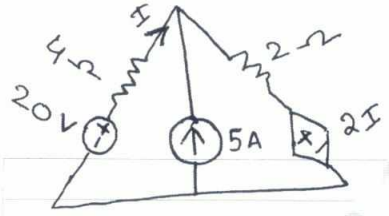

Fig Q3(b)

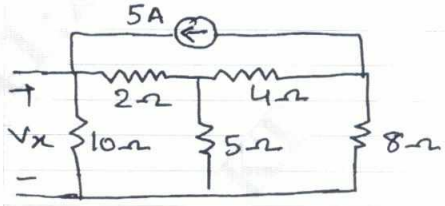

Fig Q3(c) **(08 Marks)**

OR

4 a. For the circuit shown in Fig Q4(a) obtain the Thevnin's equivalent across A – B.

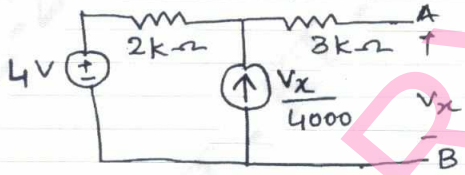

Fig Q4(a) **(06 Marks)**

b. Find I using Millman's theorem for the network shown in Fig Q4(b).

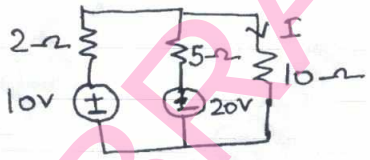

Fig Q4(b) **(04 Marks)**

c. Find the value of i_b in the Fig Q4(c) using Norton's theorem.

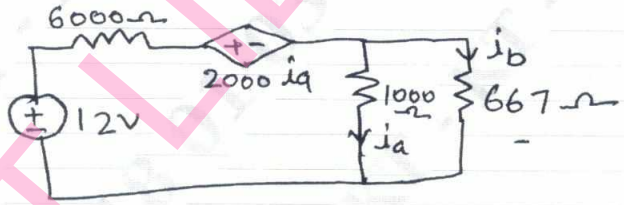

Fig Q4(c) **(06 Marks)**

Module-3

5 a. On the circuit shown in Fig Q5(a). the switch 'S' removed from a to b at t = 0. Find i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$ steady state is achieved when switch is at a. **(08 Marks)**

b. In the circuit shown in Fig Q 5(b) switch K is opened at t = 0. Find the value of V_1 $\frac{dv}{dt}$, $\frac{d^2v}{dt^2}$ at $t = 0^+$. **(08 Marks)**

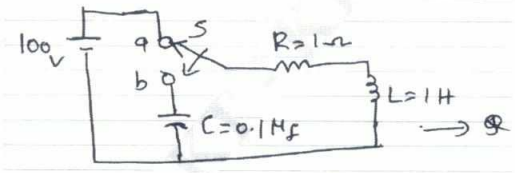

Fig Q5(a)

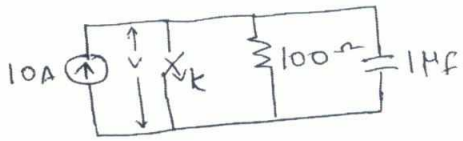

Fig Q5(b)

OR

6 a. In the circuit shown Fig Q6(a) determine the complete solution of current when switch is closed at t = 0. **(08 Marks)**

b. In the circuit sown in Fig Q6(b). Determine $V_a(0^-)$, $V_a(0^+)$ at t = 0. Steady state is reached with switch open. **(08 Marks)**

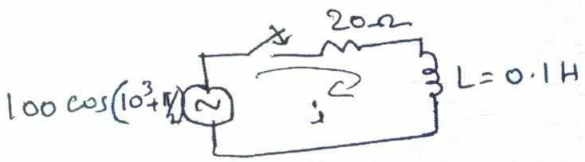

Fig Q6(a)

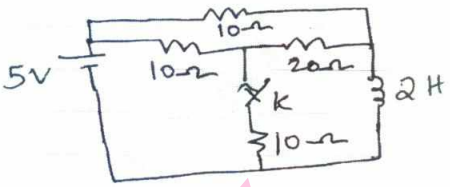

Fig Q6(b)

Module-4

7 a. Use initial and final value theorem to find F(0) and F(α)

$$F(s) = \frac{s^3 + 7s^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}.$$ **(04 Marks)**

b. State and prove initial value theorem and final value theorem. **(06 Marks)**

c. Obtain the Laplace transform of the function shown in Fig Q7(c) **(06 Marks)**

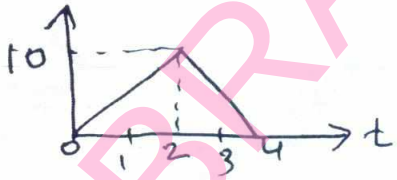

Fig Q7(c)

OR

8 a. Derive the Laplace transform of a periodic signal. **(08 Marks)**

b. Obtain the Laplace transform of the given wave form in Fig Q8(b). **(08 Marks)**

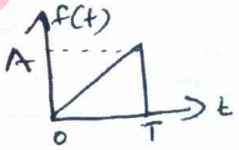

Fig Q8(b)

Module-5

9 a. A three phase, 400V, 4 wire system has a star connected load with $Z_A = (10 + j0)\Omega$, $Z_B = (15 + j10)\Omega$, $Z_c = (0 + j5)\Omega$. Find the line currents and current through neutral wire. **(06 Marks)**

b. Define Z and Y parameters. **(04 Marks)**

c. Find z parameters for the circuit in Fig Q9(c).

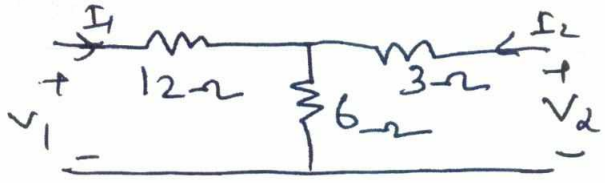

Fig Q9(c) **(06 Marks)**

OR

10 a. Find $V_c(t)$ in the circuit shown in Fig Q10(a) assuming zero initial condition. **(08 Marks)**

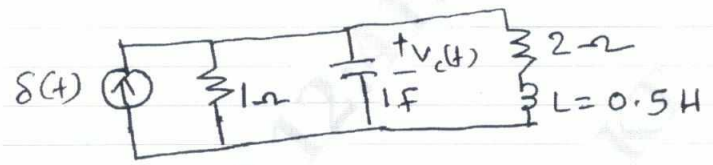

Fig Q10(a)

b. The pole – zero plot for an R-L-C circuit, driving point admittance, is as shown in Fig Q10(b). Find the values of R, L ,C. **(08 Marks)**

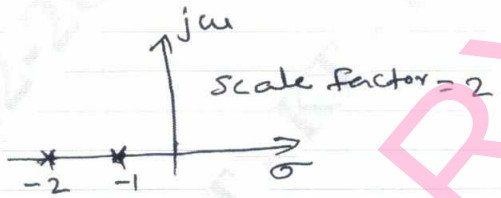

Fig Q10(b)

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15EE33

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Assume Missing data any

Module-1

1 a. With the help of phasor diagram, explain the operation of practical transformer on load. **(08 Marks)**

b. A 3-phase 1000KVA, 6600/1100V transformer is delta connected on primary and star connected on secondary. The primary resistance/ph is 1.8Ω and secondary resistance/ph is 0.025Ω. Find the efficiency when secondary is supplying full load at 0.8p.f and the iron loss is 15kN. Also determine efficiency on full load unity p.f. **(08 Marks)**

OR

2 a. Explain star zig – zag – star and open delta connection with the help of connection diagram and phasor diagram. Mention its advantages applications. **(10 Marks)**

b. The parameters of 10KVA, 500/250V, 50Hz , single – phase transformer are as follows :

Primary resistance = 0.2Ω Primary reactance = 0.4Ω
Secondary resistance = 0.5Ω Secondary reactance = 0.1Ω

Exciting circuit resistance and reactance are 1500Ω and 750Ω respectively. Find out results of O.C and S.C test. **(06 Marks)**

Module-2

3 a. What is the need for parallel operation of transformer? Mention the conditions to be satisfied for parallel operation and explain. **(08 Marks)**

b. An autotransformer is used to supply a resistive load of 5kW at 400V. Supply voltage is 440V. Neglecting the losses calculate the currents in various parts of the winding. Find the percentage of copper saving effected due to use of the autotransformer instead of equivalent two winding transformer. **(08 Marks)**

OR

4 a. With a neat diagram, explain the construction and operation of on load tap changer for transformer. **(08 Marks)**

b. Two transformers gave the followings test results: with the LV side shorted, transformer A takes current of 10A at 200V, power input is 1000W. Similarly transformer B takes 30A at 200V; the power input is 1500W. On open circuit both transformers gave a secondary voltage of 2200V when 11KV is applied to the primary terminals. These terminals of the two transformers are connected in parallel. Calculate the load shared by each transformer. **(08 Marks)**

Module-3

5 a. Explain the current in rush phenomenon in transformer. **(04 Marks)**

b. With neat diagram, explain the commutation process in DC machines. **(06 Marks)**

c. A 4- pole, 3 – phase, 50Hz star connected alternator has 60 slots, with 4 conductors per slot. The coils are short pitched by 3 slots. If the phase spread is 60°, find the line voltage induced for a flux per pole of 0.943 wb, sinusoidally distributed in space. All the turns per phase are in series. **(06 Marks)**

OR

6 a. With a neat diagram, explain how sumpnesis test is used to find efficiency and voltage regulation of a transformer? **(06 Marks)**

b. A 4 – pole, lap wound armature running at 1400rpm delivers a current of 100A and has 64 conductor segments. The brush width is equal to 1.4 commutator segments and inductance of each armature coil is 0.05mH. Calculate the value of the reactance voltage assuming linear commutation. **(06 Marks)**

c. What are the methods used to reduce the harmonics in alternator? **(04 Marks)**

Module-4

7 a. Explain the effect of variation of excitation of an alternator supplying constant load. **(08 Marks)**

b. A synchronous generator has a direct axis synchronous reactance of 0.8pu and a quadrature axis synchronous reactance of 05pu. It is supplying full load at rated voltage at 0.8 p.g lag. Find the open circuit voltage. **(08 Marks)**

OR

8 a. Explain two reaction theory as applied to synchronous machines. **(08 Marks)**

b. Two identical, three phase star connected alternators, operating in parallel share equally a total load of 1000kW at 6600V and 0.8 power factor lagging. The field of the first generator is excited so that the armature current is 50A lagging. Find

i) Armature current of second machine

ii) The power factor of each machine. **(08 Marks)**

Module-5

9 a. Explain MMF method of determining voltage regulation of an alternator. **(08 Marks)**

b. A 3 – phase, 10KVA, 400V, 50Hz star connected alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5Ω, and synchronous reactance is 10Ω, find the voltage regulation. **(08 Marks)**

OR

10 a. With suitable graphs, explain the capacity curves for an alternator. **(08 Marks)**

b. A 2300V, 50Hz, 3 – phase star connected alternator has an effective armature resistance of 0.2Ω. A field current of 35A produces a current of 150A on short circuit and an open circuit emf 780V (line). Calculate the voltage regulation at 0.8 p.g, lagging and 0.8 leading for the full load current of 25A. **(08 Marks)**

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15EE34

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain diode positive shunt clipper circuit with waveforms and transfer characteristics. **(05 Marks)**

b. What is transistor biasing? Explain emitter bias circuit with relevant circuit and equations. **(06 Marks)**

c. Design a suitable circuit represented by the box shown below, which has input and output waveforms as indicated. **(05 Marks)**

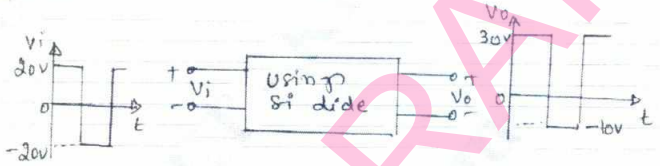

Fig.Q.1(c)

OR

2 a. What is Clamping circuit? Explain the negative clamping circuit with necessary waveforms. **(05 Marks)**

b. Obtain the expression for stability factors $S(I_{CO})$ and $S(V_{BE})$ for fixed bias circuit. **(06 Marks)**

c. For the fixed bias circuit as shown in below Fig.Q.2(c). Assuming $V_{BE} = 0.7V$ and $\beta = 60$. Find: i) I_{BQ}, I_{CQ} and V_{CEQ} ii) V_B and V_C. **(05 Marks)**

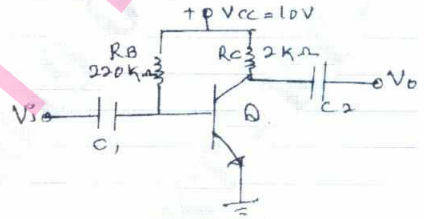

Fig.Q.2(c)

Module-2

3 a. What are the advantages of h-parameters? **(04 Marks)**

b. Obtain an h-parameter equivalent circuit of CB and CE configuration. **(06 Marks)**

c. For the circuit shown below. Determine: i) re ii) Z_i, Z_o, A_v and AI taking $r_o = \infty\Omega$. **(06 Marks)**

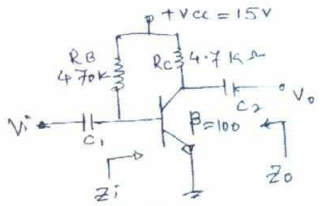

Fig.Q.3(c)

OR

4 a. Explain the law frequency response of single stage RC coupled amplifier. **(08 Marks)**

b. What is Miller effect? Derive the equations for miller input and output capacitance. **(08 Marks)**

Module-3

5 a. What is a cascading amplifier? Obtain the expression for over all voltage gain for 3 stage amplifier. **(06 Marks)**

b. With the help of block diagram, explain the concept of feed back. **(07 Marks)**

c. Write the important characteristics and application of Darlington emitter follower. **(03 Marks)**

OR

6 a. Obtain expression for voltage gain, input impedance and output impedance of a Darlington emitter follower. Draw the necessary equivalent circuit. **(08 Marks)**

b. Write the important advantages of a negative feed back amplifier and show that how band width of an amplifier increases with negative feed back. **(08 Marks)**

Module-4

7 a. Explain the operation of a class B push-pull amplifier and derive its conversion efficiency. **(06 Marks)**

b. With a neat circuit diagram, explain the operation of BJT Colpitt's oscillator. **(05 Marks)**

c. The following distortion readings are available for a power amplifier:
$D_2 = 0.2$, $D_3 = 0.02$, $D_4 = 0.06$ with $I_1 = 3.3A$ and $R_C = 4\Omega$. Calculate: i) THD ii) Fundamental power component (P_1) iii) Total power (P_T). **(05 Marks)**

OR

8 a. Mention the classification of power amplifier and explain series fed class A power amplifier with conversion efficiency. Write its merits and demerits. **(08 Marks)**

b. With a neat circuit diagram, explain the working of series resonant crystal oscillator. A crystal has L = 0.334H, C = 0.065 PF, C_M = 1PF and R = 5.5KΩ. Calculate its series and parallel resonant frequency. **(08 Marks)**

Module-5

9 a. Explain the construction, working and characteristics of n-channel JFET. **(08 Marks)**

b. For the FET amplifier shown below: i) Calculate Z_i and Z_o ii) Calculate A_v. I_{DSS} = 15mA, V_p = -6v, Y_{os} = 25μs. **(05 Marks)**

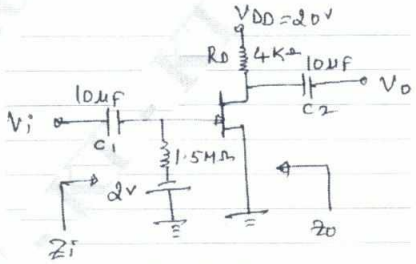

Fig.Q.9(b)

c. Write important characteristics of common-source configuration of JFET. **(03 Marks)**

OR

10 a. Define trans conductance gm and derive an expression for gm. **(06 Marks)**

b. Compare JFET and MOSFET. **(04 Marks)**

c. Explain the operation and characteristic of n-channel MOSFET. **(06 Marks)**

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15EE35

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Define a combinational circuit. With block diagram, explain the steps involved in designing the combinational circuit. **(06 Marks)**

b. Simplify the Boolean function using K-map.
$F(A, B, C, D) = \sum m(0, 4, 5, 8, 12, 13, 16, 20, 21, 24, 28, 29)$ **(06 Marks)**

c. Define the following terms:
i) Maxterm ii) Minterm
iii) Canonical SOP iv) Canonical POS **(04 Marks)**

OR

2 a. Simplify the following function using 3-variable MEV K-map.
$f(A, B, C, D) = \sum m(0, 1, 3, 5, 6, 11, 13) + d(4, 7)$ **(06 Marks)**

b. Simplify the given Boolean function using Quine-McCluskey method.
$f(A, B, C, D) = \sum m(7, 9, 12, 13, 14, 15) + d(4, 11)$ **(10 Marks)**

Module-2

3 a. Design a combinational circuit to convert BCD to Excess-3. **(06 Marks)**

b. Implement the multiple functions
$f_1(a, b, c, d) = \sum m(1, 4, 8, 13)$
$f_2(a, b, c, d) = \sum m(2, 7, 13, 14)$
using two 74138 (3 to 8) decoders. **(06 Marks)**

c. Implement a full adder using 4:1 multiplexed. **(04 Marks)**

OR

4 a. Define magnitude comparator. Design a 4-bit binary comparator and implement with suitable logic gates. **(10 Marks)**

b. Implement the following function
$f(a, b, c, d) = \sum m(0, 2, 6, 10, 11, 12, 13) + d(3, 8, 14)$
using 8:1 multiplexer. **(06 Marks)**

Module-3

5 a. Explain with waveforms a switch de-bouncer using SR latch. **(06 Marks)**

b. Explain the working of Master-Slave S-K flip-flop with the help of logic diagram, functional table, logic symbol. **(06 Marks)**

c. Obtain the characteristic equation for J-K and S-R flip-flops. **(04 Marks)**

OR

6 a. With a neat logic diagram, explain the working of positive edge triggered D-flip-flop. **(06 Marks)**

b. Design a synchronous counter to give a counting sequence 0, 2, 3, 6, 5, 1, 0... using J-K F/F. **(06 Marks)**

c. With the help of a schematic diagram, explain a serial shift register can be transformed into a (i) ring counter (ii) Johnson counter. **(04 Marks)**

Module-4

7 a. Explain Mealy and Moore models of a clocked synchronous sequential circuits. **(06 Marks)**

b. A sequential circuit has one input and one output state diagram is as shown in Fig.Q7(b). Design the sequential circuit with J-K F/F.

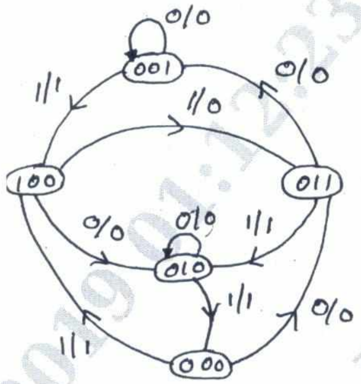

Fig.Q7(b) **(10 Marks)**

OR

8 a. Analyze the sequential circuit shown in Fig.Q8(a). Construct the excitation table, transition table, state table and state diagram for sequential circuit shown in Fig.Q8(a).

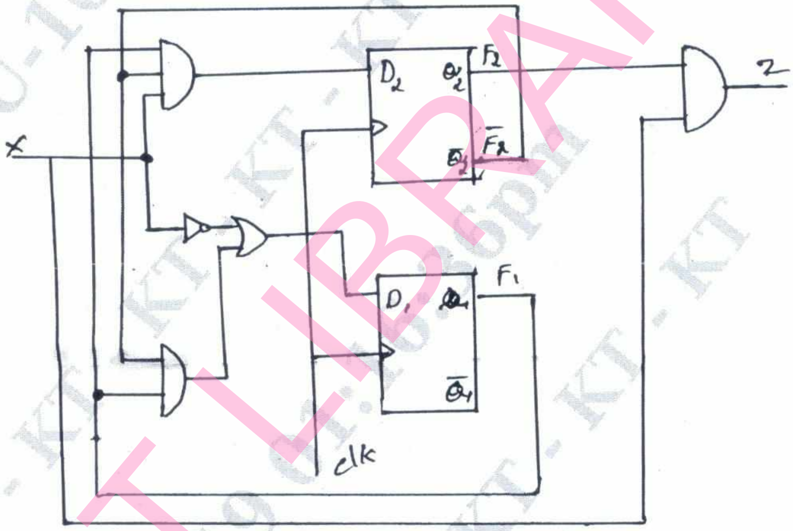

Fig.Q8(a) **(10 Marks)**

b. Write the differences between combinational and sequential circuits. **(06 Marks)**

Module-5

9 a. With general syntax and suitable example, explain the logical and relational operators in VHDL. **(06 Marks)**

b. Explain the various data types available in VHDL. **(10 Marks)**

OR

10 a. What are the different steps used for simulation and synthesis? **(08 Marks)**

b. Mention different styles of descriptions in HDL. Write a short note on behavioral description and also HDL code for half adder using behavioral description. **(08 Marks)**

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CBCS SCHEME

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15EE36

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Electrical and Electronics Measurements

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. The expression for the mean torque of an electrodynamometer type of wattmeter is given by $T_d \propto M^a E^b Z^c$ where M = mutual inductance between fixed and moving coils, E = applied voltage and Z = Impedance of load circuit. Determine the values of a, b, and c using dimensional analysis and write the equation for T_d. **(08 Marks)**

b. Explain the fall of potential method used for the measurement of earth resistance. **(08 Marks)**

OR

2 a. Derive the equations for balance in case of Maxwell's inductance capacitance bridge. Draw the phosor diagram for balance condition. **(08 Marks)**

b. An DC bridge has the following braches :
Arm ab : an unknown impedance (R_1, L_1) in series with a non inductive variable resistor r_1.
Arm bc : a non inductive resistor $R_3 = 100\Omega$
Arm cd : a non inductive resistor $R_4 = 200\Omega$
Arm da : a non inductive resistor $R_2 = 250\Omega$
Arm dc : a non inductive variable resistor r,
Arm ec : lossless capacitor c = 1μF and
Arm be : a detector
An AC supply is connected between a and C. Calculate resistance R_1 and inductance L_1 under balance condition. $r_1 = 43.1\Omega$ and $r = 229.7\Omega$. **(08 Marks)**

Module-2

3 a. Explain the special features incorporated in an electrodynamometer type of wattmeter so that it can be used for low power factor application. **(08 Marks)**

b. Explain how the following adjustments are made in single phase induction type energy meter i) lag adjustment ii) adjustment for friction compensation iii) over load compensation iv) creeping. **(08 Marks)**

OR

4 a. Describe the constructional details and working of a single phase electrodynamometer type of p.f meter. Prove that the special displacement of moving system is equal to the phase angle of the system. **(08 Marks)**

b. Explain the construction and working of Weston type frequency meter. **(08 Marks)**

Module-3

5 a. How is the current range of a PMMC instrument extended with the help of shunts? Describe the method of reducing the errors due to temp charges in the shunt connected equipment. **(08 Marks)**

b. The exciting current of a current transformer is 2A logging 40° to the secondary voltage reversed. The C.T has a bar primary and a nominal ratio of 100/1A. The external burden is 1.5Ω and the resistance of the secondary winding is 0.25Ω. When 1A of current is flowing through the secondary winding, calculate the actual ratio of C.T and its phase angle. **(08 Marks)**

OR

6 a. Describe a method of experimental determination of flues density in a specimen of magnetic material using a ballistae galvanometer. **(08 Marks)**

b. Explain the construction and working of Hopkinson permeametor. **(08 Marks)**

Module-4

7 a. With block diagram, explain the working of true RMS reading voltmeter. **(08 Marks)**

b. With block diagram explain the working of Ramp type DVM. **(08 Marks)**

OR

8 a. Describe the working principle of Q-meter with circuit diagram. **(08 Marks)**

b. With block diagram, explain the working of electronic energy meter. **(08 Marks)**

Module-5

9 With a neat sketches explain the function the following instruments used in electronic devices : i) LED ii) LCD iii) Nixe tubes. **(16 Marks)**

OR

10 a. Explain with a suitable circuit diagram of an x-y recorder mention its advantages and disadvantages. **(08 Marks)**

b. With a neat diagram, explain the construction and working principle of strip chart recorder. **(08 Marks)**

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15MATDIP31

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the modulus and amplitude of $\frac{(3-\sqrt{2}i)^2}{1+2i}$. **(06 Marks)**

b. Find the cube root of $(1-i)$. **(05 Marks)**

c. Prove that $\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = \cos\left(n\frac{\pi}{2}-n\theta\right)+i\sin\left(n\frac{\pi}{2}-n\theta\right)$. **(05 Marks)**

OR

2 a. For any three vector a, b, c show that $\left[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}\right] = 2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ **(06 Marks)**

b. Find the value of λ so that the vectors $\vec{a}=2\hat{i}-3\hat{j}+\hat{k}$, $\vec{b}=\hat{i}+2\hat{j}-3\hat{k}$ and $\vec{c}=\hat{j}+\lambda\hat{k}$ are coplanar. **(05 Marks)**

c. Find the angle between the vectors $\vec{a}=5\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}-3\hat{j}+6\hat{k}$ **(05 Marks)**

Module-2

3 a. Find the n^{th} derivative of $\cos x\cos 2x\cos 3x$. **(06 Marks)**

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

c. Find the angle between the radius vector and tangents for the curve $r^2\cos 2\theta = a^2$ **(05 Marks)**

OR

4 a. If $u = e^{ax+by}+(ax-by)$ prove that $b\frac{\partial u}{\partial x}+a\frac{\partial u}{\partial y}=2abu$. **(06 Marks)**

b. 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)**

c. If $x = u(1-v)$, $y = uv$. Find $\frac{\partial(x,y)}{\partial(u,v)}$. **(05 Marks)**

Module-3

5 a. Obtain the reduction formula for $\int_0^{\frac{\pi}{2}}\cos^n x\,dx$ $(n>0)$. **(06 Marks)**

b. Evaluate $\int_0^1 x^6\sqrt{1-x^2}\,dx$. **(05 Marks)**

c. Evaluate $\int_0^1\int_0^1\int_0^y xyz\,dx\,dy\,dz$. **(05 Marks)**

OR

6 a. Obtain the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$, $n > 0$. **(06 Marks)**

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

c. Evaluate $\int_0^1 \int_0^{\sqrt{x}} xy dy dx$. **(05 Marks)**

Module-4

7 a. A particle moves along a curve $x = e^{-t}$, $y = 2\cos 3t$, $z = 2\sin 3t$ where t is the time. Determine the component of velocity and acceleration vector at t = 0 in the direction of $\hat{i} + \hat{j} + \hat{k}$. **(08 Marks)**

b. Find the value of the constant a, b, such that $\vec{F} = (axy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (bxz^2 - y)\hat{k}$ is irrotational. **(08 Marks)**

OR

8 a. If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ show that $\vec{F} \cdot \text{curl}\vec{F} = 0$. **(06 Marks)**

b. If $\phi(x, y, z) = x^3 + y^3 + z^3 - 3xyz$ find $\nabla\phi$ at (1, −1, 2). **(05 Marks)**

c. Find the directional derivative $\phi(x, y, z) = x^2yz + 4xz^2$ at (1,−2,−1) in the direction of $2\hat{i} - \hat{j} - 2\hat{k}$. **(05 Marks)**

Module-5

9 a. Solve $\frac{dy}{dx} = \frac{y}{x - \sqrt{xy}}$. **(06 Marks)**

b. Solve $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$ **(05 Marks)**

c. $\frac{dy}{dx} - \frac{2y}{x} = x + x^2$. **(05 Marks)**

OR

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

b. Solve $(y^3 - 3x^2y)dx - (x^3 - 3xyz)dy = 0$ **(05 Marks)**

c. Solve $(1 + y^2)dx + (x - \tan^{-1} y)dy = 0$ **(05 Marks)**

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