Sem-III / Choice Based / INST

Paper / Subject Code: 51501 / Applied Mathematics-III / May-2019

Q.P. Code: 25475

Duration : 3 Hours **Max. Marks: 80**

N.B . 1) Question No. 1 is compulsory .

2) Attempt any three questions out of the remaining five questions .

3) Figures to the right indicate full marks .

1. (a) Find the Laplace transform of $t^n(1 + cosh9t.sinh7t)$. 5
   (b) Find the Fourier series for $f(x) = x^2$ in $(-\pi, \pi)$ 5
   (c) Show that the vector $\vec{F} = \frac{-yi + xj}{x^2+y^2}$ is irrotational. 5
   (d) Determine constant a,b,c,d if
   $f(z) = (4x^2 + ay^2 + 8bxy) + i(2cxy + 4dx^2 + 2x^2)$ is analytic. 5

2. (a) Find Fourier transform of $f(x) = \begin{cases} e^{iwx} & a < x < b \\ 0 & x < a \\ 0 & x > b \end{cases}$ 6
   (b) Solve using Laplace transform $(D^3 - 3D - 2)y = 540.t^3.e^{3t}$
   $y(0) = 0 , y'(0) = 0 , y''(0) = 0$. 6
   (c) Find half range cosine series for $cos\alpha x$ in $(0,\pi)$, where α is not an integer and hence show that $\sum_{n=1}^{\infty} \frac{1}{\alpha^2 - n^2} = \frac{\alpha\pi cot\alpha\pi}{1+2\alpha^2}$. 8

3. (a) If $u = (x^2 + y^2 + z^2)$ Prove that Curl(grad u) $= \vec{0}$. 6
   (b) Find Fourier Series for f(x) = $x^2 + 2x$ in $(0 , 2\pi)$. 6
   (c) Evaluate $\int_0^{\infty} e^{-3t} \int_0^t (usinh^2u)^2.cosh5u\, e^{3u}\, du.dt$ 8

4. (a) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$. 6
   (b) By using Stoke's theorem evaluate $\int_C \vec{F}.\vec{dr}$ where
   $\vec{F} = (2x + y)i - 4z^2j - y^2zk$ and C is the boundary of the hemisphere $x^2 + y^2 + z^2 = a^2 , z = 0$. 6
   (c) Find Inverse Laplace transform
   $i) \left\{\frac{5s+3}{s^2+6s+25}\right\}$ $ii) \log\left\{\frac{s^2+16}{s^2+81}\right\}$ 8

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Q.P. Code: 25475

5. a) Define Orthogonal set of functions on (a,b) ,Show that the functions $f_1(x) = 1$, $f_2(x) = 3x$ are orthogonal on (-2,2). Determine the constants P , Q such that $f_3(x) = Px^2 + Qx + 9$ is orthogonal to both $f_1(x)$ & $f_2(x)$ on the same interval . 6

(b) Find the analytic function $f(z) = u + iv$ in terms of Z if $3u - 7v = x^3 + x^2 - 3xy^2 - y^2 - 3yx^2 + y^3 - 2xy$. 6

(c) Verify Green's theorem for $\int_C (4xy - x^2)dx + (2x + 6y^2)dy$, C is the closed curve in the XY-plane bounded by $y = x^2$ and $x = y^2$. 8

6. (a) Find Laplace transform of $f(x) = \begin{cases} sin7t & 0 < t < \pi/2 \\ 2 & \pi/2 < t < \pi \end{cases}$ and $f(t) = f(t + \pi)$. 6

(b) Find the invariant points of the Bilinear transformation $w = \left(\frac{4z-9}{z-2}\right)$,also express it in the normal form. 6

(c) Obtain Complex form of Fourier series for $f(x) = sinhx$ in $(-l, l)$ 8

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[Time: Three Hours] [Marks:80]

N.B:
1. Question.No.1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data wherever necessary.

Q.1o Attempt any four questions. 20

a) Draw the circuit diagram and waveforms for positive and negative clamper circuit.
b) Explain, How BJT can be used as a switch?
c) Describe total harmonic distortion.
d) What input must be applied to the input of Fig.1 to result in an output of 2.4 V?

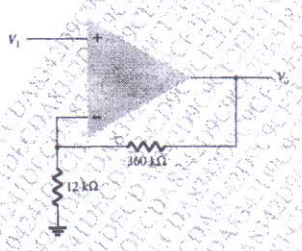

Fig. 1

e) Explain the condition for oscillation using opamp.

Q.2 a) Determine the current I_1, I_2 and I_{D2} for the fig.2 10

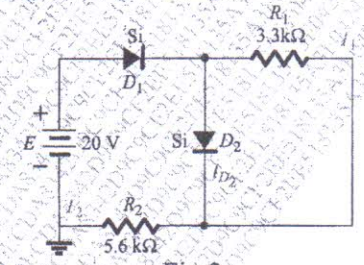

Fig.2

b) Describe how the Centre tapped full wave rectifier works, calculate its output voltage and peak inverse voltage. 10

Q.3 a) Sketch the majority and minority carrier flow for the npn transistor, Describe the resulting carrier motion. What is the source of leakage current. 10

b) For the emitter Bias network, find the parameters (Fig.3): 10
I_B, I_C, V_{CE}, V_C, V_B

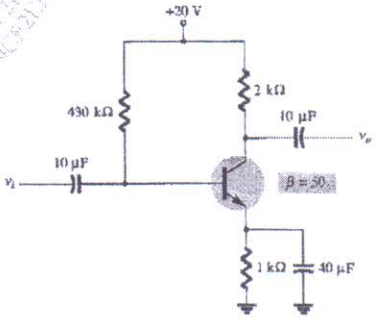

Fig. 3

Q.4 a) Is the relationship between change in V_{GS} and resulting change in I_D is linear or nonlinear, Explain? Describe in your own words why is the input impedance of JFET so high. 10

b) For the network of Fig. 4, the levels of V_{DQ} and I_{DQ} are specified. Determine the required values of R_D and R_S? 10

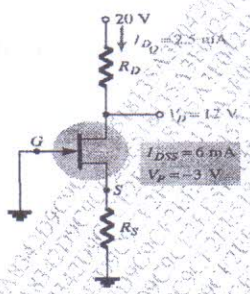

Fig.4

Q.5 a) Determine the output voltage of an op-amp for input voltages of V_{i1} = 200 mV and V_{i2} = 140 mV. The amplifier has a differential gain of A_d = 6000 and the value of CMRR is: i.) 200. ii). 10^5 10

b) Draw and explain the circuit for summation and differentiator using opamp. 10

Q.6 a) Explain class A amplifier with the help of circuit diagrams. 10

b) Derive the expression for 3 opamp Instrumentation amplifier with neat diagram. 10

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Sem III | INST Paper / Subject Code: 51503 / Transducer-I / May - 2019

choice based

Duration: 3 Hours **Total Marks: 80**

Note:
1. **Question one is compulsory.**
2. **Attempt any three from remaining five questions**
3. **Assume suitable data wherever necessary.**

Q1. Attempt any four **20**

a. What is the difference between sensor and transducer?

b. What do you mean by calibration? What is the need of calibration?

c. Explain absolute humidity and relative humidity.

d. Explain liquid level measurement using float and LVDT with appropriate diagram.

e. Explain working of bimetallic thermometer.

Q2. a Draw and explain block diagram of generalized measurement system. **10**

Q2. b Explain the flapper nozzle transducer for displacement measurement and also draw its characteristics. **10**

Q3.a A copper constantan thermocouple was found to have linear calibration between 0 to 500°C with emf at maximum temperature equal to 40.68mv. Reference junction at 20°C. **10**

i) Determine the correction which must be made to indicate emf if the cold junction temperature is 25°C.

ii) If the indicated emf is 8.92mv in the thermocouple circuit. Determine the temperature of hot junction.

Q3.b. Compare RTD, Thermistor and Thermocouple. **10**

Q4.a. Explain construction and working principle of LVDT. **10**

Q4.b. A linear resistance potentiometer is 5cm long and having resistance of 10KΩ. Under normal condition the slider is at center of potentiometer. What will be the displacement when the resistance of potentiometer as measured by bridge circuit is i) 3.8KΩ. and ii) 8.3KΩ. Comment on direction of motion of slider. **10**

Q5.a.	Explain with neat sketch how the capacitance probe can be used for level measurement of non-conducting and conducting liquids.	**10**
Q5.b.	Explain the air purge type level gauge with advantages and disadvantages.	**10**

Q6.	Write a short note on (Any two) :-	**20**
a.	Lead wire compensation in RTD	
b.	Hall Effect Transducer	
c.	Sound Pressure Level)SPL (meter	
d.	Proximity sensors	

SE/Sem - III
INST / Choice Based

 / May-2019

(3 Hours) [Total Marks: 80]

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

1. Answer the following: - [20]
   (a) Convert $(123.091)_{10}$ to Octal and Binary.
   (b) Verify De Morgan's Theorem.
   (c) Convert JK flipflop to T flipflop.
   (d) Design Half Adder circuit.

2. (a) Simplify using K-Map [10]
   i) $Y = \sum m\,(4,5,7,12,14,15) + d\,(3,8,10)$
   ii) $Y = \sum m\,(0,1,2,3,5,7,8,9,11,14)$
   (b) Perform: - i) $(29)_{10} - (33)_{10}$ using 2's complement method. [10]
   ii) $(123)_{16} * (ABC)_{16}$

3. (a) Design 4 bit Binary to Gray code converter. [10]
   (b) Design two-bit magnitude Comparator using logic gates. [10]

4. (a) Design Mod 5 synchronous counter using JK flip- flop. [10]
   (b) Explain with a neat diagram working of SISO shift register. Draw necessary timing diagram. [10]

5. (a) Explain working of static and dynamic RAM cell. [10]
   (b) Design and implement a full subtractor circuit using 3: 8 Decoder. [10]

6. Write note on: - **(Any Four)** [20]
   (a) FPGA.
   (b) Hazards and Hazard elimination.
   (c) Johnson Counter.
   (d) ECL Family.
   (e) Priority Encoder

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INST / Paper / Subject Code: 51505 / Electrical Network and Measurement / May-2019

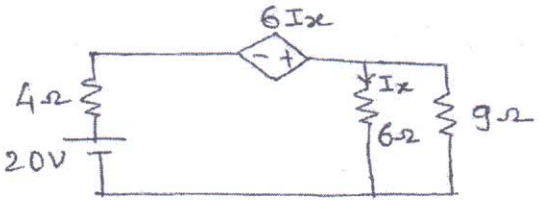
em- III - choice Based

[Time: Three Hours] [Marks:80]

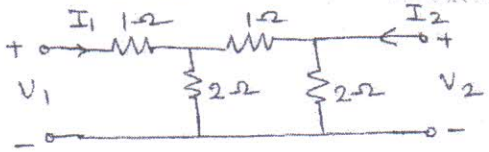
N.B: 1. Question.No.1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data wherever necessary.

1. Attempt the following. (20)

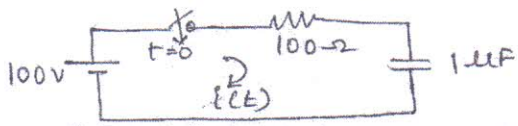
a) Find current in 9Ω resistor of the network.



b) Find Z parameters



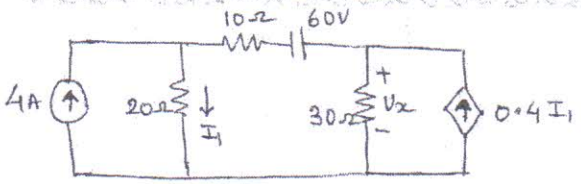
c) Find I and $\frac{di}{dt}$ at $t = 0^+$ with capacitor uncharged and switch is closed at $t = 0$



d) Write the properties of positive real function.

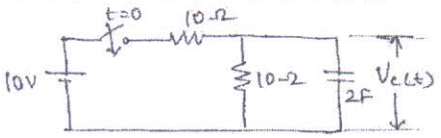
e) Write the working principle of D'Arsonval galvanometer.

2. a) Use superposition theorem to find V_x (10)



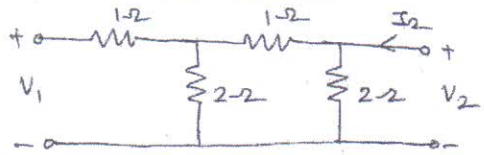
b) Explain the method to measure very high resistance. (10)

3. a) Switch is closed at t = 0. Find $V_c(t)$



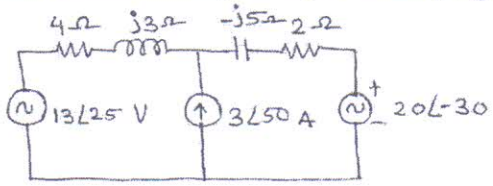
b) Explain an a.c. bridge used for measurement of capacitance. (10)

4. a) Determine ABCD parameters. **(10)**

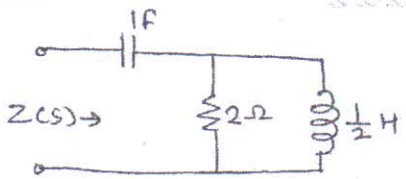


b) Explain construction and working of PMMC instrument. **(10)**

5. a) Find current flowing through 4 Ω using superposition theorem. **(10)**



b) Find poles and zeros of the impedance of the following network and plot them on S-plane **(10)**



6. a) Realize foster forms of the impedance function **(10)**

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

b) Test whether the polynomial is Hurwitz $p(s)=s^5+s^3+s$ **(5)**

c) Test positive realness of the function $F(s)=\frac{s^3+6s^2+7s+3}{s^2+2s+1}$ **(5)**

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