B.Tech THIRD SEMESTER EXAMINATION JUNE-2025
(Branch : EC & EE)

MA-3402 / MA-3302 MATHEMATICS - III

Time   :   Three Hours

Maximum Marks : **70**
Min. Pass Marks : **22**

Note : Attempt any five questions. Each question carries equal marks.

1(a) Find the Laplace transform of the functions :

(i) $f(t) = t^2 cos3t$.   (ii) $g(t) = \dfrac{e^{-t}sint}{t}$.

(b) Find the Inverse Laplace transform of the functions :

(i) $F(s) = ln\left(\dfrac{s+c}{s+d}\right), c, d$ are constants.   (ii) $G(s) = \dfrac{6+s}{s^2+6s+13}$.

2(a) Solve the initial value problem $y'' + 2y' - 3y = 3,\ y(0) = 4,\ y'(0) = -7$.

(b) Solve the initial value problem : $y' + 6y + 5\int_0^t y(\tau)d\tau = 1 + t, y(0) = 1$.

3(a) (i) Find the Fourier transform of the function $f(t) = \begin{cases} 0, & t < 0, \\ e^{-at}, & t \geq 0, \end{cases} a > 0$.

(ii) Find the inverse Fourier transform of the function $\mathscr{F}(\omega) = \dfrac{e^{-i\omega}}{2(1+i\omega)}$.

(b) Find the solution of the differential equation $y' - 2y = H(t)e^{-2t},\ -\infty < t < \infty$ using Fourier transforms, where $H(t) = u_0(t)$ is the unit step function.

4(a) The temperature distribution $u(x,t)$ in a thin homogeneous, infinite bar can be modelled by the initial boundary value problem $\dfrac{\partial u}{\partial t} = c^2 \dfrac{\partial^2 u}{\partial x^2},\ -\infty < x < \infty, t > 0,\ u(x,0) = f(x), u(x,t)$ is finite as $x \to \pm\infty$. Find $u(x,t),\ t > 0$.

(b) In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the student body.

(i)   What is the probability that mathematics is being studied?

(ii) If a student is selected at random and is found to be studying mathematics, find the probability that the student is a girl?

(iii) Find the probability that the student is a boy.

5(a) A random variable X has the following probability function :

x	1	2	3	4	5
$p(x)$	c	c	$3c$	$c^2 + c$	$6c^2$

Find the value c. Evaluate $P(X < 3)$ and $P(1 < X < 4)$. Determine the distribution function of X. Find the mean and variance of X.

(b) Two players A and B play tennis games. Their chances of winning a game are in the ratio 3:2 respectively. Find A's chance of winning at least two games out of four games played.

P.T.O.

6(a) The frequency of the accidents per shift in a factory is shown in the following table :

Accident per shift	0	1	2	3	4	Total
Frequency	192	100	24	3	1	320

Calculate the mean number of accident per shift. Fit a passion distribution and calculate theoretical frequencies.

(b) If $X \sim N(\mu, \sigma^2)$, then show that $E(X) = \mu$ and $Var(X) = \sigma^2$.

7(a) 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

(b) Calculate the regression equations of X on Y and Y on X from the following data and estimate X when $Y = 25$:

X	10	12	13	17	18	20	24	30
Y	5	6	7	9	13	15	20	21

Calculate coefficient of correlation also.

8(a) Two random samples of sizes 9 and 6 gave the following values of the variable :

Sample 1	15	22	28	26	18	17	29	21	24
Sample 2	8	12	9	16	15	10			

Test the difference of the estimates of the population variances at 5% level of significance $(F_{0.05} = 4.82)$.

(b) A book has 700 pages. The number of pages with various numbers of misprints is recorded below. At 5% significance level are the misprints distributed according to Poisson law.

No. of misprints (X)	0	1	2	3	4	5
No of pages with X misprints	616	70	10	2	1	1

(Given $\chi^2_{0.05} = 5.99$).

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B.Tech THIRD SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-3401 / EE-3301 SIGNALS & SYSTEM

Time   :   Three Hours

*Maximum Marks : **70***
*Min. Pass Marks   :   **22***

Note : Attempt any five questions. Each question carries equal marks.

1(a) Consider a signal that is the sum of two real exponentials and given as   **10**

$$x[n] = 7\left(\frac{1}{3}\right)^n u[n] - 6\left(\frac{1}{2}\right)^n u[n]$$

    (i) Evaluate the Z-transform   (ii) draw pole-zero plot with ROC

(b) List any four properties of DTFT.   **04**

2(a) Give the detailed classification of signals with example for each of the category.   **10**

(b) A continuous time system has the input-output relation given by $y(t) = tx(t-2)$.   **04**
Analyze whether the system is :

    (i) Linear   (ii) Time-invariant   (iii) Stable   (iv) Memory less   (v) Causal.

3(a) The system transfer function is given as, $H(s) = \frac{s}{s^2+5s+6}$. The input to the system is   **10**
$x(t) = e^{-2t}u(t)$. Determine the output assuming zero initial conditions.

(b) Find the final value and initial value of the function whose Laplace transform is given as   **04**

$$G(s) = \frac{2s+9}{s(s+1)}.$$

4(a) Consider an analog signal $x(t) = 5cos200\pi t$.   **10**

    (i)   Determine the minimum sampling rate to avoid under sampling.
    (ii) If sampling rate $F_s = 400Hz$, then what is the discrete time signal after sampling?

(b) Write the conditions for an LTI system to be stable and causal.   **04**

5(a) State and prove the sampling theorem. Also explain how the original signal can be   **10**
reconstructed from the sampled version.

(b) Describe the effects of under sampling and steps to eliminate aliasing.   **04**

6(a) Identify the exponential Fourier series coefficients of the signal   **10**

$$x(t) = 1 + \sin(2\omega t) + 2\cos(2\omega t) + \cos(3\omega t + \frac{\pi}{4})$$

(b) Describe the Dirichlet's conditions for Fourier series.   **04**

P.T.O.

7(a) Evaluate the Laplace transform of the following signals with their ROC. **10**

   (i) $\alpha(t) = \{3 - 4e^{-4t}\}u(t)$ (ii) $\beta(t) = t^2 e^{-2t}u(t)$

 (b) What is the relationship between Laplace transform and Fourier transform? **04**

8   A trapezoidal pulse $x(t)$ is defined by $x(t) = \begin{cases} 5 - t; & 4 \leq t \leq 5 \\ 1; & -4 \leq t \leq 4 \\ t + 5; & -5 \leq t \leq -4 \end{cases}$ **14**

   (i) Examine total energy of $x(t)$

   (ii) Sketch $x(2t-3)$

   (iii) If $y(t) = \dfrac{dx(t)}{dt}$ then determine the total energy of $y(t)$.

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B.Tech THIRD SEMESTER EXAMINATION JUNE-2025
(Branch : Electrical Engineering)

EE-3402 ELECTRICAL MEASUREMENT

Time   :   Three Hours

Maximum Marks : 70
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) What do you mean by loading effect in measuring instruments? Explain the effect in case **07**
of shunt connected instruments.

 (b) It is required to measure power factor of a load indirectly with the help of voltmeter, **07**
ammeter and wattmeter. Ranges of meters are given as follows :

   $V = 100V \pm 5\%$ $I = 10A \pm 3\%$ $W = 1000 W \pm 1\%$

   Calculate the maximum error in power factor measurement.

2(a) Discuss construction and operation of electro dynamometer type instrument. **07**

 (b) Describe various methods of damping used in indicating instruments. **07**

3(a) Discuss the theory and operation of D'Arsonval galvanometer. **07**

 (b) Give the general torque equation og Galvanometer. Discuss the operating principle of flux **07**
meter.

4(a) Describe the construction and working of a single phase induction type energy meter. Can **07**
an external magnetic field affect its operation?

 (b) What do you mean by shunts and multipliers used in indicating instruments. Discuss their **07**
applications in measurements.

5(a) Discuss the construction and operating principle of electrostatic voltmeters. Compare it **07**
with MI type voltmeter.

 (b) Describe two wattmeter method of three phase power measurement. **07**

6(a) How current transformers can be used for accurate measurement of high currents. Discuss **07**
the constructional features of CT.

 (b) What do you mean by ratio and phase angle errors in instrument transforments. How these **07**
errors can be minimized?

7(a) Discuss loss of charge method for the measurement of insulation resistance. **07**

 (b) Explain Schering bridge for the measurement of high voltage. How loss angle can be **07**
measured with this circuit?

8(a) Discuss the measurement of iron losses using Lloyd Fisher Square. **07**

 (b) Describe the working principle of coordinate type AC potentiometer. **07**

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B.Tech THIRD SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-3403 / EE-3303 CIRCUIT THEORY

Time : Three Hours	*Maximum Marks : **70***
	*Min. Pass Marks : **22***

*Note : **Attempt any five questions. Each question carries equal marks.***

1(a) State and explain Thevenin's theorem.   **07**

  (b) Find R to have maximum power transfer in the circuit of *fig.1*. Also determine the amount **07**
of maximum power.
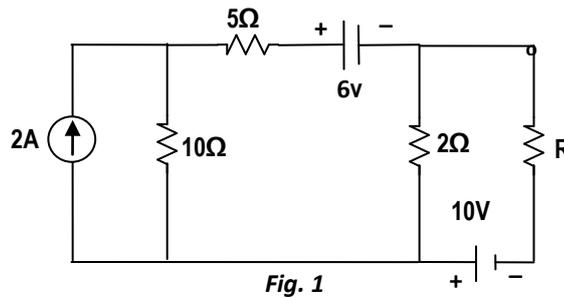
Fig. 1

2(a) Explain the meaning of half power frequencies and derive their expression for RLC series **07**
circuit.

  (b) A 10μf condenser is connected in series with a coil having L = 10mH. Determine the **07**
frequency of resonance, the resistance of the coil if a 100V source is applied creating
resonance, the circuit current being 50 mA. What is the Q factor of the coil?

3(a) In *fig.2* the switch K is kept first at position '1' and steady state is reached. At t = 0, the **07**
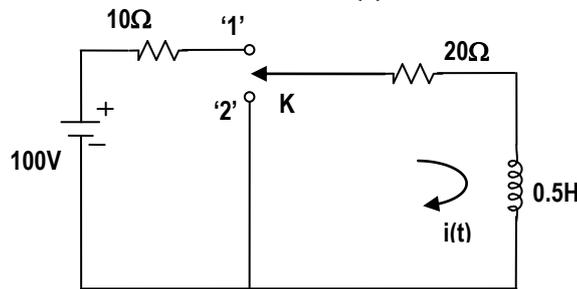switch is moved to position '2'. Find the current $i(t)$ in both the cases –

Fig.2

  (b) Switch 'S' in the circuit shown in *fig.3* is closed at t = 0. Determine the initial value of $i, \frac{di}{dt}$ **07**
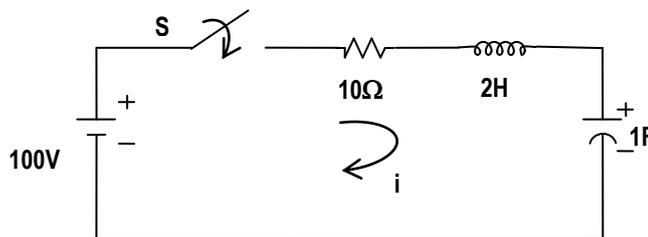and $\frac{d^2i}{dt^2}$.

Fig.3

P.T.O.

4(a) What are the two ways of connecting a 3-phase system? Draw their phasor diagrams and write the relationship between phase and line voltages and currents for these systems. **07**

(b) Two wattmeters connected to measure the total power in a 3-phase balanced circuit. One measures 4800 watt, while the other reads backwards. On reversing the latter it is found to read 400 watts. What is the total power and power factor? Draw the connection diagram and phasor diagram of the circuit. **07**

5(a) Define coefficient of coupling and derive on expression for it. *06*

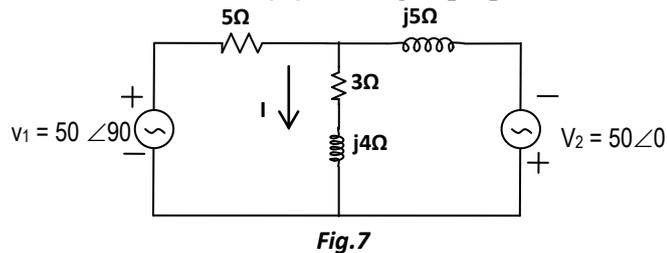(b) For the circuit shown in *fig.4*, find the drop across the capacitor – *08*

Fig.4
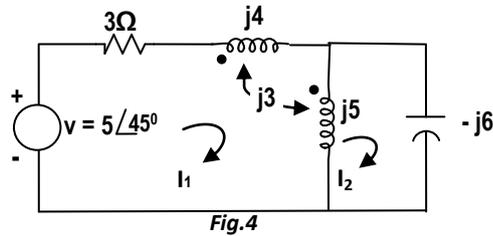
6(a) Determine the Laplace transform of the waveform shown in *fig.5*. *07*

Fig.5
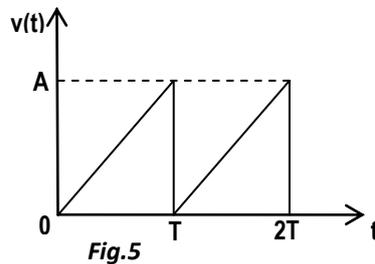
(b) Find the current $i(t)$ in the RC circuit shown in *fig.6*. *07*

Fig.6
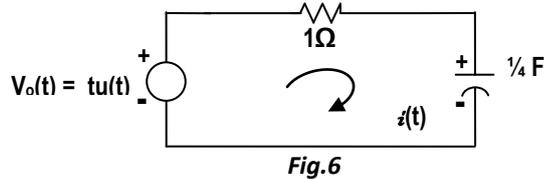
7(a) State and explain Milliman's theorem. *06*

(b) Find the current I in the circuit shown in *fig.7* using superposition theorem. *08*

Fig.7

8 Write short notes on **any two** : *14*

   (i) Parallel resonance   (ii) Advantages of poly phase system
   (iii) Reciprocity theorem   (iv) Initial and final value theorem
   (v) Tunned circuits.

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B.Tech THIRD SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

## EE-3404 / EE-3304 ELECTRONIC DEVICES & CIRCUITS

*Time   :   Three Hours*

Maximum Marks : **70**
Min. Pass Marks : **22**

Note : Attempt any five questions. Each question carries equal marks.

1(a) Sketch the V-I characteristics of an NPN transistor in CEC and indicate the different **07** regions of importance.

 (b) Explain the operation of IGFET and draw its drain and transfer characteristics.   **07**

2(a) (i)   For the transistor switching circuit in *fig.1*, what is V_{CE} when $V_{IN} = 0$ V?   **07**
      (ii) What minimum value of I_B is required to saturate this transistor if β is 200?
            Neglect V_{CE}(sat).
      (iii) Calculate the maximum value of R_B when $V_{IN} = 5$ V.
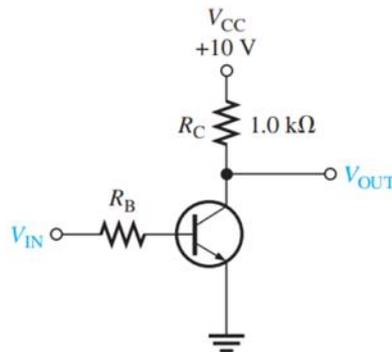
Fig.1

 (b) Determine I_B, I_C, I_E, α, V_{BE}, V_{CE} & V_{CB} in the circuit of *fig.2*. The transistor has a β = 150. **07**
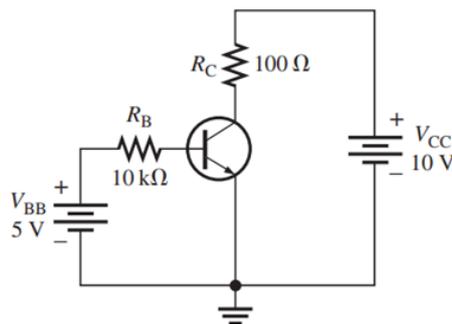
Fig.2

3(a) A BJT has $h_{ie} = 4k\Omega$, $h_{fe} = 100$, $h_{re} = 32 \times 10^{-5}$ & $h_{oe} = 100 \times 10^{-6}$. Calculate the values **07** of input and output resistances, current and voltage gains, if the load resistance is 20kΩ.

 (b) Define h-parameters. Derive expression for voltage gain, current gain and input resistance **07** of CB amplifier using h-parameters.

4(a) Describe the classification of power amplifiers. With the help of appropriate diagrams, **07** explain the working and compare Class-A, Class-B, and Class-C amplifiers.

 (b) Draw the circuit diagram of a single ended class-A power amplifier and explain its **07** operation. Also write its characteristics.

5(a) Explain the operation of a class-B push pull power amplifier with a circuit diagram. Also show the efficiency of such as amplifier $\leq 78.5\%$. **07**

 (b) Explain the terms : (i) CMRR   (ii) Slew rate   (iii) Offset current. **07**

6(a) What are the characteristics of an ideal operational amplifier? Also draw the circuit diagram of non-inverting amplifier. **07**

 (b) Define low pass and high pass filters. Explain by drawing frequency response characteristics. **07**

7(a) Explain the principle of feedback amplifier with help of block diagram. **07**

 (b) Explain the operation of Wien-bridge oscillator. Also derive the expression for frequency of Wien-bridge oscillator. **07**

8   Write short notes on **any two**: **14**

   (i)   Differentiator
   (ii) 555 timer
   (iii) Thermal Runaway and the role of a heat sink in preventing it

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