H.T No: | | | | | | | | | | | R22

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : **B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025**
Course Name : **Design of Machine Elements**
Course Code : **A403312**
Branch : **Mechanical Engineering**
Date & Session : **27-11-2025 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. Enumerate the most commonly used engineering materials. 1 M
2. Describe the condition of failure according to maximum shear stress theory. 1 M
3. Define the term fatigue. 1 M
4. Give the expression of Soderberg method, when a machine component is subjected to reversed shear loading. 1 M
5. How the shocks absorbing capacity of a bolt can be increased. 1 M
6. Define the Nominal diameter and pitch. 1 M
7. What is the difference between a cotter and Key. 1 M
8. How is the strength of a shaft affected by the keyway. 1 M
9. Explain the effect of key-way on the strength of a shaft. 1 M
10. Give at least two practical applications of couplings 1 M

PART-B

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

11.A). Explain the general considerations involved in machine design. 10M

OR

11. B). A machine element is subjected to the stresses σ_x=120 MPa and σ_y= 60 MPa and τ_{xy}= 36 MPa having yield stress as 250 MPa. Estimate factory of safety using Maximum principal stress theory, Maximum shear stress theory and Maximum distortion energy theory. 10M

12. A). Calculate the factor of safe using the Soderberg method, for a shaft diameter 60mm made of carbon steel having ultimate tensile strength of 730 MPa and yield strength of 510 MPa which is subjected to a torque which fluctuates between 2 kN-m and 1 kN-m. The endurance limit in reversed bending may be assumed to be one-half of the ultimate tensile strength. Taking the correction factor for surface finish and size are 0.87 and 0.85 respectively. 10M

OR

12. B). A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2. The corrected endurance limit stress for the machine component is 270 N/mm^2. The ultimate tensile strength and yield strength of the material are 600 N/mm^2 and 450 N/mm^2 respectively. Find the factory of safety using Soderberg line and Goodman line. 10M

(P.T.O.)

13. A). A wall bracket is attached to the wall by means for four identical bolts, two at A and two at B, as shown in Figure 1. Assuming that the bracket is held against the wall and prevented from tipping about the point C by all four bolts and using an allowable tensile stress in the bolts as 35 N/mm^2. Determine the size of the bolts on the basis of maximum principal stress theory. 10M

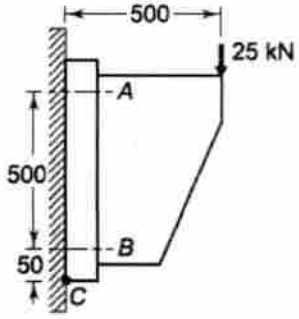

Figure. 1

OR

13. B). Determine the efficiency of double-riveted lap joint with zigzag riveting made from 6mm plates using six 16mm diameter rivets. The values for the design limits for tensile, shear and crushing stress can be taken as 70, 60 and 131 MPa, respectively. 10M

14. A). A 20kW power is transmitted at 900 rpm form a motor shaft, through a key, to a machine shaft by a means of a pulley and a belt. Design the key. Take the allowable shear stress and crushing stress as 35 N/mm^2 and 120 N/mm^2. 10M

OR

14. B). Design a knuckle joint to connect two circular rods made of plain carbon steel subjected to an axial tensile force of 50 kN. The permissible stresses are 65 MPa in tension, 50 MPa in shear and 83 MPa in crushing. 10M

15. A). A shaft can transmit power of 20 kW at 1000 rpm. The actual torque transmitted by shaft is ± 60 % of the mean torque calculated. Shaft is also subjected to a variable bending moment of 500 N-m to 1000 N-m. The maximum bending moment occurs at the same instant as that of maximum torque. Determine the diameter of the shaft required selecting material. Take factor of safety 2, size factor = 0.85 and surface factor = 0.8. 10M

OR

15. B). It is required to design cast iron protective type of flange coupling to connect two shafts. The input shaft transmits 37.5 kW power at 180 rpm to the output shaft through the coupling. The service factor for the application is 1.5. Consider the following date for design of the coupling: shear stress for shaft, bolt and key = 40Mpa, crushing stress for bolt and key =80Mpa, shear stress for cast iron = 8Mpa. Draw a neat sketch of coupling. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025**
Course Name : **Metrology & Machine Tools**
Course Code : **A403310**
Branch : **Mechanical Engineering**
Date & Session : **29-11-2025 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. Define oblique cutting. 1 M
2. Name the types of chips produced during metal cutting. 1 M
3. Define counterboring and countersinking. 1 M
4. What type of mechanism is used in slotting machines? 1 M
5. What is dressing of a grinding wheel? 1 M
6. Mention two differences between honing and lapping. 1 M
7. State Taylor's Principle of gauge design. 1 M
8. State the difference between unilateral and bilateral tolerance. 1 M
9. What is the difference between roughness and waviness? 1 M
10. What is the purpose of performing alignment tests on a milling machine? 1 M

PART-B

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

11.A). Explain the forces in orthogonal cutting and illustrate them using a Merchant's Circle with a neat diagram. 10M

OR

11. B). Describe in detail the various operations that can be performed on an engine lathe with neat sketches. 10M

12. A). Explain the different types of drilling operations with neat sketches. 10M

OR

12. B). Compare shaping, slotting, and planing machines in terms of their construction and applications. 10M

13. A). Describe various types of milling cutters and their applications with neat sketches. 10M

OR

13. B). Compare surface grinding, cylindrical grinding and centerless grinding. 10M

14. A). Explain the different types of fits with neat sketches. 10M

OR

14. B). Explain the different instruments used for measurement of angles with neat sketches. 10M

15. A). Explain with neat sketches the stylus method of surface roughness measurement. 10M

OR

15. B). Explain the different methods of measuring gear tooth thickness with neat sketches. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025**
Course Name : **Business Economics & Financial Analysis**
Course Code : **A400102**
Branch : **Mechanical Engineering**
Date & Session : **02-12-2025 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. List out any two types of business entities. 1 M
2. What is inflation? 1 M
3. Define Law of Demand. 1 M
4. What is test marketing? 1 M
5. List out factors of production. 1 M
6. Explain about marginal cost. 1 M
7. Explain about double entry bookkeeping. 1 M
8. What is the meaning of Journal? 1 M
9. Name any two types of Liquidity ratios. 1 M
10. List out any two types Profitability ratios. 1 M

PART-B

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

11.A). Distinguish between Public limited company and Private limited company with suitable examples. 10M

OR

11. B). Explain in detail the methods of measuring National Income. 10M

12. A). Categorize the various types of Elasticity of Demand. 10M

OR

12. B). Explain in detail any two Demand Forecasting techniques. 10M

13. A). Classify the various stages of Law of Variable proportion with suitable example. 10M

OR

13. B). i) Demonstrate the various stages of Product life cycle with the help of a diagram. 5M
ii) Identify the various causes for monopoly markets. 5M

14. A). Examine the various accounting concepts and conventions. 10M

(P.T.O..)

OR

14. B). From the following trial balance and adjustment of ABC company Ltd, prepare trading and profit and loss account and balance sheet for the period ending 31-12-2017 10M

	Rs/-	Rs/-
Sundry debtors	64,000	
Stock(1-1-2-17)	44,000	
Cash in hand	70	
Plant and machinery	35,000	
Sundry creditors		21,300
Trade expenses	2,150	
Sales		2,69,000
Salaries	4,450	
Carriage outwards	800	
Rent	1,800	
Bills payable		15,000
Purchases	2,37,740	
Discounts	2,200	
Business premises	69,000	
Capital (1-01-2017)		1,59,000
Cash at bank	3,090	
	4,64,300	4,64,300

Adjustments:

i) The stock as on 31-12-2017 was Rs/- 24,900
ii) Rent was unpaid to the extent of Rs/- 170
iii) Outstanding trade expenses were Rs/- 300
iv) Write off for bad debts Rs/-800
v) Provide 5% for doubtful debts
vi) Depreciate plant and machinery @ 10 % per annum
vii) Business premises are to be depreciated by 2% per annum.

15. A). i) Explain the significance and limitations of Ratio Analysis. 5M
ii) Explain about any two types of Leverage ratios. 5M

OR

15. B). Calculate the debt equity ratio and current ratio from the following information 10M

Particulars	Amount(Rs/-)	Particulars	Amount(Rs/-)
Debentures	1, 40,000	Bank balance	30,000
Long term loans	70,000	Sundry debtors	70,000
General reserves	40,000		
Creditors	66,000		
Bills payable	14,000		
Share capital	1,20,000		

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025**
Course Name : **CAD/CAM**
Course Code : **A403314**
Branch : **Mechanical Engineering**
Date & Session : **04-12-2025 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. Define a design workstation. 1 M
2. What is a parametric representation of a curve? 1 M
3. Define blending functions. 1 M
4. What is a ruled surface? 1 M
5. What are the different elements of NC system? 1 M
6. What do you understand the M and G functions? 1 M
7. What is the purpose of production flow analysis? 1 M
8. What are the benefits of MRP? 1 M
9. What are the inputs and outputs of FMS? 1 M
10. What is the role of computers in quality control? 1 M

PART-B

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

11.A). Differentiate the terms wire frame, surface and solid models, along with their benefits. 10M

OR

11. B). What is the most commonly used graphics terminal? Explain its working? 10M

12. A). Explain constructive solid geometry (CSG) and boundary representation (B-rep) methods of solid modeling. 10M

OR

12. B). What is meant by sweep? Discuss in detail the various types of sweep techniques available for 3Dgeometric construction. 10M

13. A). Explain the concept of adaptive control of NC machines and explain the types of adaptive control systems? 10M

OR

13. B). What are the main features of CNC Machine Tool? Write any 10 G-codes and 10 M-codes with a short description. 10M

14. A). Discuss how part classification is done in the context of GT. What are the essential attributes such a coding system should take care of? 10M

OR

14. B). Write short notes on: 10M
(i) Enterprise Resource Planning (ERP) (ii) Capacity Requirements Planning (CRP).

15. A). Describe the following with respect to CIM. i) Process monitoring and control ii) Quality control. 10M

OR

15. B). How does Lean manufacturing differ from Flexible manufacturing system? Explain. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	**B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025**
Course Name	:	**Dynamics of Machinery**
Course Code	:	**A403308**
Branch	:	**Mechanical Engineering**
Date & Session	:	**06-12-2025 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.	Define gyroscopic precession and state its effect on a two-wheeler.	1 M
2.	Explain D'Alembert's principle in dynamic force analysis.	1 M
3.	What is a turning moment diagram? Mention its importance.	1 M
4.	Define fluctuation of energy and coefficient of fluctuation of speed.	1 M
5.	Name the different types of clutches and give one example of each.	1 M
6.	What is the function of a dynamometer?	1 M
7.	Define primary and secondary balancing.	1 M
8.	What is meant by hammer blow in locomotives?	1 M
9.	Define free and forced vibrations.	1 M
10.	What is meant by critical speed of a shaft?	1 M

PART-B

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

11.A). i) A gyroscope rotor of mass 10 kg rotates at 1200 rpm. The rotor's radius of gyration is 120 mm. Find the gyroscopic couple if the precession speed is 1 rad/s and discuss its effect on an airplane taking a left turn. 3M

ii) A ship propelled by a turbine rotor which has a mass of 5 tonnes and a speed of 2100 r.p.m. The rotor has a radius of gyration of 0.5 m and rotates in a clockwise direction when viewed from the stern. Find the gyroscopic effects in the following conditions: 7M

a) The ship sails at a speed of 30 km/h and steers to the left in a curve having 60 m radius.

b) The ship pitches 6 degree above and 6 degree below the horizontal position. The bow is descending with its maximum velocity. The motion due to pitching is simple harmonic and the periodic time is 20 seconds.

OR

11. B). A slider-crank mechanism has crank = 75 mm, connecting rod = 300 mm, crank speed = 1000 rpm. Find the velocity and acceleration of the piston when the crank is at 30°. Also determine the position of the crank for zero acceleration of the piston. 10M

(P.T.O.)

12. A). The flywheel of a steam engine has a radius of gyration of 1 m and mass 2500 kg. The starting torque of the steam engine is 1500 N-m and may be assumed constant. Determine: i). the angular acceleration of the flywheel, and ii). the kinetic energy of the flywheel after 10 seconds from the start. 10M

OR

12. B). In a Porter governor, each of the four arms is 400 mm long. The upper arms are pivoted on the axis of the sleeve whereas the lower arms are attached to the sleeve at a distance of 45 mm from the axis of rotation. Each ball has a mass of 8 kg and the load on the sleeve is 60 kg. What will be the equilibrium speeds for the two extreme radii of 250mm and 300 mm of rotation of the governor balls? 10M

13. A). A single plate clutch is required to transmit 8 kW at 1000 rpm. The axial pressure is limited to 70 kN/m^2. The mean radius of the plate is 4.5 times the radial width of the friction surface. If both the sides of the plate are effective and the coefficient of friction is 0.25, find the (i) inner and the outer radii of the plate and the mean radius (ii) width of the friction lining. 10M

OR

13. B). A car moving on a level road at a speed 50 km/h has a wheel base 2.8 metres, distance of C.G. from ground level 600 mm, and the distance of C.G. from rear wheels 1.2 metres. Find the distance travelled by the car before coming to rest when brakes are applied to the rear wheels only. The coefficient of friction between the tyres and the road may be taken as 0.6. 10M

14. A). Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90^0 and 195^0 respectively with that of mass B in the counter-clockwise direction. The rotating masses have the following properties: $m_b = 25$ kg; $m_c = 40$ kg; $m_d = 35$ kg; $r_a = 150$ mm ; $r_b = 200$ mm ; $r_c = 100$ mm; $r_d = 180$ mm; Planes B and C are 250 mm apart. Determine the (i) Mass A and its angular position with that of mass B. (ii) Positions of all the planes relative to plane of mass A. 10M

OR

14. B). Four masses A, B, C and D carried by a rotating shaft at radii 80 mm, 100 mm, 160 mm and 120 mm respectively are completely balanced. Masses B, C and D are 8 kg, 4 kg and 3 kg respectively. Determine the mass A and the relative angular positions of the four masses if the planes are spaced 500 mm apart. 10M

15. A). A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft. 10M

OR

15. B). A steel shaft 1.5 m long is 95 mm in diameter for the first 0.6 m of its lengh, 60 mm in diameter for the next 0.5 m of the length and 50 mm diameter for remaining 0.4 m of its length. The shaft carries two flywheels at two ends, the first having a mass of 900 kg and 0.85 m radius of gyration located at the 95 mm diameter end and the second having a mass of 700 kg and 0.55 m radius of gyration located at the other end. Dertemine the loaction of the node and the natural frequecy of free torsional vibration of the system. The modulus of rigidity of the shaft material may be taken as 80 GN/m^2. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	**B.Tech V Semester Regular & Supplementary Examinations Nov/Dec-2025**
Course Name	:	**Steam Power & Jet Propulsion**
Course Code	:	**A403311**
Branch	:	**Mechanical Engineering**
Date & Session	:	**08-12-2025 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.	Name the four main components of a Rankine cycle.	1 M
2.	State the function of a feed check valve.	1 M
3.	What is critical pressure ratio in a steam nozzle?	1 M
4.	Why is the condenser placed below the turbine in a power plant?	1 M
5.	State one difference between impulse and reaction turbines.	1 M
6.	Why is the steam expanded in nozzles and not on blades in an impulse turbine?	1 M
7.	What happens to turbine efficiency if the draft tube is removed in reaction turbines?	1 M
8.	How can you increase the efficiency of a jet engine?	1 M
9.	Name one mechanical method used for thrust augmentation.	1 M
10.	What is the main advantage of liquid-propellant rockets over solid ones?	1 M

PART-B

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

11.A).	Explain the working of a regeneration cycle with a neat sketch. Also state its advantages and disadvantages.	10M
	OR	
11. B).	Classify the different types of draughts and explain forced draught and induced draught systems with diagrams.	10M
12. A).	A convergent divergent nozzle receives steam at 10bar and 200^0C and exhaust to 5bar. The mass flow rate of the steam is 0.1kg/s and the flow is isentropic. Neglecting inlet velocity make calculations for the nozzle exit area. If the nozzle coefficient is 0.92. Determine the exit area.	10M
	OR	
12. B).	Explain central flow surface condenser with a neat sketch. Also explain the advantages of a surface condenser.	10M
13. A).	Explain the mechanical details and construction of an impulse turbine with a neat sketch.	10M
	OR	
13. B).	With a neat labeled diagram, explain the working of a velocity-compounded impulse turbine (Curtis stage).	10M

(P.T.O..)

14. A). The following data refer to a particular stage of a parson's reaction turbine: Speed of the turbine = 1500 rpm Mean diameter of the rotor = 1m. Stage efficiency = 80% Blade outlet angle = 20^0 Speed ratio = 0.7 Determine the available isentropic enthalpy drop in the stage. 10M

OR

14. B). Explain the working of the Ram – jet with a neat sketch. Also mention its advantages and disadvantages. 10M

15. A). Compare turbojet, turbofan, turboprop, and turboshaft engines in terms of performance, applications, and efficiency. 10M

OR

15. B). i) How rockets are classified? 4M

ii) What is the essential difference between rocket propulsion and turbojet propulsion? 6M

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