

CBCS SCHEME

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18MAT41

Fourth Semester B.E. Degree Examination, June/July 2024 Complex Analysis, Probability and Statistical Methods

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- Derive Cauchy - Riemann equations in Cartesian form. (06 Marks)
 - Show that the function $v = (\sin x \cosh y + 2 \cos x \sinh y) + (x^2 - y^2 + 4xy)$ is harmonic and hence find Analytic function. (07 Marks)
 - Verify that $v = \frac{1}{r^2} (\cos 2\theta)$, $r \neq 0$ is harmonic. Find an analytic function $f(z)$ whose real part is u . (07 Marks)

OR

- Derive Cauchy-Riemann equations in polar form. (06 Marks)
 - Given $f(z) = u + iv$ an analytic function and prove the following property:
$$\left(\frac{\partial}{\partial x} |f(z)|\right)^2 + \left(\frac{\partial}{\partial y} |f(z)|\right)^2 = |f'(z)|^2$$
 (07 Marks)
 - Find an analytic function $f(z) = u + iv$, given
 $u - v = e^x (\cos y - \sin y)$ (07 Marks)

Module-2

- Discuss the transformation $w = e^z$. Show the transform in z -plane and w -plane. (06 Marks)
 - Evaluate $\int_c \frac{e^z}{(z-2)(z-5)^3} dz$, where c is the circle $|z| = 8$. (07 Marks)
 - Evaluate $\int_{z=0}^{z=1+i} (x^2 - iy) dz$ along the following curves:
i) The straight line $y = x$ ii) The parabola $y = x^2$. (07 Marks)

OR

- Find the bilinear transformation that maps the points $z = -1, i, 1$ onto the points $w = 1, i, -1$ respectively. (06 Marks)
 - Discuss the transformation $w = z + \frac{1}{z}$. Show the transform in z and w planes. (07 Marks)
 - State and prove Cauchy's integral formula. (07 Marks)

Module-3

- Find the value of k such that the following table represents a finite probability distribution:

$x :$	-3	-2	-1	0	1	2	3
$P(x_i) :$	k	$2k$	$3k$	$4k$	$3k$	$2k$	k

Find the mean and the standard deviation of the distribution Also find $P(x > 1)$ and $P(-1 < x \leq 2)$. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

- b. In a certain factory turning out razor blades, there is a small chance of 0.002, for a blade to be defective. The blades are supplied in packets of 10. Using Poisson distribution, calculate the approximate number of packets containing i) no defective ii) one defective iii) two defective blades in a consignment of 10,000 packets. (07 Marks)
- c. For the normal distribution with mean 2 and standard deviation 4, calculate the following probabilities:
 i) $P(x \geq 5)$ ii) $P\{|x| < 4\}$ iii) $P\{|x| > 3\}$ (07 Marks)

OR

- 6 a. A fair coin is tossed three times. Let x denotes the number of heads showing up. Find the distribution of x . Also find its mean variance and standard deviation. (06 Marks)
- b. An underground mine has 5 pumps installed for pumping out storm water, the probability of any of the pumps failing during the storm is $1/8$. What is the probability that
 i) At least 2 pumps will be working ii) All pumps will be working during a particular storm? (07 Marks)
- c. At a certain city bus stop, three buses arrive per hour on an average. Assuming that the time between successive arrivals is exponentially distributed, find the probability that the time between the arrivals of successive buses is
 i) less than 10 minutes ii) at least 30 minutes. (07 Marks)

Module-4

- 7 a. If F is the force required to lift a load W , by mass of a pulley, fit a linear expression $F = a + bW$ against the following data:

W	50	70	100	120
F	12	15	21	25

(07 Marks)

- b. Employ the formula $r = \frac{\sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2}{2\sigma_x \sigma_y}$ to determine the coefficient of correlation r , for the following data:

x :	92	89	87	86	83	77	71	63	53	50
y :	86	83	91	77	68	85	52	82	37	57

(07 Marks)

- c. The tangent of the angle θ between the lines of regression of y on x and x on y is 0.6 and the standard deviation of y is twice the standard deviation of x , find the coefficient of correlation between x and y . (06 Marks)

OR

- 8 a. Fit a second-degree parabola in the form $y = a + bx + cx^2$ for 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

(06 Marks)

- b. Obtain the lines of regression and hence find the coefficient of correlation for the following data:

x :	1	3	4	2	5	8	9	10	13	15
y :	8	6	10	8	12	16	16	10	32	32

(07 Marks)

- c. Fit a curve of best fit of the form $y = ax^b$ to the following data:

x :	1	2	3	4	5
y :	0.5	2	4.5	8	12.5

(07 Marks)

Module-5

- 9 a. The joint probability function for two discrete random variables X and Y is given by $f(x, y) = c(2x + y)$ where x and y can assume all integral values such that $0 \leq x \leq 2$ and $0 \leq y \leq 3$ and $f(x, y) = 0$ otherwise.
Find i) The value of constant c ii) $P(X = 2, Y = 1)$ iii) $P(X \geq 1, Y \leq 2)$ iv) $P[(x + y) \leq 1]$ (10 Marks)
- b. Define Type-I and Type-II errors. A coin was tossed 400 times and returned heads 216 times. Test the hypothesis that the coin is unbiased. (10 Marks)

OR

- 10 a. The life time of electric bulbs for a random sampling of 10 from a large shipment gave the following data:

Item	1	2	3	4	5	6	7	8	9	10
Life in '1000s of hrs	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average life time of bulbs is 4000 hrs. (10 Marks)

- b. A joint distribution is given by the following table:

X \ Y	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

Find the marginal distribution of X and Y evaluate $\mu_X, \mu_Y, \sigma_X, \sigma_Y$. (10 Marks)

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CBCS SCHEME

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18ME42

Fourth Semester B.E. Degree Examination, June/July 2024

Applied Thermodynamics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Derive an expression for thermal efficiency of Otto cycle. (08 Marks)
- b. Calculate the percentage loss in the ideal efficiency of a diesel engine with compression ratio 14, if the fuel cut-off is delayed from 5% to 8%. (08 Marks)
- c. Describe the phenomenon of detonation in SI engine. Mention any four important effects of detonation. (04 Marks)

OR

- 2 a. Classify the IC Engines. (06 Marks)
- b. In a test of a 4-stroke, 4-cylinders engine 75 mm bore, and 100 mm stroke, the following results were obtained at full throttle at a constant speed and constant fuel supply 6 kg/h. BP when all cylinders are working is 15.6 kW and when cylinder No. 1 cut-out is 11.1 kW, cylinder no.2 cut-out is 11.03 kW, cylinder no.3 cut-out is 10.88 kW, cylinder no.4 cut-out is 10.66 kW. If the calorific value of fuel is 83600 kJ/kg and clearance volume is 0.001 m^3 , Calculate (i) Mechanical efficiency (ii) Indicated thermal efficiency (iii) Air standard efficiency. (08 Marks)
- c. Compare Otto and Diesel cycles for constant maximum pressure and heat supplied with P-V and T-S diagrams. (06 Marks)

Module-2

- 3 a. Explain how the reheating will improve the specific output of the Brayton cycle, with T-S diagram and also give reason for reduction in thermal efficiency. (10 Marks)
- b. A Gas turbine unit has a pressure ratio 6:1 and maximum cycle temperature of 610°C . The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output. The air enters the compressor at 15°C at the rate of 16 kg/s. Take $C_p = 1.006 \text{ kJ/kg}$, $\gamma = 1.4$ for compression process and $C_p = 1.11 \text{ kJ/kg}$, $\gamma = 1.333$ for expansion process. (10 Marks)

OR

- 4 a. With neat sketch explaining the working of Ram-Jet and write the advantages. (08 Marks)
- b. In a gas turbine the compressor takes in air at a temperature of 15°C and compresses it to four times the initial pressure with an isentropic efficiency of 82%. The air is then passed through a heat exchanger heated by the turbine exhaust before reaching combustion chamber. The effectiveness of heat exchanger is 0.78. The maximum temperature after constant pressure combustion is 600°C and the efficiency of the turbine is 70%. Neglect all losses and working fluid throughout the cycle having characteristic of air. Find the efficiency of the cycle. Take $C_p = 1.0045 \text{ kJ/kgK}$, $\gamma = 1.4$. (12 Marks)

Module-3

- 5 a. What are the drawbacks of Carnot cycle as a reference cycle? (04 Marks)
- b. Explain with T-S diagram the effects of pressure and temperature on the Rankine cycle. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. A steam power plant operating on Rankine cycle gets steam at 40 bar and dry saturated. After doing work steam is exhausted at 0.30 bar. If the steam flow rate is 60 kg/s determine
 (i) Pump work (ii) Turbine work
 (iii) Cycle efficiency (iv) Heat flow in the condenser. (10 Marks)

OR

- 6 a. With a schematic and T-S diagram, explain the working of reheat vapour power cycle and deduce an expression for cycle efficiency. (10 Marks)
 b. A simple Rankine cycle works between pressures 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption. (10 Marks)

Module-4

- 7 a. Derive an expression for C.O.P of an air refrigeration system working on Reversed Carnot cycle. (10 Marks)
 b. A Bell-Coleman Refrigerator operates between pressure limits of 1 bar and 8 bar. Air is drawn from the cold chamber at 9°C , compressed and then it is cooled to 29°C , before entering the expansion cylinder. Expansion and compression follow the law $PV^{1.35} = C$. Calculate the theoretical C.O.P of the system. Take $C_p = 1.003 \text{ KJ/kg K}$, $C_v = 0.716 \text{ KJ/kgK}$, $R = 0.287 \text{ KJ/kgK}$. (10 Marks)

OR

- 8 a. Define the following :
 (i) Dry bulb temperature (ii) Dew point temperature.
 (iii) Relative humidity . (iv) Specific humidity.
 (v) Degree of saturation. (10 Marks)
 b. An air conditioning system is designed under the following conditions :
 Outdoor conditions = 30°C DBT and 75% RH
 Required indoor conditions = 22°C DBT and 70% RH
 Amount of free air circulated = $3 \text{ m}^3/\text{sec}$.
 Coil dew point temperature = 14°C
 The required condition is achieved first by cooling and dehumidifier and then by heating.
 Calculate : (i) The capacity of the cooling coil in tones
 (ii) The capacity of the heating coil in kW.
 (iii) The amount of water vapour removed in kg/s. (10 Marks)

Module-5

- 9 a. Explain the operation of single stage, single acting reciprocating compressor with P-V diagram. Assume no clearance. (08 Marks)
 b. What are the advantages of multi-stage compression? (04 Marks)
 c. A multistage compressor is to be designed to elevate the pressure from 1 bar to 120 bar such that the stage pressure ratio will not exceed 4. Determine
 (i) Number of stages (ii) Exact pressure ratio (iii) Intermediate pressures
 (iv) The minimum power required to compress $15 \text{ m}^3/\text{min}$ of free air. Take $n = 1.2$. (08 Marks)

OR

- 10 a. Derive an expression for pressure ratio which gives maximum discharge through the nozzle. (10 Marks)
 b. Explain different types of steam nozzles. (04 Marks)
 c. In a steam nozzle, the steam expands from 4 bar to 1 bar. The initial velocity is 60 m/s and the initial temperature is 200°C . Determine the exit velocity of the nozzle efficiency is 92%. (06 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2024 Fluid Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define the following terms : (i) Surface tension (ii) Kinematic viscosity
(iii) Compressibility (iv) Capillarity (08 Marks)
- b. The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm. (08 Marks)
- c. The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp. gr. 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm. (04 Marks)

OR

- 2 a. Define the following : (i) Total pressure (ii) Centre of pressure (04 Marks)
- b. Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane surface submerged in the liquid. (08 Marks)
- c. A rectangular plane surface 2 m wide and 3 m deep lies in water in such a way that its plane makes an angle of 30° with the free surface of water. Determine the total pressure and position of centre of pressure when the upper edge is 1.5 m below the free water surface. (08 Marks)

Module-2

- 3 a. Define : (i) Buoyancy (ii) Centre of Buoyancy (iii) Meta-centre
(iv) Meta-centric height (08 Marks)
- b. Find the volume of water displaced and position of centre of buoyancy for a wooden block of width 2.5 m and of depth 1.5 m, when it floats horizontally in water. The density of wooden block is 650 kg/m^3 and its length 6.0 m. (04 Marks)
- c. A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of the block if its size is $2\text{m} \times 1\text{m} \times 0.8\text{m}$ (08 Marks)

OR

- 4 a. Derive the continuity equation for the 3-D flow in Cartesian co-ordinates. (08 Marks)
- b. Differentiate between :
(i) Stream function and velocity potential function. (ii) Stream line and streak line.
(iii) Rotational and Irrotational flow. (iv) Laminar and Turbulent flow. (08 Marks)
- c. Stream function is given by $\psi = 2xy$. Determine whether the flow is possible or not. (04 Marks)

Module-3

- 5 a. What is a Venturimeter? Derive an expression for the discharge through a Venturimeter. (08 Marks)
- b. An oil of sp.gr. 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$. (08 Marks)

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- c. A pitot-static tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6 m and static pressure head is 5 m. Calculate the velocity of flow assuming the co-efficient of tube equal to 0.98 (04 Marks)

OR

- 6 a. Define Reynold's number. What is its significance? List the characteristics of laminar flow. (08 Marks)
- b. A fluid of viscosity 0.7 NS/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 196.2 N/m^2 . Find, (i) The pressure gradient, (ii) The average velocity (iii) Reynold's number of the flow. (08 Marks)
- c. A rough pipe is of diameter 8.0 cm. The velocity at a point 3.0 cm from wall is 30% more than the velocity at a point 1 cm from pipe wall. Determine the average height of the roughness. (04 Marks)

Module-4

- 7 a. Define Lift force and drag force. Also derive their expressions. (08 Marks)
- b. Define: (i) Laminar boundary layer. (ii) Turbulent boundary layer
(iii) Laminar sub-layer (iv) Boundary layer thickness (08 Marks)
- c. A flat plate $1.5 \text{ m} \times 1.5 \text{ m}$ moves at 50 km/hour in stationary air of density 1.15 kg/m^3 . If the co-efficient of drag and lift are 0.15 and 0.75 respectively, determine :
(i) The lift force.
(ii) The drag force.
(iii) The resultant force.
(iv) The power required to keep the plate in motion. (04 Marks)

OR

- 8 a. Explain dimensional homogeneity with examples. (04 Marks)
- b. Define similitude and explain the following :
(i) Geometric similarity (ii) Kinematic similarity (iii) Dynamic similarity (08 Marks)
- c. The resisting force (R) of a supersonic plane during flight can be considered as dependent upon the length of the aircraft (L), Velocity (V), Air Viscosity (μ), Air density (ρ) and Bulk modulus of air (K). Express the functional relationship between these variables and the resisting force. (08 Marks)

Module-5

- 9 a. Define : (i) Mach number (ii) Mach cone (iii) Zone of action (iv) Super-sonic flow (04 Marks)
- b. Define stagnation properties. Obtain an expression for stagnation pressure of a compressible fluid in terms of Mach number and pressure. (08 Marks)
- c. A projectile travels in air of pressure 10.1043 N/cm^2 at 10°C at a speed of 1500 km/hour. Find the Mach number and Mach angle. Take $K = 1.4$ and $R = 287 \text{ J/kg}^\circ \text{K}$. (08 Marks)

OR

- 10 a. What is CFD? Explain the necessity of CFD. (04 Marks)
- b. List the advantages, disadvantages and applications of CFD. (08 Marks)
- c. Write short note on "Engineering philosophy behind CFD. (08 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2024 Kinematics of Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Distinguish between:
 i) Mechanism and Machine ii) Higher pair and lower pair (04 Marks)
 b. Find the degrees of freedom for the kinematic chains shown in the Fig.Q.1(b). (08 Marks)

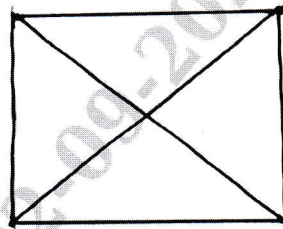


Fig.Q.1(b)(i)

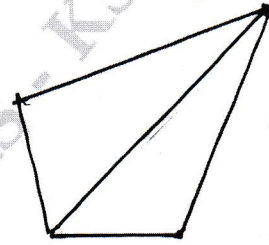


Fig.Q.1(b)(ii)

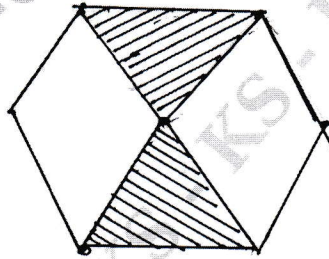


Fig.Q.1(b)(iii)

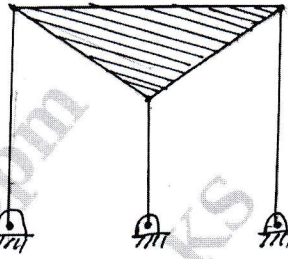


Fig.Q.1(b)(iv)

- c. Explain inversions of mechanism. With neat sketch explain the inversions of single slider crank mechanism with applications for each inversion. (08 Marks)

OR

- 2 a. Sketch and explain Peaucellier's straight line mechanism and prove that it can trace a straight line. (10 Marks)
 b. In a crank and slotted lever quick return mechanism, the driving crank length is 75mm. The distance between the fixed centres is 200mm and the length of the slotted lever is 500mm. Find the ratio of the times taken on the cutting and idle strokes. Determine the effective stroke also. (10 Marks)

Module-2

- 3 A slider crank mechanism has crank AB of 200mm and connecting rod BC of 600mm length. The angular velocity of the crank AB is 30 rad/sec, crank rotates in CW direction. When the crank has turned 30° from inner dead center, find the angular acceleration of connecting rod and acceleration of slider C. (20 Marks)

OR

- 4 a. What is Coroli's component of acceleration? Explain with a neat sketch. (06 Marks)
 b. In a four bar mechanism ABCD, AD is fixed and crank AB rotates at a uniform speed of 300rpm in anticlockwise direction. Lengths of various links are as follows: AB = 20cm, BC = 30cm, CD = 32cm and AD = 60cm. When the crank AB has turned through 60° , locate all instantaneous centers and find the angular velocity of link BC. (14 Marks)

Module-3

- 5 In a slider crank mechanism, crank radius is 100mm and connecting rod length is 500mm. The crank rotates in the counter clockwise direction at an angular velocity of 15 rad/sec and angular acceleration of 115rad/sec^2 . Find the acceleration of piston and the angular acceleration of connecting rod when the crank is at 60° from inner dead centre. (20 Marks)

OR

- 6 Derive the Freudenstein's equation for four bar mechanism. Also explain the function generation for four bar mechanism. (20 Marks)

Module-4

- 7 Draw the profile of a cam operating a knife edge follower from the following data:
 i) Follower to move outward through a distance of 20mm during 120° of cam rotation.
 ii) Dwell for the next 60° .
 iii) Return to initial position during next 90° .
 iv) Dwell for the remaining 90° of cam rotation.

The cam rotates at 500rpm in clockwise direction. The minimum radius of the cam is 40mm and the line of stroke of the follower is offset 15mm from the axis of the cam. Displacement of the follower is to take place with uniform acceleration and retardation motion for both outward and return stroke. Determine the maximum acceleration during outward and return stroke. (20 Marks)

OR

- 8 Draw the profile of a cam operating a roller follower with the following data:
 Minimum cam radius = 25mm, Lift = 30mm, Roller diameter = 20mm. The cam lifts the follower for 120° with SHM followed by a dwell of 30° , then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration, followed by a dwell period. If cam rotates at a uniform speed of 150rpm in clockwise direction. Find the maximum velocity and acceleration during return stroke. (20 Marks)

Module-5

- 9 a. Derive an expression for the minimum number of teeth on pinion to avoid interference. (08 Marks)
 b. The following data relate to a pair of 18° involute gears in mesh:
 Module = 8mm, Number of teeth on pinion = 15, Number of teeth on gear = 45, Addenda on pinion and gear is 1.1 module. Find:
 i) Number of pairs of teeth in contact.
 ii) The angle turned by the gear.
 iii) Ratio of sliding to rolling motion when the tip of the tooth is just making the contact and is just leaving the contact. (12 Marks)

OR

- 10 a. Explain different types of gear trains. (08 Marks)
 b. In an epicyclic gear train, an arm carries two gears A and B having 40 and 50 teeth respectively. If the arm rotates at 120rpm in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 250rpm in the clockwise direction, what will be the speed of gear B? (12 Marks)

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CBCS SCHEME

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18ME46B/18MEB406

Fourth Semester B.E. Degree Examination, June/July 2024 Mechanical Measurements and Metrology

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Metrology. State and explain the objectives of metrology. (07 Marks)
b. Explain with necessary sketch the imperial standard yard. Highlight the significance of Airy points. (08 Marks)
c. A calibrated metre end bar has an actual length of 1000.03mm. It is to be used in the calibration of two bars A and B each having a basic length of 500mm when compared with the metre bar $L_A + L_B$ was found to be shorter by 0.0002mm. In comparing A with B it was found that A was 0.0004mm longer than B. Find the actual length of A and B. (05 Marks)

OR

- 2 a. Explain with necessary sketch the sine bar and sine principle. (07 Marks)
b. Explain with necessary diagram the use of sine bar to determine unknown angle. (08 Marks)
c. With necessary sketch explain the working principle of Vernier bevel protractor. (05 Marks)

Module-2

- 3 a. What is Fit? Explain with necessary sketches the different types of Fits. (10 Marks)
b. Differentiate between hole basis system and shaft basis system. (04 Marks)
c. Calculate the limits of tolerance and allowance for a 25mm shaft and hole pair designated by H_8d_9 . (06 Marks)

OR

- 4 a. Define Comparator. Give the classification of comparators. (04 Marks)
b. Explain the functional requirements of comparators. (04 Marks)
c. Explain with neat sketches the working of following comparators:
i) Johnsons Microkator ii) Solex pneumatic gauge. (12 Marks)

Module-3

- 5 a. What is Best size wire? Explain three wire method of measurement of effective diameter. (08 Marks)
b. With necessary sketch explain the measurement of gear tooth profile using gear tooth Vernier caliper. (08 Marks)
c. Define Addendum Dedendum, tooth profile and pitch circle. (04 Marks)

OR

- 6 a. With a neat sketch, explain the working Toolmaker's microscope. List the applications of TMM. (08 Marks)
b. List the major types of errors of spur gear. (06 Marks)
c. With a necessary sketch explain the measurement of major diameter of a screw thread using bench micrometer. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. What is measurement with the help of block diagram explain the generalized measurement system. (10 Marks)
b. Explain with a neat sketch the working of Cathode Ray oscilloscope. (10 Marks)

OR

- 8 a. Explain the inherent problems present in mechanical modifying devices. (08 Marks)
b. Define error. List and explain different types of errors. (07 Marks)
c. List the elements of mechanical transducer. (05 Marks)

Module-5

- 9 a. List different methods of strain measurement. Explain with neat sketch the working of McLeod gauge. (12 Marks)
b. With a neat sketch, explain the working of proving ring. (08 Marks)

OR

- 10 a. What is thermocouple? State and explain the laws of thermocouple. (06 Marks)
b. Describe the construction and working of optical pyrometer. (08 Marks)
c. Explain with neat sketch the wheat stone bridge arrangement for strain measurement. (06 Marks)
