Sem - III - (choice based) / INST / Applied Mathematics - III / Maths.

Q.P. Code: 25486

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

Note: 1. Questions No. 1 is compulsory.
2. Attempt any 3 Questions from the remaining questions.
3. Figures to the right indicate full marks.

Que. 1 a. Find Laplace Transform of $e^{-4t}tcos3t.sin2t$. 5

b. Find Fourier expansion for $f(x) = x^2$ in $(-\pi, \pi)$. 5

c. Prove that $\bar{F} = \frac{\bar{r}}{r^3}$ is solenoidal . where $\bar{a}$ is constant vector. 5

d. Find constant a in the analytic function $\frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\frac{ay}{x}$ 5

Que. 2 a. If f(z)=u+ iv is analytic then show that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$$ 6

b. By using convolution theorem, find inverse Laplace Transform of

$\frac{s^2}{(s^2+9)(s^2+16)}$ 6

c. Find Fourier series for $f(x) = \frac{3x^2 - 6x\pi + 2\pi^2}{12}$ in $(0, 2\pi)$ 8

Que. 3 a. Prove that a vector field $\bar{F}$ is given by
$\bar{F} = (ysinz - sinx)i + (xsin z + 2yz)j + (xycosz + y^2)k$ is irrotational, hence find its scalar potential. 6

b. Find analytic function f(z) , whose real part is $u = \frac{\sin 2x}{\cosh 2y + \cos 2x}$ 6

c. By using Laplace transform, solve $y''+2y'+5y = e^{-t}\sin t$; $y(0)=0, y'(0)=1$ 8

Que. 4 a. Find the half range Fourier cosine series for $f(x) = \begin{cases} 1 & ; 0 \le x \le 1 \\ x & ; 1 \le x \le 2 \end{cases}$ 6

b. Evaluate $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = (2x - y)i - yz^2j - y^2zk$, where is the boundary of the surface of hemisphere $x^2 + y^2 + z^2 = a^2$ lying above the xy – plane. 6

c. Find Inverse Laplace Transform of i. $\frac{(s+1)e^{-\pi s}}{s^2+2s+5}$ ii. $\frac{1}{s}\log\left(\frac{s+2}{s+1}\right)$ 8

Que 5 a. Show that the set of functions { sin x , sin 3x , sin 5x ,. . . . . } are orthogonal in $[0 , \frac{\pi}{2}]$ and find the corresponding set of orthonormal functions. 6

b. Show that the transformation $w = z^2 + z$ maps the circle $|z| = 1$ in z- plane into the cardiode $\rho = 2(1 + \cos\phi)$ in w-plane. 6

c. Verify Green's Theorem in the plane for $\oint (x^2 - y)dx + (2y^2 + x)dy$ around the boundary of the region defined by $y = x^2$ and $y = x$. 8

Que 6 a. By using Laplace transform, evaluate $\int_0^\infty e^t \frac{\sin^2 t}{t} dt$ 6

b. Find bilinear transformation which maps z=1, i, -1 into w= 0,i, -∞ and hence find the fixed points. 6

c. Using Fourier cosine integral for $f(x) = 1 - x^2 , \quad 0 \le x \le 1$
$= 0 \quad , \quad x > 1$ 8

Hence evaluate $\int_0^\infty \left(\frac{x\cos x - \sin x}{x^3} \right) \cos\frac{x}{2} dx.$

QP Code : 25992

Max. Time: 3 hr

Max. Marks: 80

1 is compulsory (any Four). Attempt any 3 from Q.2 to Q.6

1 For the circuit shown in Fig.1, find the value of R if the circuit regulates at 6 V for the input supply voltage of 22 V. The zener diode currents are minimum 10mA and maximum 40mA. The load current IL varies from 0 to Vmax. What is the value of I_{max}? Also, find the power rating of the zener diode. (5)

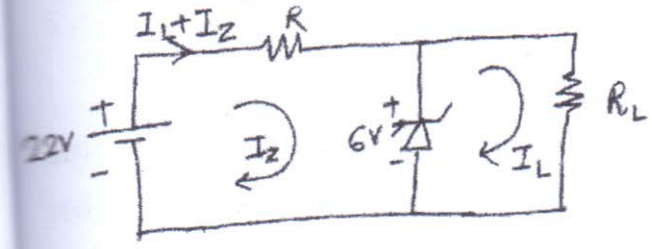


Fig. 1

Determine the I_B, I_C, V_{CE}, V_C and V_{BC} for the fixed-bias configuration of fig.2. (5)

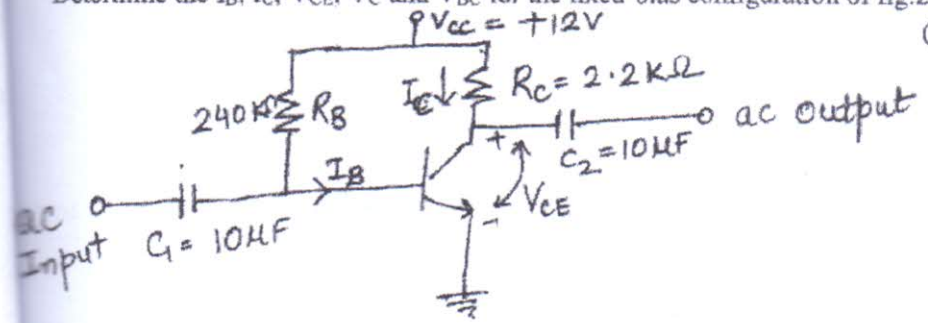


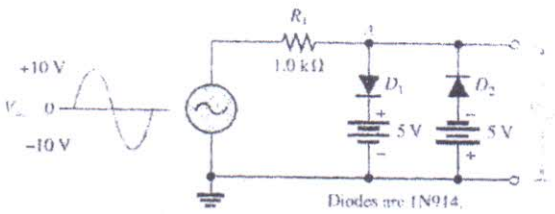
Fig. 2

Explain the term "Field Effect" in JFET. (5)

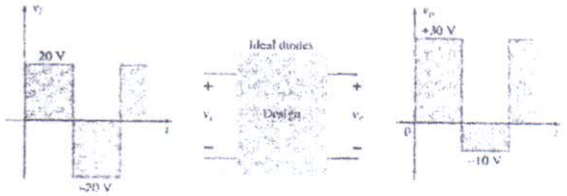
1(d) Draw and explain series voltage regulator. (5)

1(e) Define a filter. How are filters classified? (5)

2(a) Determine the output voltage waveform. (5)

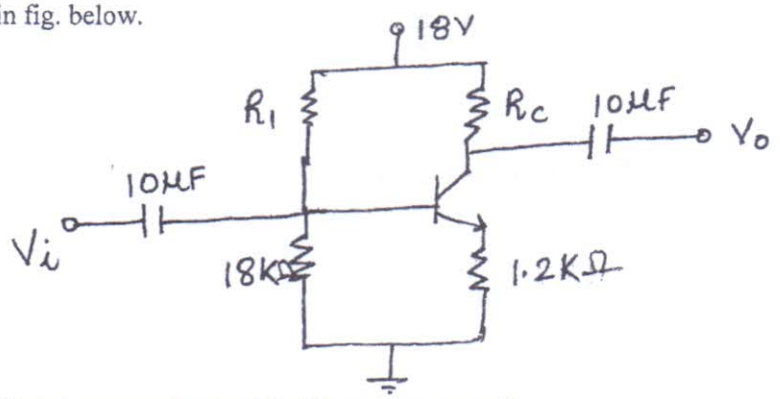


2(b) Design a clamper to perform the function (5)



2(c) Explain with a neat diagram a transformer coupled audio power amplifier (10)

3(a) Given that I_C=2mA and V_{CE}= 10V, determine R_1 and R_C for the network shown in fig. below. (10)



3(b) What do you understand by Thermal runaway? (5)

3(c) How transistors can be used as switches? (5)

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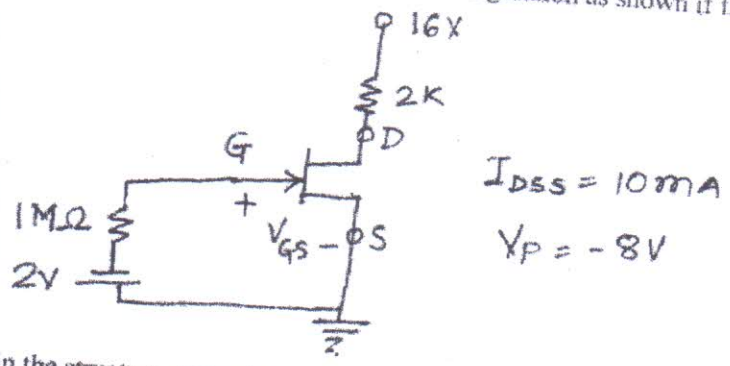
4(a) Determine V_{GS}, I_D, V_{DS} for the fixed Bias configuration as shown if fig below. (10)



4(b) Explain the structure, operation and current-voltage characteristics of Enhancement type MOSFET. (10)

5(a) Draw the block diagram and state its characteristics for ideal op-amp. (5)

5(b) Design a scaling amplifier circuit that will amplify the first input by a factor of 3 and a second by a factor of 4. Use the inverting configuration for the same. (5)

5(c) Draw the circuit diagram for Integrator. Derive the necessary equations. Draw its frequency response. How the problems of basic integrator can be corrected. (10)

6(a) Write down the condition for oscillations. Draw the circuit for a Wein bridge oscillator and derive the expressions for frequency and gain. (10)

6(b) Using standard 5%resistances, design a circuit such that (10)

$$V_0 = -2(2v_1 + 3v_2 - 2v_3).$$

SE/INST/Sem-III [CHOICE BASED]/Transducers-I/May-1

Q.P. CODE: 36223

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

Note:

1. Question one is compulsory.

2. Solve any three from remaining and assume suitable data wherever necessary.

Q1. Attempt any four **20**

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

b. Define transducer and state its classification.

c. Define i) Accuracy and ii) sensitivity.

d. What is an LVDT? State its application.

e. Define ultra-sonic liquid level measurement.

Q2. 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.

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

Q2. b What is lead compensation in RTD? Why it is required? How it is achieved? **10**

Q3.a Explain flapper-nozzle application for the measurement of displacement also draws its characteristics. **10**

Q3.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**

Q4.a. Explain the air purge type level gauge with advantages and disadvantages. **10**

Q4.b. Draw and explain the schematic block diagram of hair hygro meter. **10**

Q5.a. Classify pyrometers. Explain any one with suitable block diagram. **10**

Q5.b. Explain with neat sketch how the capacitance probe can be used for level measurement of non- conducting and conducting liquids. **10**

Q6. Write a short note on (Any two) :- **20**

a. Solid level detectors.

b. Types of error.

c. Selection criteria for transducers

SEM III (Choice Base) / INST / Digital Electronics / MAY 2018

Q. P. CODE:37896

(3Hours) **(TOTAL MARKS:80)**

Please check whether you have the right question paper.

N.B.:
1) **Questions No.1 is compulsory.**
2) **Attempt any three from remaining question.**

Q.1 Attempt the following **[20]**

a) Verify De Morgan's Theorem.
b) Design Half adder circuit
c) Convert JK Flip Flop
d) Compare synchronous and asynchronous counter
e) Explain Noise Margin and fanout of digital IC's

Q.2 a) Convert. **[10]**

i) $(1110)_2$ to decimal
ii) $(1085)_{10}$ to octal
iii) $(34FB)_{16}$ to Binary
iv) $(5890)_{10}$ to Hexadecimal
v) $(123)_6$ to decimal

b) Prove the following and draw the logic circuit. **[5]**

$AB + \bar{A}C = AB + \bar{A}C + BC$

c) Design an exclusive OR operation using all NOR gates. **[5]**

Q.3 a) Minimize the following functions using K-map and implement as a SOP using AND/OR gates. $F = \sum (2, 3, 4, 5, 12, 13)$ **[10]**

b) Design 4 bit binary to Gray code converter. **[10]**

Q.4 a) Design a synchronous MOD 4 updown counter using JK Flip Flop. **[10]**

b) What is Shift Register? Explain the working of 4-bit bidirectional Shift Register. **[10]**

Q.5 a) Realize the following using 16:1 MUX and only one 8:1 MUX **[10]**

$F(A, B, C, D) = \sum m (2, 3, 5, 7, 9, 11, 15)$

b) Perform following operation:- **[5]**

$(29)_{10}$-$(33)_{10}$ using 2's complement method.

c) Explain the following term with respect to asynchronous sequential circuits. **[5]**

i) Fundamental mode ii) Pulse mode iii) Primitive state iv) Cycle and Races.

Q.6 Write short notes on :- (any four) **[20]**

a) PAL and PLA
b) Dynamic RAM
c) ECL family
d) DEMUX
e) ASCII Codes.

June 2018.

S.E. SEM III (Choice Base) INST.

Electrical Network & Measurement.

Q. P. Code: 37653

[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 any following . 20

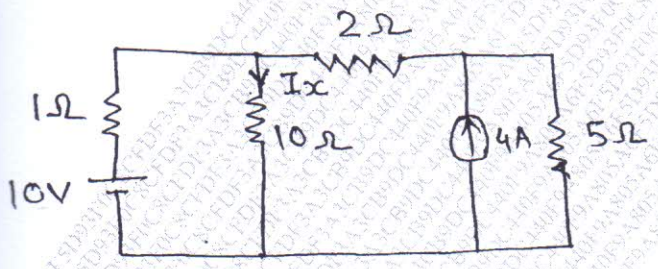
a What is series resonance? Explain

b Explain Digital Voltmeter (DVM).

c What are the advantages of an A.C. Bridge?

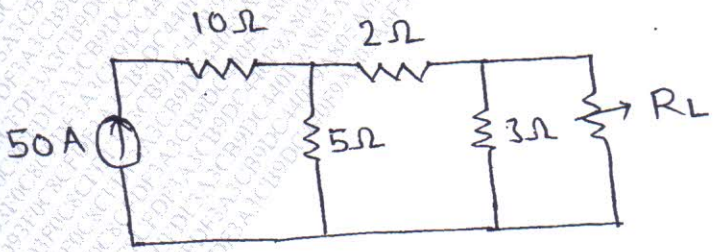
d What is Q-meter? Explain in brief.

2 a Find the current I_x using Superposition 10



b Find the open-circuit impedance parameters with equivalent circuit diagram and also derive the condition for Reciprocity and Symmetry. 10

3 a What will be the value of R_L to get maximum power delivered to it? 10



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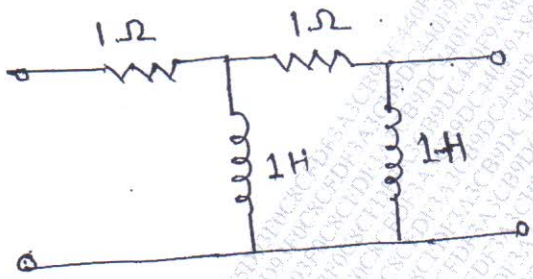
b Explain the transient condition for a series R-L circuit for D.C. conditions.

4 a Determine the Z parameters for the network shown.



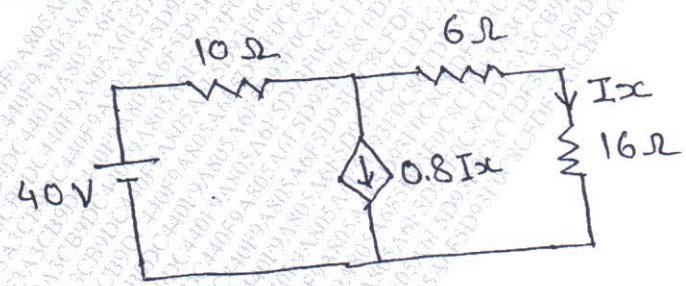
b Test whether $F(s)=\frac{s^3+6s^2+7s+3}{s^2+2s+1}$ is positive real function.

5 a Realize Foster forms of the following LC impedance function.

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

b Explain the working of PMMC instruments.

6 a Find the current through the 16 Ω resistor.



b Derive the balancing condition for an A.C. bridge and also find the unknown parameters for Hay's Bridge

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