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(20514) Roll No. .....

B.Tech.-IV Sem.

TU-109

B.Tech. Examination, May 2014

EC/ME/EI

Mathematics-III

[BT-405(N)]

Time : Three Hours] *[Maximum Marks : 100*

Note: Attempt any **five** questions. **All** questions carry equal marks.

1. (a) Test the analyticity of the function $w = \sin z$ and hence derive that

$$\frac{d}{dz}(\sin z) = \cos z \qquad 10$$

(b) Find the value of the integral

$$\int_c \frac{3z^2 + 7z + 1}{z + 1}$$ where c is the circle

$$|z| = \frac{1}{2} \qquad 10$$

2. (a) Expand cos z about the point $z = \left(\frac{\pi}{2}\right)$

P.T.O.

by Taylor's series. 10

(b) Use the complex variable technique to find the value of the integral

$$\int_0^{2\pi} \frac{d\theta}{5 + 3\cos\theta}$$ 10

3. (a) Calculate the first four moments of the following distribution about the mean. 10

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

(b) Find a straight line that can be fitted to the following data: 10

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

4. (a) Establish the formula $\sigma_{x-y}^2 = \sigma_x^2 + \sigma_y^2 - 2r\sigma x\sigma y$. Where r is the correlation coefficient between x and y. 10

(b) Ten percent of screws produced in a certain factory turn out to be defective. Find the probability that in a sample of 10 screws chosen at random; exactly two will be defective. 10

5. (a) Find the probability that in ten tosses of a fair coin, a head appears

(i) at no time (ii) once

(iii) twice (iv) thrice

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. 10

6. (a) Using bisection method, find the negative root of $x^3 - x + 11 = 0$ 10

(b) Find the double root of $f(x) = x^3 - x^2 - x + 1 = 0$ by Newton - Raphson method. 10

7. (a) Find the value of $\nabla^2 y_5$, given: 10

$y_1 = 2$, $y_2 = 5$, $y_3 = 10$, $y_4 = 17$, $y_5 = 26$

(b) Find the number of men getting the wages Rs. 10 and Rs. 15 from the following table: 10

Wages	0-10	10-20	20-30	30-40
Frequency	9	30	35	42

8. (a) Solve the system

$2x + y + 4z = 12$, $8x + 3y + 2z = 20$,

$4x + 11y + z = 33$ by Crout's method. 10

(b) Explain Gauss-Seidel's method for the following system of equation. 10

$a_{11}x + a_{12}y = b_1$

$a_{21}x + a_{22}y = b_2$

9. (a) Find $\frac{dy}{dx}$ at $x = 4$ by using the following table: 10

x	0	2	5	1
y	0	8	125	1

(b) Use Picard's method to approximate the value of y when $x=0.1$ given $y=1$ at $x=0$ and $\frac{dy}{dx} = \frac{y-x}{y+x}$ 10

10. (a) Using Runge's Kutta's method, find y at $x=1.1$ given $\frac{dy}{dx} = 3x + y^2$, $y(1) = 1.2$ 10

(b) Write a short notes on any **two** of the following: 10

(i) Convergence of Newton-Raphson method

(ii) Binomial distribution

(iii) Simpson's one third rule

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B.Tech. IV Sem.

TU-110

B.Tech. Examination, May 2014

EC/EI/ME BRANCH

TRANSDUCERS AND SENSORS

[BT-406(N)]

Time : Three Hours] *[Maximum Marks : 100*

Note: Attempt any **five** questions. **All** questions carry equal marks.

1. (a) Define the following terms:

   (i) Resolution

   (ii) Span

   (iii) Dead zone

   (iv) Sensitivity

   (v) Threshold

P.T.O.

(b) An 820Ω resistance with an accuracy of ±10% carries a current of 10 mA. The current was measured by an analog meter on 25 mA range with an accuracy of ±2% of full scale. Calculate the power dissipated 'P' in the resistor and % error in 'P'.

2. (a) Explain the difference between deflection and null type instruments giving suitable examples.

(b) Explain how the effects of Modifying and Interfering inputs are minimized in measurement systems.

3. (a) Describe the constructional details of a resistive potential divider and derive the expression for its output voltage when connected across a meter of finite impedance.

(b) Write a short note on velocity sensory.

4. A parallel plate capacitive transducer uses plates of area 500 mm^2 which are separated by a distance of 0.2mm. Calculate the value of capacitance when the dielectric is air having a permittivity of 8.85×10^{-12} F/m.

(i) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18mm. Also calculate the ratio of per unit change of capacitance to per unit change of displacement.

(ii) Suppose a mica sheet 0.01mm thick is inserted in the gap. Calculate value of original capacitance and change in capacitance for the same displacement. Also calculate the ratio of per unit change

in capacitance to per unit change in displacement. Dielectric constant of mica is 8.

5. (a) Explain the construction and working of U-tube Manometer. Also list the errors that can occur in manometers along with their advantages and disadvantages.

   (b) Write the basic principle, construction and working of Pirani gauge. What are its advantages, disadvantages and rang?

6. (a) Discuss briefly about dynamometers.

   (b) What are Elastic type pressure transducers? What are the different types of primary sensing elements used in them? Explain their construction with a neat and clean diagram.

7. (a) A Venturimeter has an area ratio of 9 to 1, the larger diameter being 30cm. During the flow, the recorded pressure head in the larger section is 6.5m and at the throat 4.25m. If meter coefficient is 0.99, compute the discharge through the meter in litres per second.

(b) What is meant by inferential flow meters? Name its few types.

8. (a) Discuss vortex shedding flowmeter along with its advantages and disadvantages.

(b) With proper diagram, explain the working of Rotameter also explain the reason for variable area used in Rotameter. What effect will appear on the readings if the Rotameter is placed horizontally?

9. (a) What is ment by pyrometery? Explain the working principle of optical pyrometer. Also explain the three conditions of filament. Write its range, advantages and disadvantages.

(b) What are thermocouples? Explain their working principle with a neat diagram. What are the materials normally used in making thermocouples? What are their major advantages? Give their range.

10. (a) What are the sources of errors in Filled-system thermometers? Explain liquid in glass thermometer with the help of a neat and well labeled diagram.

(b) A thermistor has resistance of 3980 Ω at ice point and 794 Ω at 50°C. The

resistance temperature relationship is given by $R_T = aR_O \exp\left(\frac{b}{T}\right)$. Calculate the constants a and b. Also calculate the range of resistance to be measured in case the temperature varies from 40^0C to 100^0C.

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B.Tech.-IV Sem.

TU-106

B.Tech. Examination, May 2014

E. I.

Electronics Circuits

[BT-401(N)]

[Time : Three Hours] *[Maximum Marks : 100*

Note : Attempt any **five** questions.

1. (a) Define the following parameters :

   (i) Input Bias current

   (ii) Input offset current

   (iii) Common mode Rejection Ratio (CMRR)

   (iv) Slew rate

   (v) Power Supply Rejection Ratio (PSRR)

P.T.O.

(b)

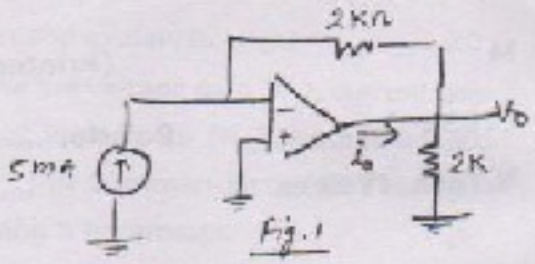

Fig. 1

Find out the output voltage V_0 and current i_0 as shown in Figure 1.

2. (a) Determine the expression for the output voltage in terms of V_1 and V_2 for the circuit shown in figure 2.

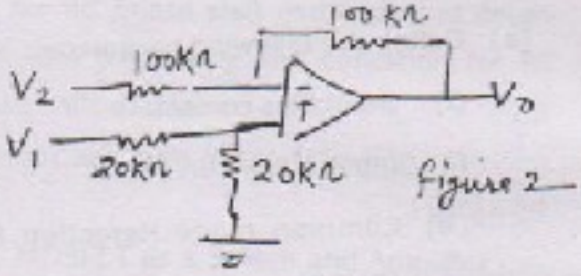

Figure 2

(b) Draw the circuit for integrator and determine the output voltage. 10

3. (a)

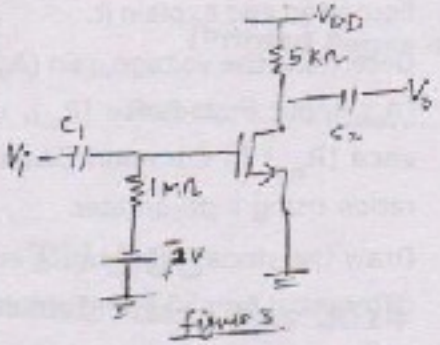

figure 3.

Determine V_{GSQ}, I_{DQ}, and V_{DSQ} as shown in the figure 3.

(b) Explain MOSFET Gate oxide and junction capacitances? 10

4. Determine the input impedance and gain in CS configuration as shown in figure 4.

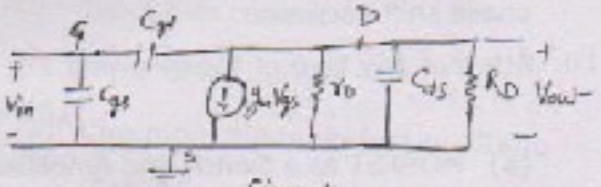

figure 4.

20

5. Draw input and output characteristics curve of a transistor in Common Emitter (CE) con-

figuration and explain it. 20

6. Determine the voltage gain (A_v), current gain (A_i), input impedance (R_{in}), output impedance (R_{out}) in Common Base (CB) configuration using h parameter. 20

7. Draw the circuit diagram of emitter coupled differential Amplifier and obtain its DC analysis? 20

8. Define positive and negative feedback. Determine the input and output impedance in voltage series feedback. 20

9. Explain, Barkhausen criteria? Draw the circuit for RC phase shift oscillator and determine the frequency and condition for RC phase shift oscillator. 20

10. Attempt any **two** of the following : $10 \times 2 = 20$

    (a) MOSFET as a Switch and Amplifier

    (b) High frequency model of BJT

    (c) Configuration of Differential Amplifier

    (d) Tank Oscillators

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B.Tech. IV Sem.

TU - 107

B.Tech. Examination, May 2014

E. I.

Electronics Instrumentation and Measurements

[BT-403(N)]

Time : Three Hours] *[Maximum Marks : 100*

Note : Attempt any **five** questions. **All** questions carry equal marks.

1. (a) Differentiate clearly between systemetic and absolute error. 10

   (b) The current passing through a resistor of 100 ± 0.02 Ω is 2.00 ±.01 A. Using the relationship $P=I^2R$ calculate the error in computed value of power dissipation. 10

P.T.O.

2. (a) Give the comparison between D.C. bridges and a.c. bridges. Write the limitation of Wheatstone bridge. 10

(b) Hay's ac bridge is used to measure the effective resistance and self inductive of an iron cored coil . Its four 'arms are AB: 833Ω resistance in series with a capacitor 0.38 μF BC: Resistance of 16.8k Ω,CD: resistance of 1kΩ and DA: unknown coil L_x,R_x. Calculate L_x, R_x. The bridge is supplied from a 50 Hz supply source. 10

3. (a) Explain the electronic A.C. voltmeter with the help of block diagram. 10

(b) Explain the construction and operation of PMMC instrument. 10

4. (a) Explain the principle and working of series type ohm meter 10

(b) Explain the functioning of digital multi meter with neat block diagram. 10

5. Determine the function of each of the following oscilloscope control. 20

(i) Focus

(ii) Astigmation

(iii) ALT/CHOP mode

(iv) X Y mode

6. Explain analog storage oscilloscope (ASO). Also compare digital storage oscilloscope (DSO) with Analog storage oscilloscope. 20

7. What are the major components of a CRT? Why is the opreating voltage in a CRT arranged such that the deflection plates are nearly at ground potential. 20

8. (a) Draw and explain various waveforms at each stage of a sampling oscilloscope. 10

(b) Differentiate between passive probes and active probes. 10

9. (a) What is the calibration of instrument? Why digital Multimeter is used as a standard instrument? 10

(b) Explain the principle and working of X-Y recorder with the help of block diagrams. 10

10. Write short notes any of **four:** 5×4=20

(i) Basics of statistical analysis

(ii) Digital multimeter

(iii) Q meter

(iv) Oscilloscope probes

(v) Plotter

(vi) Instrument Calibration

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B.Tech.- IV Sem.

TU-108

B. Tech. Examination, May 2014

E. I.

Signals System and Measurements

[BT-404 (N)]

Time : Three Hours] *[Maximum Marks : 100*

Note : (i) Solve any **five** questions.

(ii) **All** questions carry equal marks.

(iii) Use of electronic calculator is permitted.

1. (a) Determine the even and odd components of the following signals. 10

(i) $x(t) = \sin\left(W_0 t + \frac{\pi}{4}\right)$

(ii) $x(n) = e^{j\left(w_0 n + \frac{\pi}{2}\right)}$

P.T.O.

(b) Determine whether or not each of the following signals is periodic. If a signal is periodic, determine its fundamental period.

(i) $x(n) = e^{j[(n/4)-\pi]}$

(ii) $x(t) = \cos\left(2t + \frac{\pi}{4}\right)$

2. (a) Consider a discrete time LTI system with impulse response h[n] given by 10

$$h[n] = \left(-\frac{1}{2}\right)^n u[n-1]$$

(i) Is the system causal

(ii) Is the system stable?

Comment on your result.

(b) Compute the output y(t) for a continuous-time LTI system whose impulse response h(t) and the input x(t) are given

by

$h(t)=e^{-at}\,u(t)$; $x(t)=e^{at}\,u(-t)$, $a>0$

3. (a) The step response of continuous time LTI system is given by $(1-e^{-t})u(t)$. For a certain unknown input $x(t)$, the output $y(t)$ is observed to be $(2-3e^{-t}+e^{-3t})u(t)$. Find the input $x(t)$.

(b) (i) Find the Laplace Transform of

$$x(t)=(e^{-t}\cos 2t-5e^{-2t})u(t)+\frac{1}{2}e^{-2t}u(-t)$$

(ii) Find the inverse Laplace Transform of $X(s)=\dfrac{s+1}{s^2+4s+13}$; $Re(s)>-2$

4. (a) State and prove the following properties of Fourier Transform. 10

(i) Duality

(ii) Differentiation time domain

(b) Discuss with an example, the convolu-

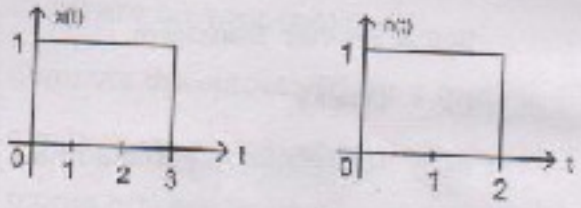
tion property of C.T. Fourier Transform. Also give the physical significance of convolution property.

5. (a) Explain all the properties of Z-Transform and what is the physical significance of Z-Transform. 10

(b) Find inverse Z-Transform of

$$X(Z) = \frac{1-\frac{1}{2}z^{-1}}{1-\frac{1}{4}z^{-2}} \; ; |z| > \frac{1}{2}$$

6. (a) Evaluate $y(t) = x(t) * h(t)$, where $x(t)$ and $h(t)$ are shown in fig. (1) by convolution technique.



(b) Consider an integrator whose input x(t) and output y(t) are related by

$$y(t) = \int_{-\infty}^{t} x(c)\, \partial c$$

(i) Find the system response h(t) of the integrator

(ii) Is the integrator stable or not?

7. (a) Find the Z-Transform of 10

$$x[n] = 3\left(\frac{1}{2}\right)^{n} u(n) - 2\left(\frac{1}{4}\right)^{n} u(-n-1)$$

(b) For the following difference equation and associated input and initial conditions, determine the output y[n]

$$y[n] - \frac{1}{2} y[n-1] = x[n]$$

$$x[n] = \left(\frac{1}{3}\right)^{n} \quad ; \quad y[-1] = 1$$

8. For the following signal, verify whether it is linear or non linear, stable or unstable, time variant or invariant, causal or non causal. 10

(i) $y(t) = t\, x(t) + 10x(t+5)$

(ii) $y(t) = \sin [x(t)]$