DECEMBER 2019

EXAMINATION TIME TABLE
PROGRAMME - S.E. (Electronics) (Choice Based)
SEMESTER - III

Days and Dates	Time	Paper Code	Paper
Thursday, November 14, 2019	02:30 p.m. to 05:30 p.m.	51301	APPLIED MATHEMATICS III
Monday, November 18, 2019	02:30 p.m. to 05:30 p.m.	51302	ELECTRONICS DEVICES & CIRCUITS I
Wednesday, November 20, 2019	02:30 p.m. to 05:30 p.m.	51303	DIGITAL CIRCUITS AND DESIGN
Friday, November 22, 2019	02:30 p.m. to 05:30 p.m.	51304	ELECTRICAL NETWORK ANALYSIS AND SYNTHESIS
Tuesday, November 26, 2019	02:30 p.m. to 05:30 p.m.	51305	ELECTRONIC INSTRUMENTS AND MEASUREMENTS

DURATION : 3 HOURS **MAX.MARKS:80**

1) Question No.1 is compulsory
2) Attempt any THREE of the remaining
3) Figures to the right indicate full marks.

Q1

A) Find Laplace transform of $f(t) = \sin^5 t$ 5

B) Prove that $u = x^2 - y^2$ is harmonic function also find corresponding analytic function f(z) 5

C) Find the half range sine series of $f(x) = 2x$ in $(0 , \pi)$ 5

D) Find the Unit normal vector to the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at (2,-1,2) hence find angle between them 5

Q2

A) Prove that $J_{(-3/2)}(x) = -\sqrt{\frac{2}{\pi x}} .(\frac{\cos x}{x} + \sin x)$ 6

B) Find the Bilinear transformation which maps the points $z = 1 , i , -1$ onto the points $w = 0 , 1, \infty$ 6

C) Obtain the fourier series for $f(x) = x\cos x$ in $(-\pi , \pi)$ 8

Q3

A) Find inverse laplace transform of 6

(i) $\log(\frac{1+s^2}{4+s^2})$ (ii) $\frac{s+5}{(s+4)^3}$

B) Show that the of functions {cosx ,cos3x , cos5x ,.....} is an orthogonal over $[0 , \pi/2]$ .Hence construct orthonormal set of functions. 6

C) Prove that $y = \sqrt{x} .J_n(x)$ is a solution of the equation , 8

$x^2 \frac{d^2 y}{dx^2} + (x^2 - n^2 + \frac{1}{4})y = 0$

Q4

A) Prove that $\int x^4 J_1(x)dx = x^4 J_2(x) - 2x^3 J_3(x)$ 6

B) Use Gauss's Divergence theorem to evaluate $\iint_S \bar{N}.\bar{F}ds$ where $\bar{F}$=4xi +3yj -2zk and S is the surface bounded by x=0 ,y=0 ,z= 0 and 2x +2y +z=4 6

C) Solve using Laplace transform(D^2 +2D+1)y =3te^{-t} ,given y(0)=4 and y'(0)=2 8

Q5

A Find Fourier series for 6

f(x)= $\begin{cases} \pi + x\ , & 0 < x < \pi \\ \pi - x\ , & -\pi < x < 0 \end{cases}$

B) Find the image of the region bounded by x+y=0 , x=y , x+y=1 ,x-y=1 under the bilinear transformation w = 2z +2i 6

c) Prove that $\bar{F}$=(y^2cosx + z^3)i+(2ysinx-4)j+(3xz^2+2)k is a conservative field .Find (i)Scalar Potential for $\bar{F}$ (ii) The work done in moving an object in this field from (0 ,1,-1) to($\frac{\pi}{2}$, -1 ,2). 8

Q6

A) Find the Laplace Transform of $e^{-t}\int_0^t sin3ucos2udu$ 6

B) Find Complex form of Fourier Series of sinh2x in (-2 , 2) 6

C) Express the function 8

f(x) ={ $\begin{matrix} 1 & , & |x| < 1 \\ 0 & , & |x| > 1 \end{matrix}$ as Fourier integral .Hence evaluate

$$\int_0^\infty \frac{sinw.coswx}{w}\, dw$$

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[3 Hours] **[Total Marks :-80]**

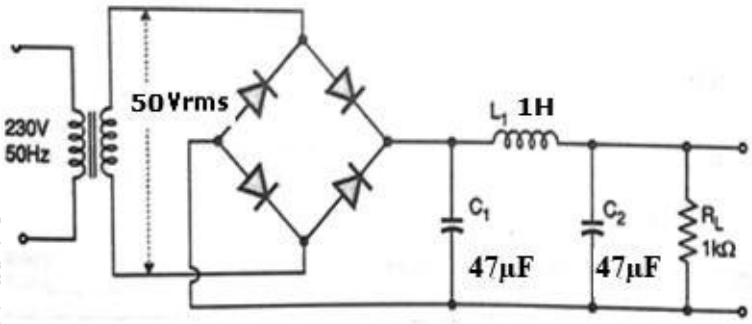
N.B: (1) Question No.1 is compulsory.
(2) Solves any three out of remaining question.
(3) Assume suitable data if necessary.

1. Any four

a Draw characteristics of PN junction in thermal equilibrium and explain. **5**
b. Explain the operation of MOSFET as amplifier. **5**
c. Explain construction, working principle and characteristics of Photodiode. **5**
d. Compare HWR, FWR and Bridge rectifier. **5**
e. Compare Zener and avalanche breakdown **5**

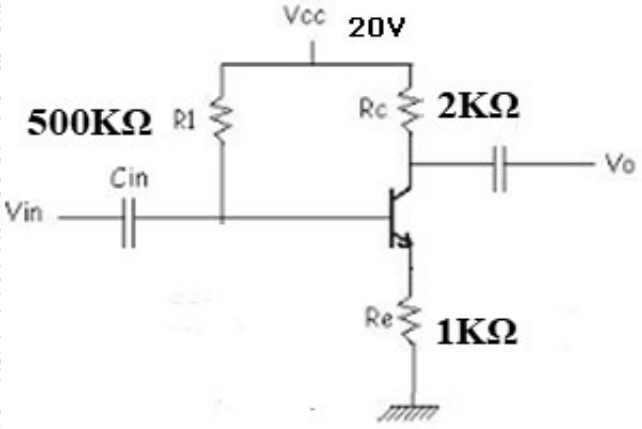
2.

a. Draw and explain positive and negative clamper circuit. **10.**
b. Calculate dc load voltage, an ac ripple in output and ripple factor **10**



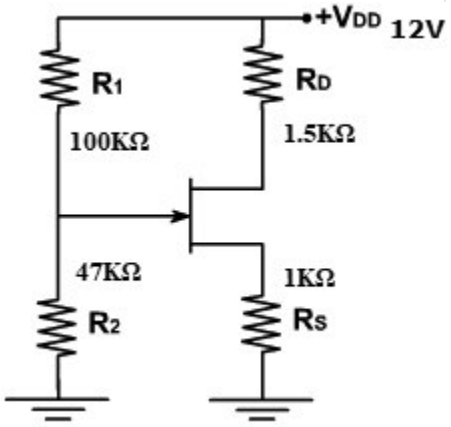
3.

a. Draw and explain VI and CV characteristics of p-channel Enhancement type MOSFET. **10**
b. Find I_B, I_C, V_C, V_E, and V_{CE} for following circuit (β=100). **10**



4

a. Find V_{GSQ}, I_{DQ}, and V_{DSQ} for following circuit. (VP= -4V, IDSS= 6mA) **10**



b. Compare CE,CB and CC amplifiers **10**

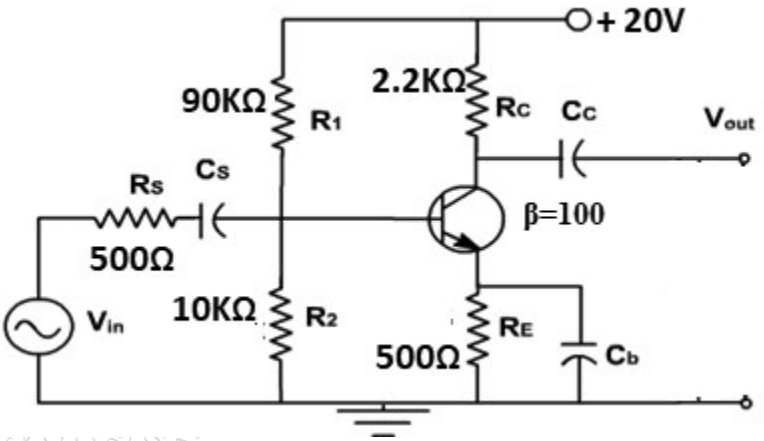
5.

a. Design single stage CE amplifier for $A_V \geq 110$, $V_O$rms= 3 V, h_{FE} =180,h_{fe}=220
h_{ie} = 2.7 KΩ, S≤10, $f_L \leq$ 15Hz $V_{CE\ sat}$ = 0.25V, V_{BE}= 0.7 V. **15**

b) Compare D-MOSFET and E-MOSFET. **05**

6

a. Find Zi, Zo, Av and Avs for following circuit. **10**



b) Compare capacitor, inductor, LC and π filter. **10**

DBEC DATA SHEET

Transistor type	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	$V_{CE}^{(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{EBO} volts d.c.	T_j max °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal h_{fe} min.	Small Signal h_{fe} typ.	Small Signal h_{fe} max.	V_{BE} max.	θ_{jc} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN 055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN 149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

Transistor type	hie	hoe	hre	θja
BC 147A	2·7 K Ω	18µ ℧	1·5 × 10^{-4}	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25µ ℧	3·2 × 10^{-4}	—
BC 147B	4·5 K Ω	30µ ℧	2 × 10^{-4}	0·4°C/mw
ECN 100	50 Ω	—	—	—
ECN 149	15 Ω	—	—	—
ECN 055	12 Ω	—	—	—
2N 3055	6 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
I_{DS} max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
I_{DS} typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	1·7	0·8	0·2	0·0	0·0	0·0	0·0
I_{DS} min. mA	4·0	3·0	2·2	1·6	1·0	0·5	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0

N-Channel JFET

Type	V_{DS} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{mo} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 µ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 µ ℧	2·5	50 KΩ	—	0·59° C/mW

Time: 3 Hrs **Marks: 80**

NB: (1) Question No. 1 is **Compulsory**.
(2) Attempt any **three** questions out of **remaining five**.
(3) Each question carries 20 marks and sub-question carry equal marks.
(4) Assume suitable data if required.

Q.1 Answer Any Four.

a) Convert the decimal number $(175.23)_{10}$ to their octal, hexadecimal, BCD and gray code equivalent. **5m**

b) Prove the following Boolean theorem. **5m**
$(A+\bar{A}B) = (A+B)$

c) Implement CMOS inverter and NOR gate. **5m**

d) Design and implement half subtractor circuit. **5m**

e) Explain various triggering methods and symbols of flip flops. **5m**

Q.2 a) Simplify the logic function using Quine-McClusky method. **10m**
$Y (A, B, C, D) = \Sigma m (0 ,1,2,3,5,7,8,9,11,14)$
b) Design and implement D flip flop using T flip flop and JK flip flop using D flip flop. **10m**

.Q.3 a) Design and implement asynchronous MOD-9 counter using T flip flop. **10m**
b) Draw and explain 5bit comparator using IC 7485. **10m**

Q.4 a) Implement and explain 4-bit BCD adder using IC 7483. **10m**
b) Design and implement the following expression using a single 8:1multiplexer . **10m**
$Y (A, B, C, D) = \Sigma m (0 ,2,3,6,8,9,12,14)$

Q.5 a) Draw and explain master slave JK flip flop with its advantage. Derive characteristics equation and excitation table of JK flip-flop. **10m**
b) Implement and explain 4-bit twisted ring counter. **10m**

Q.6 Write a short note on **any three.** **20m**
a) Hamming code
b) Characteristics of logic families
c) Static and dynamic Hazards
d) Application of flip flop in switch debouncing

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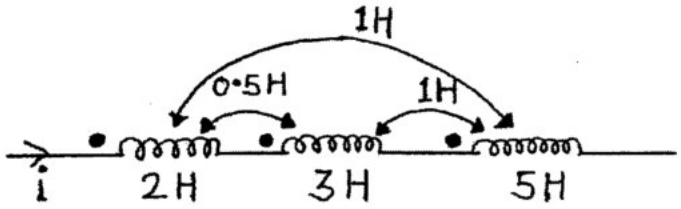
(3 Hours) **Total Marks: 80**

N.B: (1) Question **No. 1** is compulsory.
(2) Attempt any **three questions** from the remaining.
(3) Figures to the right indicate full marks.
(4)Assume suitable data if required.

Q.1) (a) Obtain Y parameters in terms of Z parameters. (5)

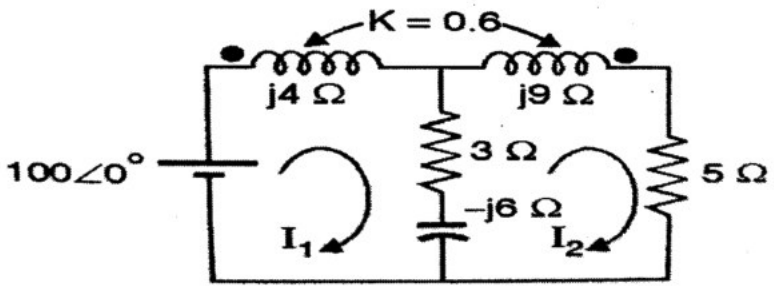
(b) Explain the properties of positive real functions. (5)

(c) Find the equivalent inductance of the network shown. (5)



(d) Explain various types of filters (5)

Q.2) (a) Find currents i_1 and i_2 in the given network using mesh analysis. (10)

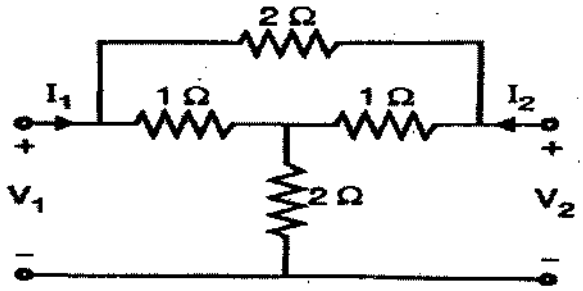


(b) Test whether the following functions are a positive real functions. (10)

(i) $F(S) = \frac{S^4+3S^3+S^2+S+2}{S^3+S^2+S+1}$ (ii) $F(S) = \frac{S^2+4}{S^3+3S^2+3S+1}$

TURN OVER

Q.3) (a) Determine Y parameter of the interconnected network. (10)

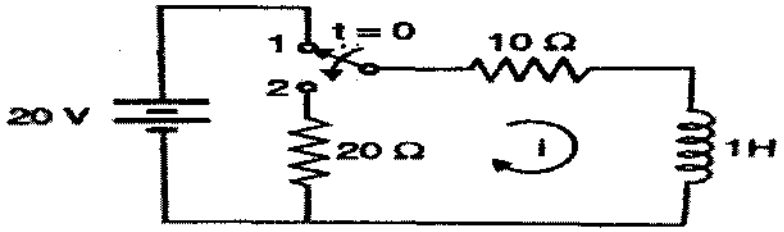


(b) Test whether the following polynomials are Hurwitz polynomials. (10)

(i) $P(s) = S^4+5S^3+5S^2+4S+10$

(ii) $P(s) = 2S^4+5S^3+6S^2+3S+1$

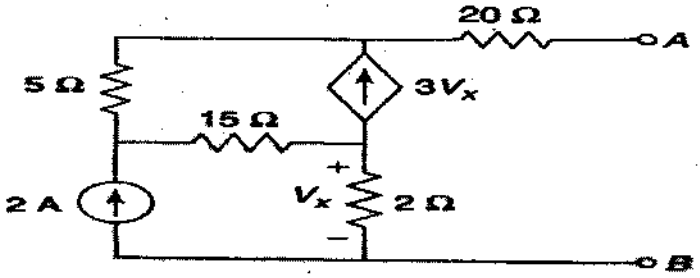
Q. 4) (a) In the circuit given, switch K is changed from position 1 to position 2 at time t=0. Find i , $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at time $t=0^+$. (10)



(b) Determine the Foster forms of realization of the RC impedance function. (10)

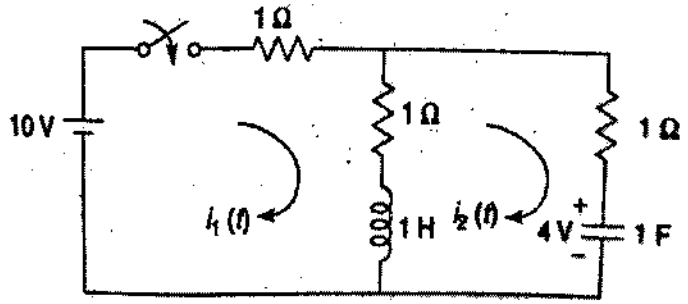
$$Z(s) = \frac{(s+1)(s+3)}{s(s+2)(s+4)}$$

Q.5) (a) Find Norton's equivalent of the following network. (10)

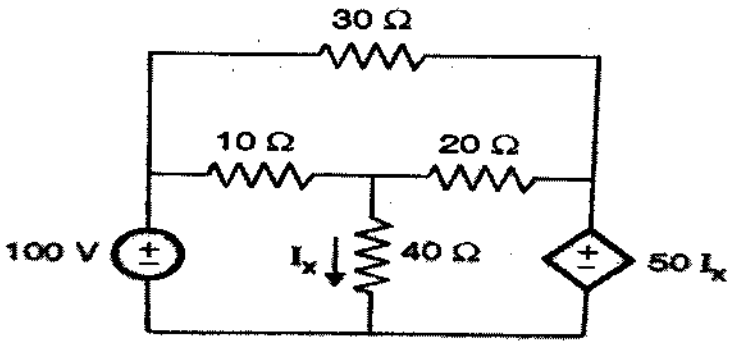


TURN OVER

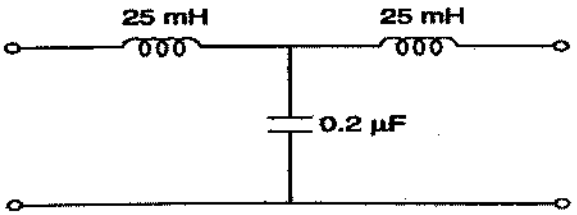
(b) Find the currents $i_1(t)$ and $i_2(t)$ when initial current through the inductor is zero and initial voltage on the capacitor is 4V. (10)



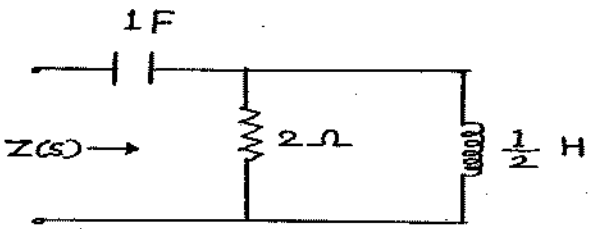
Q. 6) (a) Find current through 20Ω resistor using mesh analysis. (10)



(b) Find the nominal impedance, cut off frequency and pass band for the network. (6)



(c) Find poles and Zeros of the impedance of the following network and plot pole zero diagram. (4)



Time: 03Hours **Marks:80 Marks**

(i) Question **No. 1** is **compulsory** & attempt any **three** out of the remaining **five** questions.
(ii) Assume suitable data if required but justify it logically wherever applicable.
(iii) Figures to the right indicate full marks & every sub-question from Q.2 to Q.6 has equal weightage.

Q. No.	Attempt any **four**	**Marks**
Q1.(a)	The expected value of the voltage across a resistor is 80v.However the measurement gives a value of 79v. Calculate (i) absolute error, (ii) %error, (iii) relative accuracy, and (iv) %accuracy.	**5**
Q1.(b)	Explain Megger Bridge (Mega Ohmmeter) for high resistance measurement with diagram.	**5**
Q1.(c)	Draw block diagram of Dual trace and dual beam CRO.	**5**
Q1.(d)	Define Transducers. List selection criteria of Transducers.	**5**
Q1.(e)	With a neat labelled diagram explain Digital frequency meter.	**5**
Q1.(f)	List various types of Elastic Pressure Transducers and explain any one.	**5**
Q2.(a)	What are the different types of errors in measuring instruments? State the remedies to eliminate errors in the measurements.	**10**
Q2.(b)	Explain the measurement of unknown resistance using Kelvin Double Bridge.	**10**
Q3.(a)	Explain how Lissajous figures are used for measurements of unknown frequency and phase shift using cathode ray oscilloscope.	**10**
Q3.(b)	Draw and Explain the block diagram of Digital storage oscilloscope. List any 4 applications of DSO.	**10**
Q4.(a)	Describe the operation of Successive Approximation type digital voltmeter with a neat block diagram.	**10**
Q4.(b)	With neat labelled block diagram explain the operation of spectrum analyzer	**10**
Q5.(a)	Draw and explain construction and working of Linear Variable Differential Transducer and comment on Residual voltage	**10**

Q5.(b) Draw and explain the construction and working of Dead Weight Tester with labeled diagram. **10**

Q6. (a) Compare RTD, Thermocouple and Thermistor on the basis of the following parameters: **10**
1.Principle of working
2.Characterstics
3.Range
4.Applications
5.Diagram

Q6.(b) You are asked to measure the flow rate in a network of pipes that carry brine (a salt water solution). At first, it seems an easy task to use electromagnetic flow meters since the brine solution being highly conductive, the output signal obtained is proportional to the flow rate. However, on close inspection, you find that due to several issues: including the storage of space and the myriad of piping the flow transducer and only installed in vertical position. The plant supervisor also tells you "it should be such that" simply by looking at flowrate directly on its scale, he can adjust the valve manually and quickly so as to control it. Which flow transducer will you select for such an application? Explain with a neat diagram. **10**

----------*BEST OF LUCK*----------