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R22



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : B.Tech V Semester Regular Examinations December-2024
Course Name : Dynamics of Machinery
Course Code : A403308
Branch : Mechanical Engineering
Date & Session : 18-12-2024 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 axis about which precession occurs in a gyroscope. 1 M
2. Why is D'Alembert's Principle used in dynamic analysis? 1 M
3. Define maximum fluctuation of energy. 1 M
4. What is the main difference between a Watt and a Porter governor? 1 M
5. Name the three main types of clutches. 1 M
6. What is the primary function of a brake? 1 M
7. Define secondary balancing in reciprocating masses. 1 M
8. Explain the concept of hammer blow in locomotive balancing. 1 M
9. Define damped free vibration. What is the effect of damping on the amplitude of vibration? 1 M
10. How is the critical speed of a shaft defined? 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). An aeroplane makes a complete half circle of 50 metres radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. 10M

OR

11. B). If the crank and the connecting rod are 300 mm and 1 m long respectively and the crank rotates at a constant speed of 200 r.p.m., determine: 1. The crank angle at which the maximum velocity occurs, and 2. Maximum velocity of the piston. 10M

12. A). The mass of flywheel of an engine is 6.5 tonnes and the radius of gyration is 1.8 metres. It is found from the turning moment diagram that the fluctuation of energy is 56 kN-m. If the mean speed of the engine is 120 r.p.m., find the maximum and minimum speeds. 10M

OR

12. B). A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor. 10M

(P.T.O..)

13. A). A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2 . Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. 10M

OR

13. B). Describe the construction and operation of a prony brake or rope brake absorption dynamometer. 10M

14. A). Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are $45^\circ, 75^\circ$ and 135° . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. 10M

OR

14. B). The data refer to two cylinder locomotive with cranks at 90° : Reciprocating mass per cylinder = 300 kg; Crank radius = 0.3 m ; Driving wheel diameter = 1.8 m ; Distance between cylinder centre lines = 0.65 m ; Distance between the driving wheel central planes = 1.55 m. 10M

Determine : 1. the fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 km. p.h. ; 2. the variation in tractive effort ; and 3. the maximum swaying couple.

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 shaft 1.5 m long, supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2 . Find the lowest whirling speed of the shaft, taking into account the mass of the shaft. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech V Sem Regular Examinations December-2024
Course Name : Design of Machine Elements
Course Code : A403312
Branch : Mechanical Engineering
Date & Session : 20-12-2024 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 factor safety? How it changes for ductile and brittle materials? 1 M
2. In a bi-axial stress problem, the stresses in x and y directions are $\sigma_x = 200$ MPa and $\sigma_y = 100$ MPa. Determine the maximum principal stress in MPa. 1 M
3. Draw the S-N curve for ductile material. 1 M
4. Write Goodman's equation for design of a component. 1 M
5. What permissible stresses are used in design of welded joints? 1 M
6. How is rivet specified? 1 M
7. What is cotter joint? Classify cotter joints? 1 M
8. How are the keys classified? 1 M
9. Which theories of failure are applicable for shafts? 1 M
10. Define coupling. Write suitable material for couplings. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). A machine member is subjected to the normal stress of 150 MPa along with a shear stress of 50 MPa. Find the equivalent stress from the following theories of failure. (i) Maximum shear stress theory (ii) Maximum principal stress theory 10M

OR

- 11.B). The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to (i) Maximum Principal stress theory, (ii) Maximum Principal strain theory, (iii) Distortion energy theory. If the yield strength is taken as 250 MPa and factor of safety as 2. 10M

- 12.A). A circular rod made of ductile material has endurance strength of 280 N/mm² and ultimate strength of 350 N/mm². The member is subjected to a variable axial load varying from + 70 kN (tensile) to - 300 kN (Compressive). Take fatigue stress concentration factor as 1.8 and factor of safety as 2.0. Find a suitable diameter of the rod. 10M

OR

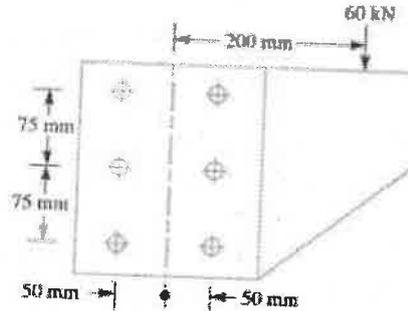
- 12.B). A 50mm diameter shaft is made from cold drawn carbon steel having ultimate tensile strength of 630 Mpa and yield strength 510Mpa. It is subjected to fluctuating torque (minus) 800 N-m to (plus) 2000 N-m. Calculate the factor of safety. Take Size factor is 0.9 and surface finish factor is 0.92. 10M

(P.T.O.)

13. A). Find the efficiency of the riveted joint of single riveted lap joint of 5 mm plates with 24 mm diameter rivets having a pitch of 55 mm. The safe working stresses are as follows: $\sigma_t = 90$ MPa; $\tau = 60$ MPa and $\sigma_c = 120$ MPa. 10M

OR

13. B). A bracket is riveted to a column by 6 rivets of equal size as shown in Figure. It carries a load of 60 kN at a distance of 200 mm from the centre of the column. If the maximum shear stress in the rivet is limited to 150 MPa, determine the diameter of the rivet. 10M



14. A). Design a socket and spigot cotter joint carrying a tensile load of 25kN. The allowable tensile strength = allowable compressive strength = 300Mpa, shear strength = 200 Mpa. Assume the factor of safety as 4. 10M

OR

14. B). Design a knuckle joint to transmit 150 KW. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. 10M

15. A). A shaft made of mild steel is required to transmit 100 KW at 300 r.p.m. The supported length of the shaft is 3 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Assuming the safe value of stress as 60 MPa, determine the diameter of the shaft. 10M

OR

15. B). Design a muff coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech V Sem Regular Examinations December-2024

Course Name : Metrology & Machine Tools

Course Code : A403310

Branch : Mechanical Engineering

Date & Session : 23-12-2024 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 tool life. 1 M
2. Classify lathe machines. 1 M
3. How a drilling machine is specified? 1 M
4. Differentiate planning and shaping machines. 1 M
5. What is indexing in milling machine? 1 M
6. Classify broaching machines. 1 M
7. Distinguish unilateral and bilateral tolerance system. 1 M
8. Give the limitations of sine bar. 1 M
9. List the factors affecting surface roughness. 1 M
10. List out the applications of CMMs. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Draw a Merchant's Circle diagram and derive expression to show relationships among the forces acting on the cutting tool. 10M
- OR**
11. B). Describe various lathe accessories used on a lathe machine with neat sketches. 10M
12. A). List and explain the various operations performed on drilling machine with neat sketches. 10M
- OR**
12. B). Describe the feed mechanism of a shaper with a neat sketch. 10M
13. A). What are the various types of milling cutters used in milling explain? 10M
- OR**
13. B). How grinding machines are classified? Explain plain cylindrical grinding machine with neat sketch. 10M
14. A). i) Define fit? With neat sketch describe three types of fits. 5M
ii) Distinguish between 'Hole basis system' and 'Shaft basis system' of fits 5M
- OR**
14. B). Describe with a neat sketch the principle of working of an auto-collimator. Explain how flatness of the surface is determined with help of an auto-collimator? 10M

(P.T.O.)

15. A). With a neat sketch, the principle and working of Talysurf roughness tester for the measurement of surface finish. 10M

OR

15. B). What is 'best size of wire' for effective diameter measurement? Derive a relationship for the best size wire in terms of its effective diameter. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech V Sem Regular Examinations December-2024
Course Name : Business Economics & Financial Analysis
Course Code : A400102
Branch : Mechanical Engineering
Date & Session : 26-12-2024 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 Sole proprietorship? 1 M
2. What is Micro Economics? 1 M
3. Explain the Law of Demand. 1 M
4. What are the determinants of supply? 1 M
5. What are the factors of production? 1 M
6. What is Product Life Cycle? 1 M
7. Explain the features of Balance sheet. 1 M
8. What are the five accounting concept? 1 M
9. Write the formula of Liquidity ratio 1 M
10. Define solvency. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain the structure of a business firm and discuss the role of different types of business entities. 10M

OR

11. B). Discuss the concept of national income and explain the nature and scope of Business Economics. 10M

12. A). Explain the characteristics of good demand forecasting and outline the steps involved in the demand forecasting process. 10M

OR

12. B). Discuss the factors that affect elasticity of demand and how understanding elasticity can benefit businesses. 10M

13. A). Define the cost and explain the types of cost. 10M

OR

13. B). Discuss the importance of break-even analysis and explain how it assists businesses in pricing decisions. 10M

(P.T.O.)

14. A). Discuss the elements of financial statements and explain the process of preparing final accounts. 10M

OR

14. B). i) Describe the advantages and disadvantages of double entry bookkeeping. 5M

ii) Mr. Normal has the following transactions in the month of April. Write Journal Entries for the transactions. 5M

10th April: Commenced business with a capital of Rs.1,00,000

11th April: Purchased goods from Veeru for Rs.20,000

13th April: Purchased Goods for Cash Rs. 15,000

14th April: Purchased Goods from Abhiram for cash Rs.9,000

16th April: Bought Goods from Shyam on credit Rs.12,000

17th April: Sold goods worth Rs.15,000 to Tarun

19th April: Sold goods for cash Rs.20,000

20th April: Sold goods to Utsav for cash Rs.6,000

21st April: Sold goods to Pranav on credit Rs.17,000

22nd April: Returned goods to Veeru Rs. 3,000

15. A). Discuss the significance of ratios and explain the types of ratios. 10M

OR

15. B). i) Given the values of Rs.3,00,000 for sales, Rs. 1,60,000 for cost of goods sold and Rs.60,000 for inventory in a company, what is its inventory turnover? 5M

ii) A firm makes sales of Rs. 50,00,000 for the year of which 60% is on credit basis. The balance of debtors at the beginning and the end of the year were Rs. 4,00,000 and Rs.3,00,000 respectively. Calculate debtor's turnover ratio and debt collection period 5M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech V Sem Regular Examinations December-2024

Course Name : CAD/CAM

Course Code : A403314

Branch : Mechanical Engineering

Date & Session : 28-12-2024 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 one benefit of using CAD in design. 1 M
2. How does regenerative surface modeling differ from parametric surface modeling? 1 M
3. Define surface modeling. 1 M
4. What is a B-spline surface? 1 M
5. How do adaptive control systems improve CNC machine efficiency? 1 M
6. What is an NC part program? 1 M
7. Describe the role of Machine cell in Group technology. 1 M
8. Define capacity requirements planning (CRP). 1 M
9. What is the significance of CIM (Computer Integrated Manufacturing)? 1 M
10. What is meant by automated inspection? 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain the process of geometric modeling, focusing on interpolation and approximation of curves. 10M

OR

11. B). i) Interpret the hardware components necessary for a CAD/CAM system. 5M
ii) Outline different types of CAD/CAM software and their applications. 5M

12. A). Discuss the challenges involved in surface parameterization for complex shapes like turbine blades or automotive panels. Include real-world applications. 10M

OR

12. B). Identify and enumerate the process of generating solid models using sweep representation and boundary representation techniques. Compare their strengths and limitations. 10M

13. A). i) Examine the architecture of a Direct Numerical Control (DNC) system and analyze how it improves production flexibility. 5M
ii) Identify the various methods of NC part programming, focusing on the advantages and drawbacks of manual programming vs. computer-assisted programming 5M

OR

13. B). i) Explain the difference between the NC, CNC and DNC systems. 7M
ii) Describe the role of post-processors in NC part programming. 3M

(P.T.O.)

14. A). i) Analyze how Group Technology influences factory layout design. Analyze the impact of part families and coding systems on reducing setup times and inventory costs. 5M
ii) Examine the benefits and challenges of using MRP in computer-aided production planning. 5M

OR

14. B). Criticize the concept of generative process planning. How does it differ from retrieval process planning, and what are its implications for production efficiency? 10M

15. A). i) Analyze the role of Flexible Manufacturing Systems (FMS) in optimizing production layouts. 5M
ii) Explain the concept of automated inspection in quality control. 5M

OR

15. B). Analyze the role of Coordinate Measuring Machines (CMM) and Automated Inspection Systems in maintaining high standards of product quality. How do these systems integrate with CAD data for real-time feedback? 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : B.Tech V Sem Regular Examinations December-2024
Course Name : Steam Power & Jet Propulsion
Course Code : A403311
Branch : Mechanical Engineering
Date & Session : 30-12-2024 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 the various components in a steam power plant. 1 M
2. List various boiler mountings. 1 M
3. Classify steam nozzles. 1 M
4. Define condenser efficiency. 1 M
5. Define blade efficiency. 1 M
6. What are the various methods to reduce the rotor speed of a turbine? 1 M
7. Write the conditions for 50% degree of reaction in Parson's turbine. 1 M
8. Classify jet engines. 1 M
9. Sketch the flow diagram of the turbo-jet engine. 1 M
10. Classify rocket engines. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). i) What are the advantages of reheating and regeneration in steam power plants? 4M
ii) In a steam turbine power plant, steam entering at 20 bar, 360°C is expanded to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assuming ideal processes, estimate per kg of steam (a) the power developed by the turbine (b) heat supplied in the boiler (c) heat rejected in the condenser and (d) the cycle efficiency. 6M

OR

11. B). i) Compare the fire-tube and water-tube boilers 4M
ii) Describe the functions of (a) superheater (b) air preheater and (c) fusible plug. 6M
12. A). i) Explain the features of various types of steam nozzles. 5M
ii) Dry saturated steam enters a frictionless adiabatic nozzle with negligible velocity at a temperature of 300°C. It is expanded to a pressure of 5000 kPa. The mass flow rate is 1 kg/s. Calculate the exit velocity of steam. 5M

OR

12. B). i) Describe the working of an evaporative condenser with a neat sketch. 6M
ii) What are the various sources of air leakage into condenser? What are its effects? 4M

(P.T.O..)

13. A). A simple impulse turbine has a mean blade speed of 200 m/s. The nozzles are inclined at 20° to the plane of rotation of the blades. The steam velocity from nozzles is 600 m/s. The turbine uses 3500 kg/h of steam. The absolute velocity at exit is along the axis of the turbine. Determine: (i) The inlet and exit angles of the blades. (ii) The power output of the turbine. (iii) The diagram efficiency. (iv) The axial thrust. Assume inlet and outlet angles to be equal. 10M

OR

13. B). i) Derive the expression for the blade efficiency in a simple impulse turbine. 5M
ii) Explain the principle of working of a velocity compounded impulse turbine. 5M

14. A). In a reaction turbine, the fixed blades and moving blades are of the same shape but reversed in direction. The angles for the receiving tips are 35° and of the discharging tips 20° . Find the power developed per pair of blades for a steam consumption of 2.5 kg/s, when the blade speed is 50 m/s. If the heat drop per pair is 10.04 kJ/kg, find the efficiency of the pair. 10M

OR

14. B). i) Explain the working of a reaction turbine with a neat sketch. 5M
ii) Explain the working of a turbo-prop engine with a neat sketch. 5M

15. A). i) Define the following terms related to the turbo-jet engine: (a) compressor efficiency 6M
(b) turbine efficiency and (c) thermal efficiency.
ii) Describe the thermodynamic cycle of operation of the turbo-jet engine. 4M

OR

15. B). Explain the working of a rocket engine with a neat sketch. 10M
