CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : B.Tech IV Sem Supplementary Examinations January-2025
Course Name : Instrumentation & Control Systems
Course Code : A403309
Branch : Mechanical Engineering
Date & Session : 07-01-2025 AN ·Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.

10x1=10M

1.	Describe different types of sources of errors during measurement.	1 M
2.	Define environmental factor on the design of measuring instruments.	1 M
3.	Discuss briefly about displacement measurement.	1 M
4.	Define thermocouple.	1 M
5.	Define an ultrasonic flow meter.	1 M
6.	Explain the limitations of non-contact type tachometers.	1 M
7.	Define torque and power.	1 M
8.	Discuss about bonded strain gauge.	1 M
9.	List the basic elements of a feedback control system.	1 M
10.	Define servomotor.	1 M

PART-B
Answer the following. Each question carries TEN Marks.

5x10=50M

11.A).	Explain briefly with a neat sketch, photo electric transducers for displacement measurements.	10M
	OR	
11. B).	Describe, the calibration procedure for measuring instruments and its importance.	10M
12. A).	Explain the working of an optical pyrometer with a neat sketch.	10M
	OR	
12. B).	Explain the Mcleod vacuum gauges used for pressure measurement and its limitations.	10M
13. A).	Distinguish, with neat sketches, between the AC and DC Tacho -generators.	10M
	OR	
13. B).	Distinguish between ultrasonic and capacitive type level measuring gauges.	10M
14. A).	i) Distinguish between the quarter bridge and half bridge circuits of Wheatstone bridge used for strain measurements.	5M
	ii) Give the applications of each.	5M
	OR	
14. B).	Explain the working of sling psychomotor with neat sketch.	10M
15. A).	Discuss feedback control system and explain them.	10M
	OR	
15. B).	Explain the transfer functions for first and second order mechanical systems.	10M

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Examination	:	B.Tech IV Sem Supplementary Examinations January-2025
Course Name	:	Manufacturing Processes
Course Code	:	A403302
Branch	:	Mechanical Engineering
Date & Session	:	09-01-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.
10x1=10M

1.	What is the function of pattern?	1 M
2.	What is the purpose of chills and chaplets used in casting?	1 M
3.	Define the term weldability.	1 M
4.	List the advantages of Thermit welding.	1 M
5.	What is explosive welding process?	1 M
6.	What is heat effected zone in welding?	1 M
7.	Define the term strain hardening.	1 M
8.	What is the deference between hot spinning and cold spinning?	1 M
9.	What is rotary forging?	1 M
10.	Define the principle of explosive forming.	1 M

PART-B
Answer the following. Each question carries TEN Marks.
5x10=50M

11.A).	Explain different types of gates and design a gating system.	10M
	OR	
11. B).	Explain with a neat sketch of cupola furnace.	10M
12. A).	Explain different Resistance Welding processes with neat sketches.	10M
	OR	
12. B).	Explain different welded joints and their characteristics.	10M
13. A).	Explain with a neat sketch of laser beam welding process.	10M
	OR	
13. B).	Explain different non-destructive testing of welds and its applications.	10M
14. A).	Explain hydrostatic extrusion process with a diagram.	10M
	OR	
14. B).	What is Drawing? Explain different types of drawing operations.	10M
15. A).	What is cold forging? explain the forces in forging operation.	10M
	OR	
15. B).	Explain Electro-magnetic forming process.	10M

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Examination	:	B.Tech IV Sem Supplementary Examinations January-2025
Course Name	:	Probability, Statistics & Complex Variables
Course Code	:	A400004
Branch	:	Mechanical Engineering
Date & Session	:	10-01-2025 FN

Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   **10x1=10M**

1. Define conditional probability.   1 M
2. When a fair coin is tossed, what is the expected value of the experiment?   1 M
3. Write the probability law of Poisson distribution.   1 M
4. Is the normal distribution symmetric? Why?   1 M
5. Give the formulas of standard error of sample mean and sample proportion.   1 M
6. Write a formula for Z - test for difference of means.   1 M
7. Write Cauchy-Riemann equations.   1 M
8. If $w = iz + 3\bar{z}$, then find the real and imaginary parts of w.   1 M
9. State Cauchy's theorem.   1 M
10. Find the solution of the integral $\int_{0}^{1+i} z^2 dz$.   1 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). In a college, 25% of boys and 10% of girls are studying Mathematics. 60% of the students are girls in the college. (i) What is the probability that Mathematics being selected in the college? (ii) If a student is selected at random and is found to be studying Mathematics, find the probability the student is a girl?   10M

OR

11. B). A random variable X has the following probability density function. Show that the mean of X is 1 and find its variance.   10M

$f(x) = kx(2 - x), \quad x \in [0, 2]$

$\quad = 0, \quad x \notin (0, 2)$

Where k is a real constant such that f(x) is the probability density function of X.

12. A). The probability that the life of a bulb is 0.05. Apply the appropriate probability distribution, find (i) at least one (ii) greater than one (iii) none will be having a life of 100 days.   10M

OR

12. B). In a sample of 1000 students, the mean score of a test is 14 and the standard deviation is 2.5. Assuming the distribution of marks of the students is normal, find (i) how many students will score between 12 and 15? (ii) how many will score above 18? (iii) how many will score below 18? Mention the situations in diagrams.   10M

(P.T.O..)

13. A). i) Discuss Point and Interval estimations through suitable example each.   5M

         ii) Explain the test procedure to test a hypothesis, in general.   5M

<div align="center">OR</div>

13. B). In a survey of buying habits, 400 women shoppers are chosen at random from super   10M
market A located in a certain of the city. Their average weekly food expenditure is Rs.
250 with a standard deviation of Rs. 40. Another 400 women shoppers chosen at random
from super market B in the other section of the city, the average weekly food expenditure
is Rs. 220 with a standard deviation of Rs. 55. Test at 5% level of significance whether
the average weekly food expenditure of the women shoppers are same in the city and how
you conclude it?

14. A). Show that the function $u = 2\log(x^2 + y^2)$ is harmonic and find its harmonic conjugate.   10M

<div align="center">OR</div>

14. B). Prove that z^n , (n is a positive integer) is analytic and hence find its derivative.   10M

15. A).   10M

Evaluate $\int_C (y^2 + 2xy)dx + (x^2 - 2xy)dy$ where C is the boundary of the region by $y = x^2$

and $x = y^2$.

<div align="center">OR</div>

15. B).   10M

Expand $f(z) = \dfrac{1}{z^2}$ by Taylor's series (i) in powers of z + 1 (ii) in powers of z − 2. State

the region of validity of the expansion in each case.

<div align="center">✱✱✱✱✱</div>

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **B.Tech IV Sem Supplementary Examinations Jan-2025**
Course Name : **IC Engines & Gas Turbines**
Course Code : **A403306**
Branch : **ME**
Date & Session : **25-01-2025 FN**   Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	List any two advantages of reciprocating IC engines.	1 M
2.	Thermal efficiency of CI engine is higher than that of SI engine, why?	1 M
3.	What do you mean by pre-ignition in SI engines?	1 M
4.	Define fuel rating?	1 M
5.	What is heat balance sheet?	1 M
6.	What do you mean by clearance volume in reciprocating compressors?	1 M
7.	What do you mean by isentropic efficiency in axial flow compressor?	1 M
8.	State one reason which lowers the volumetric efficiency of compressor.	1 M
9.	The work ratio of closed cycle gas turbine plant depends upon what?	1 M
10.	Thermal efficiency of closed cycle gas turbine plant increases by what process?	1 M

PART-B
Answer any FIVE questions. One question from each unit either A or B (Compulsory)
Each question carries TEN Marks.   5x10=50M

11. A. With neat sketches explain the working principle of four-stroke spark ignition engine.   10M

OR

11. B. (I) Compare SI and CI engines with respect to   7M

(i) basic cycle	(v) compression ratio
(ii) fuel used	(vi) speed
(iii) introduction of fuel	(vii) efficiency
(iv) ignition	(viii) weight

(II) Draw P-V diagram for S.I & C.I engine.   3M

(P.T.O.)

12. A. i) Explain the phenomena of normal and abnormal combustion in S.I engines   6M

ii) Classify S.I engines.   4M

OR

12. B. i) Discuss about the four stages of combustion in CI engines.   7M

ii) What is delay period in CI engines? Also write its importance.   3M

13. A. a) Define the following efficiencies: 5M

    (i) indicated thermal efficiency   (iv) relative efficiency

    (ii) brake thermal efficiency   (v) volumetric efficiency

    (iii) mechanical efficiency

b) The mechanical efficiency of a single-cylinder four-stroke engine is 80%. The frictional power is estimated to be 25 kW. Calculate the indicated power (ip) and brake power (bp) developed by the engine.   5M

OR

13. B. Explain the working principle of reciprocating compressor with neat sketch.   10M

14. A. i) What is a rotary compressor? How are rotary compressors classified?   7M

ii) Discuss about slip factor, adiabatic co-efficient and pressure co-efficient.   3M

OR

14. B. i) A centrifugal compressor delivers 16.5kg/s of air with a total head pressure ratio of 4:1. The speed of the compressor is 1500 r.p.m. Inlet total head temperature is 20°C, slip factor 0.9, power input factor 1.04 and 80% isentropic efficiency. Calculate   6M

        a) Overall diameter of the impeller

        b) Power input

ii) Explain the mechanical details of centrifugal compressor.   4M

15. A. i) A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of the engine. Take γ for air as 1.4.   6M

ii) Differentiate between Ideal cycle, closed cycle and open cycle for gas torbins.   4M

OR

15. B. Describe with neat diagram a closed cycle gas turbine. State also its merits and demerits.   10M

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Examination	:	B.Tech IV Sem Supplementary Examinations January-2025
Course Name	:	Kinematics of Machinery
Course Code	:	A403307
Branch	:	Mechanical Engineering
Date & Session	:	27-01-2025 FN　　　Duration: 3 hours　　　Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.　　　　　　　　10x1=10M

1. Define the term degrees of freedom of a mechanism.　　　　　　1 M
2. Explain the terms: (i) Mechanism (ii) Higher pair　　　　　　1 M
3. What is tangential and radial acceleration?　　　　　　1 M
4. What is the magnitude of Coriolis component of acceleration?　　　　　　1 M
5. What are the limitations of a single Hooke's joint?　　　　　　1 M
6. Classify the Straight-line motion Mechanisms.　　　　　　1 M
7. Define the terms prime circle, pitch circle, base circle of a cam　　　　　　1 M
8. Classify cams and followers with examples?　　　　　　1 M
9. State the advantages of involute profile as a gear tooth profile.　　　　　　1 M
10. What do you understand by the term 'interference' as applied to gears?　　　　　　1 M

PART-B
Answer the following. Each question carries TEN Marks.　　　　　　5x10=50M

11.A). With neat sketches explain inversions of quadratic cycle chain.　　　　　　10M

OR

11. B). Draw the inversions of single slider crank mechanism with neat sketches.　　　　　　10M

12. A). In a slider crank mechanism, the length of crank OB and connecting AB are 125mm & 500mm respectively. The centre of gravity 'G' of the connecting rod is 275mm from the slider A. the crank speed is 600rpm clockwise when the crank has turned 45 0 from the IDC position, determine:　　　　　　10M
i) Velocity of the slider A
ii) Velocity of the point G, and
iii) Angular velocity of the connecting rod AB.

OR

12. B). In a four-bar chain ABCD, AD is fixed and 160mm long. The crank AB is 40mm long and rotates at 150rpm clockwise. The link CD is 80mm long oscillate about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD is 60^0.　　　　　　10M

13. A). Derive the condition for correct steering and which steering gear is preferred and why?　　　　　　10M

OR

13. B). Explain the constructional details and application of Peaucellier mechanism.　　　　　　10M

(P.T.O..)

14. A). A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to given a knife-edged follower the motion as described below: (a) To move outwards through 40 mm during 100° rotation of the cam; (b) to dwell for next 80° (c) To return to its starting position during next 90° and (d) To dwell for the rest period of revolution. Draw the profile of the cam when the line of stroke of the follower passes through the centre of the cam shaft and the line of stroke of the follower is to take place with Uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m.   10M

OR

14. B). A cam with 30 mm as minimum diameter is rotating clockwise at a uniform speed of 1200 rpm and operates a roller follower of 10 mm diameter as given below: (i) Outward stroke of 30 mm during 120^0 of cam rotation with equal uniform acceleration and retardation. (ii) Follower is to dwell for 50^0 of cam rotation. (iii) Inward stroke during 90^0 of cam rotation with equal uniform acceleration and retardation. (iv) Follower is to dwell for the remaining period of cam rotation. Draw the cam profile if the axis of follower passes through the axis of the cam. Determine the maximum velocity and acceleration during outward and inward strokes.   10M

15. A). The following data relate to a pair of 20° involute gears in mesh: Module = 6 mm, Number of teeth on pinion = 17, Number of teeth on gear = 49; Addenda on pinion and gear wheel = 1 module. Find: a) The number of pairs of teeth in contact; b) The angle turned through by the pinion and the gear wheel when one pair of teeth is in contact, and c) The ratio of sliding to rolling motion when the tip of a tooth on the larger wheel (i) is just making contact, (ii) is just leaving contact with its mating tooth, and (iii) is at the pitch point.   10M

OR

15. B). (i) A pair of 20^0 full involute spur gears having 40 and 60 teeth of module 4 mm are in mesh. The smaller gear rotates at 1440 rpm. Find (a) sliding velocity at engagement and disengagement of the pair of teeth, and (b) contact ratio   5M

(ii) Differentiate between Helical and Bevel gears; List out their applications?   5M

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