

H.T No:

--	--	--	--	--	--	--	--	--	--

**R22**



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(UGC AUTONOMOUS)**

**Examination** : B.Tech IV Semester Supplementary Examinations Nov/Dec-2025  
**Course Name** : IC Engines & Gas Turbines  
**Course Code** : A403306  
**Branch** : Mechanical Engineering  
**Date & Session** : 08-12-2025 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. What are the functional requirements of an injection system? 1 M
2. What are the functions of a lubrication system? 1 M
3. What is knocking in SI engines? 1 M
4. What are the four stages of combustion in CI engines? 1 M
5. Define brake specific fuel consumption. 1 M
6. What is the function of the intercooler in a multi-stage reciprocating compressor? 1 M
7. Classify the rotary air compressors. 1 M
8. What are the advantages of axial flow compressors? 1 M
9. What are the essential components of simple gas turbine plant? 1 M
10. What are the applications of the gas turbine plants? 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain the working of a four stroke Diesel engine with neat sketches. 10M
- OR**
11. B). Explain the working of a simple carburetor with a neat sketch. What are its limitations? 10M
12. A). Discuss the factors affecting ignition delay period. 10M
- OR**
12. B). Describe the phenomenon of knocking or detonation in S.I engines. How it can be controlled? 10M
13. A). A four stroke petrol engine delivers 35 kW with a mechanical efficiency of 80%. The fuel consumption of the engine is 0.4gm per kWh and the air fuel ratio is 14:1. The heating value of the fuel is 43000kJ/kg. Find indicated power, friction power and brake thermal efficiency. 10M
- OR**
13. B). Explain the working of single acting single stage reciprocating air compressor with diagram and obtain expression for work done. 10M
14. A). Explain working principles and operation of axial flow compressor with a neat sketch. . 10M
- OR**
14. B). A centrifugal air compressor receives air at 1 bar and delivers it at 3.5 bar. Find the final temperature of air and power required by the compressor if the initial temperature of air is 310 K. The compressor compresses 2 kg of air per second. 10M

(P.T.O..)

15. A). Derive an expression for thermal efficiency of a gas turbine plant. 10M

**OR**

15. B). A simple closed cycle gas turbine installation works between the temperature limits of 300K and 1000K and pressure limits of 1 bar and 5 bar. If 1.25 kg of air is circulated per second, determine the power developed by the turbine. For air, take  $C_p=1.008\text{kJ/kg K}$  and  $C_v=0.718\text{ kJ/kg K}$ . 10M

\*\*\*\*\*



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

<b>Examination</b>	: B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
<b>Course Name</b>	: Instrumentation & Control Systems
<b>Course Code</b>	: A403309
<b>Branch</b>	: Mechanical Engineering
<b>Date &amp; Session</b>	: 09-12-2025 FN
<b>Duration</b>	: 3 hours
<b>Max. Marks</b>	: 60

(Note: Assume suitable data if necessary)

**PART-A**

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- |   |     |
|---|-----|
| 1. Explain the different applications of different measuring instruments. | 1 M |
| 2. Explain the different methods in measurement.                          | 1 M |
| 3. List the various transducers used for displacement measurement.        | 1 M |
| 4. Define pressure thermometer.   | 1 M |
| 5. Define piezo-electric effect.  | 1 M |
| 6. Explain the classification of pressure measuring instruments.          | 1 M |
| 7. List the types of dynamometers.  | 1 M |
| 8. What is strain gauge rosette?  | 1 M |
| 9. Define control system.   | 1 M |
| 10. Define relays.  | 1 M |

**PART-B**

**Answer the following. Each question carries TEN Marks.**

**5x10=50M**

- |   |     |
|---|-----|
| 11.A). Compare mechanical and electrical transducers. Explain theory and construction of any one mechanical transducer. | 10M |
|---|-----|

**OR**

- |  |     |
|--|-----|
| 11. B). Explain the various elements of generalized measurement system with neat sketch. | 10M |
| 12. A). Explain briefly the various types of transmission dynamometers.                  | 10M |

**OR**

- |   |     |
|---|-----|
| 12. B). Define RTDs? On what basic principle do they work? Explain with diagram one of the RTDs.                                | 10M |
| 13. A). Define about non-contact type tachometers? Explain the principle of working of any one of such type with a neat sketch. | 10M |

**OR**

- |   |     |
|---|-----|
| 13. B). List the advantages and limitations of stroboscope.   | 10M |
| 14. A). Discuss briefly with neat diagrams the following methods of liquid level Measurement:<br>(i) Ultrasonic level measuring gauge (ii) Capacitive type with Variable Dielectric constant. | 10M |

**OR**

- |  |     |
|--|-----|
| 14. B). Explain how eddy current dynamometer works.                    | 10M |
| 15. A). Differentiate between open loop system and closed loop system. | 10M |

**OR**

- |   |     |
|---|-----|
| 15. B). Explain the working of a potentiometer. | 10M |
|---|-----|

\*\*\*\*\*

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

**Examination** : B.Tech IV Semester Supplementary Examinations Nov/Dec-2025  
**Course Name** : Manufacturing Processes  
**Course Code** : A403302  
**Branch** : Mechanical Engineering  
**Date & Session** : 10-12-2025 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. Name two types of molds used in the casting process. 1 M
2. Compare the advantages and disadvantages of sand casting. 1 M
3. What are the applications of MIG and TIG welding? 1 M
4. Why is shielding gas used in welding processes like GMAW and GTAW? 1 M
5. Define Soldering process. 1 M
6. Define Brazing process. 1 M
7. Write any four disadvantages of Hot working process? 1 M
8. Compare blanking and piercing. 1 M
9. List out the limitations of direct extrusion? 1 M
10. What is the reciprocating speed of hydraulic punch in impact extrusion? 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Describe the complete casting process, starting from pattern making to the final finishing of the cast product. Include all the key steps involved. 10M

**OR**

11. B). Explain the working principles and significance of components like the pattern, mold, core, sprue, runner, and riser in the casting process. How do they ensure the success of the casting operation. 10M

12. A). Explain the working principle of Gas Tungsten Arc Welding (GTAW or TIG). Describe the roles of tungsten electrode, shielding gas, and filler metal. 10M

**OR**

12. B). What are the causes and remedies involved in Welding Defects? 10M

13. A). Write the advantages and disadvantages and applications of submerged arc welding. 10M

**OR**

13. B). Explain Thermite welding process with a neat sketch. Explain Advantages and disadvantages. 10M

14. A). Explain cold working of metals with a neat sketch. Give a suitable example. 10M

**OR**

14. B). Define forging and explain drop forging with a neat sketch. 10M

15. A). Differentiate about hot working and cold working Processes. 10M

**OR**

15. B). Describe Backward and forward forging processes with neat sketch. 10M

\*\*\*\*\*



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

<b>Examination</b>	: B.Tech IV Semester Supplementary Examinations Nov/Dec-2025	<b>Duration:</b> 3 hours	<b>Max. Marks:</b> 60
<b>Course Name</b>	: Kinematics of Machinery		
<b>Course Code</b>	: A403307		
<b>Branch</b>	: Mechanical Engineering		
<b>Date &amp; Session</b>	: 19-12-2025 FN		

(Note: Assume suitable data if necessary)

**PART-A**

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- |   |     |
|---|-----|
| 1. Explain the term fluid link.   | 1 M |
| 2. Define lower pair.   | 1 M |
| 3. Explain graphical method to determine velocity of a link in a mechanism. | 1 M |
| 4. What is the Coriolis acceleration component?                             | 1 M |
| 5. What is straight line motion mechanism?                                  | 1 M |
| 6. What is ackerman's steering gear.  | 1 M |
| 7. Define the term base circle for a cam mechanism.                         | 1 M |
| 8. What is follower?  | 1 M |
| 9. What is the merit when arc of recess is equal to arc of approach gears?  | 1 M |
| 10. What is velocity of sliding in gears?                                   | 1 M |

**PART-B**

**Answer the following. Each question carries TEN Marks.**

**5x10=50M**

- |   |     |
|---|-----|
| 11.A). Describe the inversions of slider crank chain when<br>i) Sliding pair is fixed ii) crank is fixed. | 10M |
|---|-----|

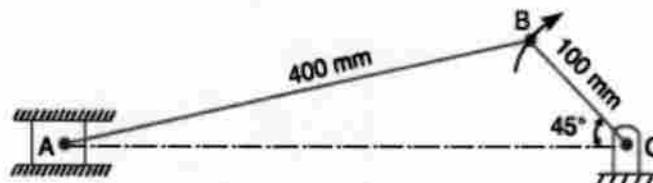
**OR**

- |   |     |
|---|-----|
| 11. B). What is Kutzbach's criterion for degree of freedom of plane mechanisms? In what way is Grubler's criterion different from it? | 10M |
|---|-----|

- |   |     |
|---|-----|
| 12. A). Derive the expression to determine the magnitude of the coriolis component of acceleration. | 10M |
|---|-----|

**OR**

- |   |     |
|---|-----|
| 12. B). Locate all the instantaneous centres of the slider crank mechanism as shown in figure. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find i) Velocity of the slider A and ii) Angular velocity of connecting rod AB. | 10M |
|---|-----|



- |   |     |
|---|-----|
| 13. A). Sketch a Paucellier mechanism. Show that it can be used to trace a straight line. | 10M |
|---|-----|

**OR**

- |  |     |
|--|-----|
| 13. B). Derive an expression for the ratio of angular velocities of the shafts of a Hooke's joint. | 10M |
|--|-----|

(P.T.O..)

14. A). What is a cam? What type of motion can be transmitted with a cam and follower combination? What are its elements? 10M

**OR**

14. B). A tangent cam with straight working faces tangential to a base circle of 120 mm diameter has a roller follower of 48 mm diameter. The line of stroke of the roller follower passes through the axis of the cam. The nose circle radius of the cam is 12 mm and the angle between the tangential faces of the cam is  $90^\circ$ . If the speed of the cam is 180 rpm, determine the acceleration of the follower when (i) during the lift, the roller just leaves the straight flank. (ii) the roller is at the outer end of its lift, i.e., at the top of the nose. 10M

15. A). Compare cycloidal and involute gear tooth profile. 10M

**OR**

15. B). What is interference? Derive the relation for the minimum number of teeth for a pair of involute profile of teeth to avoid interference. 10M

\*\*\*\*\*

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

Examination : B.Tech IV Semester Supplementary Examinations Nov/Dec-2025  
 Course Name : Probability, Statistics & Complex Variables  
 Course Code : A400004  
 Branch : Mechanical Engineering  
 Date & Session : 06-12-2025 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 Expectation of a continuous random variable X. 1 M
2. If A and B are independent events with  $P(A) = 1/3$  and  $P(B) = 1/2$ , then find the probability of their joint occurrence. 1 M
3. What are the underlying assumptions of binomial distribution. 1 M
4. Write the probability density function of exponential distribution. 1 M
5. What do you understand by point estimation? 1 M
6. When do you apply Z - test for difference of proportions? 1 M
7. How do you identify a harmonic function? 1 M
8. List any two properties of analytic function. 1 M
9. Give Cauchy's integral formula. 1 M
10. Define line integral. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). State Baye's theorem. 10M  
 In a bolt factory, machines A, B, C manufacture 20%, 30% and 50% of the total of their output and it is found that 6% 3% and 2% are defective bolts. A bolt is drawn at random and is found to be defective. Find the probabilities that the defective bolt is manufactured by (machine A (ii) machine B and (iii) machine C
- OR**
11. B). A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number of defective items. 10M
12. A). If a random variable X follows Poisson distribution such that  $P(X = 1) = P(X = 2)$ , find (i) the mean (ii)  $P(X = 4)$  (iii)  $P(X > 1)$  (iv)  $P(1 < X < 3)$  10M
- OR**
12. B). In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of distribution. 10M
13. A). A Researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there are 150 students have mean IQ of 75 with S.D. of 15 in the second group there are 250 students having mean IQ of 70 with S.D 20. 10M

(P.T.O.)

**OR**

13. B). A company wanted to introduce a new plan of work and a survey was conducted for this purpose. Out of a sample of 500 workers in one group 62% favoured the new plan and another group of a sample of 400 workers 41% were against the new plan. Is there any significant difference between the two groups in their opinion towards the new plan at 5% level of significance. 10M

14. A). Find all possible values of  $z$  which satisfy (i)  $e^z = -2$  (ii)  $e^z = 1 + i$  (iii)  $e^z = 1 + 2i$ . 10M

**OR**

14. B). Show that both the real and imaginary parts of an analytic function  $f(z)$  are harmonic. 10M

15. A). Evaluate  $\int_{(0,0)}^{(1,1)} (3x^2 + 4xy + ix^2) dz$  along the curve  $y = x^2$ . 10M

**OR**

15. B). Obtain Laurent's series of the function  $f(z) = z/[(z+1)(z+2)]$  about  $z = -2$  10M

\*\*\*\*\*