III Year B. Tech I- Semester

MECHANICAL ENGINEERING

QUESTION BANK

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

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COMPUTER INTEGRATED MANUFACTURING TECHNOLOGIES

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UNIT-1

1. A. Explain the geometry of Single point cutting tool with a neat sketch?
   B. Explain the types of chips & Chip breakers with neat sketch?
2. A. Explain the Merchant circle diagram a neat sketch?
   B. Derive the shear angle
3. A. Explain any three methods of taper turning on a lathe?
   B. Differentiate between turret and capstan lathe machines state their applications?
4. A. What are the different operations performed on lathe explain briefly?
   B. Explain about work holding devices and tool holding devices on lathe?
5. A. List out various tool materials and explain their applications?
   B. Explain the principal features of automatic lathes?

UNIT-2

1. A. With a neat sketch explain construction and working of a planner?
   B. Explain the difference between Planner and shaper machine?
2. A. With a neat sketch explain construction and working of shaper machine?
   B. Describe the operation of quick return motion in mechanical Shaper & Explain the different types of shaper operations?
3. A. With a neat sketch Explain and construction of Radial drilling machine?
   B. Explain the twist drill nomenclature with a neat sketch?
4. A. Explain clearly what is mean by jig boring with a neat sketch?
   B. Describe the vertical boring machine. What they are performed and why?
5. A. Explain the types of Drilling operations with a neat sketch?
   B. Explain the types of shaper machines?

UNIT-3

1. A. What are the main features of CNC Machine Tool? Write any 10 G-codes and 10 M-codes with a short description.
   B. Discuss the advantages of computer assisted part programming over manual part programming.
2. A. Compare the Open-Loop NC control system with closed-Loop NC control system
   B. Classification NC Machine systems?

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3. A. Discuss the four types of statements used in APT part programming.
   B. State the advantages and disadvantages of Numerical Control.
4. Explain the quick-change tooling system& Automatic tool changing system?
5. Explain preset& Qualified tools in CNC machining?

UNIT-4

1. A. what are the major components of NC Machines? Explain in details.
   B. Explain the Concept of adaptive control of NC Machines?
2. Briefly Explain CNC and DNC Systems Functions?
3. What are the types of DNC Systems (BTR & Machine control unit)?
4. Distinguish between ACO (Adaptive Control Optimization) and ACC (Adaptive control constraint) types of adaptive control systems?
5. What is a CNC Post Processor & Explain the structure of Post processor?

UNIT-5

1. A. Explain the need of CAPP (Computer Aided Process Planning).
   B. With a neat sketch Explain the Variant and generative types approach CAPP systems?
2. Explain any two types Contact and Non-Contact inspection methods?
3. A. Explain Off line and On-line Inspection Process?
   B. Explain optical Inspection Methods?
4. A. Define computer aided quality control. Explain how it is implemented?
   B. Explain with a neat sketch of Coordinate Measuring Machine& Types of CMM?
5. Explain Artificial intelligence Expert system?

DESIGN OF HYDRAULIC AND PNEUMATICS SYSTEMS

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UNIT-1

1. Discuss the components required for basic hydraulic system? Draw a neat labelled diagram and mention their functions.
2. What are the types of Fluids used FLUID power system and mention their properties?
3. Explain the working principle of hydraulic press with neat sketch.
4. Explain the working principle of external gear pump and internal gear pump with neat sketch.
5. Define fluid power, explain the advantages and applications of fluid power systems.
6. With neat labelled diagram, briefly explain the balanced vane pump & Radial piston pump.

UNIT-2

1. What are hydraulic actuators? Explain briefly the following hydraulic cylinders with neat diagram.
    a. Single acting cylinder
    b. Double acting cylinder
    c. Tandem cylinder
    d. Telescopic cylinder
2. What is mean by hydraulic cushioning? Explain with neat diagram.
3. List out all the direction control valves and explain 2/2 & 3/2 valves with neat diagram.
4. What is the importance of servo & proportional valves in hydraulic system? Explain with neat diagram.
5. List all the pressure control valves used in hydraulic systems and explain pressure reducing valve & counter balance valves with neat diagram.
6. List out all the flow control valves and explain pressure compensated flow control valve with neat diagram.
7. Explain the working principle of piston type of motor with neat sketch.

UNIT-3

1. Explain working and construction of pilot operated pressure relief valve with neat sketch.
2. With the help of circuit diagram explain types and applications of accumulator.
3. Design and explain the working of a regenerative circuit with neat diagram.
4. Design and explain the working of a sequencing circuit with neat diagram.
5. Explain the working principle of pressure intensifier with neat diagram.
6. Draw and explain the Air-over-oil circuit used in the hydraulic circuit.

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7. Design the circuit to speed up the extending speed of a double acting cylinder with suitable circuit.

UNIT-4

1. Define compressor. Explain the working principle of piston type of compressor with neat sketch.
2. With neat sketch, explain the construction and working of pneumatic filter, regulator and lubricators used in pneumatic systems.
3. Explain the construction and working principle of Muffler with neat sketch.
4. With neat sketch explain the construction & working of Quick exhaust valves and air control valves used in pneumatic systems.
5. With neat sketch explain the working principle of a screw compressor.
6. Explain about the Electro pneumatic system with neat diagram.

UNIT-5

1. Explain in detail about how the failure and troubleshooting is carried out in hydraulic system.
2. Explain in detail about various selection criteria for pneumatic components.
3. Design and draw a circuit using the hydraulic components for the Drilling operation.
4. Design and draw a circuit using the hydraulic components for the Press and forklift application.
5. Design and draw a circuit using the pneumatic components for the Pick and Place application.
6. Design and draw a circuit using the hydraulic components for the Surface grinding operation.

INTERNAL COMBUSTION ENGINES

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UNIT-1

1. Sketch and explain the valve timing diagram of a four stroke Otto cycle?
2. Explain fuel injection system of an SI engine?
3. Explain lubrication system for IC engines?
4. Explain Magneto ignition system with a neat diagram?
5. Draw the valve timing diagram of a 4-stroke C.I Engine.

UNIT-2

1. State and explain different combustion stages in SI engine?
2. Explain knocking, properties and its effects in CI engine?
3. What is the importance of variables like flame speed flame front in case of delay period?
4. Factors influencing knocking in SI and CI engine?
5. Differentiate between normal combustion and abnormal combustion phenomena in case of SI Engine.

UNIT-3

1. Explain the Morse test?
2. Write short notes on Exhaust gas analysis
3. What is the significance of heat balance sheet? Discuss the procedure to draw heat balance sheet for CI engine?
4. Define the following terms: Indicated Power, Brake power, Friction Power, Mechanical efficiency, Mean effectiveness.
5. Discuss different types of dynamometers.

UNIT-4

1. What is volumetric efficiency in case of compressor?
2. What is the difference between reciprocating and rotary compressors?
3. State how the air compressors are classified?
4. What do you mean by multistage compression? And state its advantages?
5. Discuss of working centrifugal compressors?
6. According to law pv 1.2 = constant. It is then delivered to a receiver at a constant pressure of 10 bar. R=0.287 KJ/Kg K. Determine: (i) Temperature at the end of compression (ii) Work done and heat

transferred during compression per kg of air.

7. A single –stage, double-acting compressor has a free air delivery (FAD) of 14 m^3/min. measured at 1.013 bar and 150C. The pressure and temperature in the cylinder during induction are 0.95 bar 320 C. The delivery pressure is 7 bar and index of compression and expansion n=1.3. The clearance volume is 5 % of the swept volume. Calculate (i) Indicated power required (ii) Volumetric efficiency.

UNIT-5

1. Explain the work required for Multi-stage compressor?
2. Explain the working principle of reciprocating compressor with a neat sketch.
3. Derive volumetric efficiency of air compressor
4. Explain about intercooling
5. State five uses of compressors?
6. Air at 103 K Pa and 27^0 C is drawn in LP cylinder of a two stage air compressor and is isentropic ally compressed to 700 KPa. The air is then cooled at constant pressure to 37^0 C in an intercooler and is then again compressed isentropic ally to 4 MPa in the H.P cylinder, and is then delivered at this pressure Determine the power required to run the compressor if it has to deliver 30 m^3 of air per hour measured at inlet conditions.

MACHINE DESIGN - I

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UNIT-1

1. A. What are the general considerations in the design of machine elements?
   B. What are the manufacturing considerations in the design of Castings?
2. A. Explain simple stresses
   B. A cast iron pulley transmits 10 KW at 400 rpm. The diameter of the pulleys 1.2 meter and it has four straight arms of elliptical cross section. In which the major axis is twice the minor axis. Determine the dimensions of the arm if the allowable bending stress is 15MPa.
3. A. Explain Goodman line, soderberg line and gerber lines.
   B. Draw S-N curve for mild steel and explain its significance.
   C. Explain briefly the various theory of failures under static loading.
4. A. Explain the modified Goodman diagram for bending stresses.
   B. A transmission shaft of cold drawn steel 27Mn2 (S_{ut} = 500 N/mm^2 and, Syt = 30N/mm^2) is subjected to a fluctuating torque which varies from -100 N-m to +400 N-m. The factor of safety is 2 and the expected reliability is 0%. Neglecting the effect of stress concentration, determine the diameter of the shaft. Assume the distortion energy theory of failure.
5. 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 shear stress theory,
   iii. maximum distortion energy theory. Take permissible tensile stress at elastic limit as 100 MPa and poison's ratio as 0.3.

UNIT-2

1. A cantilever cold drawn steel bar 20 mm diameter and 100 mm length is loaded by a transverse force of 0.55 kN, an axial load of 8 kN and a torque of 30 Nm. The yield tensile and compressive strength are 165MPa and 190MPa.Compute factor of safety based on maximum shear stress theory and Maximum distortion energy theory.
2. A Solid circular shaft made of steel Fe620(Sut = 620 N/mm^2 and Syt = 380 N/mm^2) is subjected to an alternating torsional moment, that varies from -200N-m to +400 N-m. The shaft is ground and the expected reliability is 90%. Neglecting the stress concentration, Calculate the shaft diameter for infinite life. The factor of safety is 2. Use the distortion energy theory of failure.

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3. A. A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10kN-m and a torsional moment of 30kN-m. Determine the diameter of shaft using all theories of failure and assuming a factor of safety of 2. Take E = 210 GPa and Poisson's ratio = 0.25.B. Explain the twist drill nomenclature with a neat sketch?

   B. Explain briefly about the torsional and bending stresses in the design of machine elements
4. A. Estimate the factors that affect the fatigue strength.

   B. Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm2. Also find the angle of twist for a length of 2.5 meters. Take G = 80 GPa.
5. A. Explain the types of fluctuating stresses.

   B. A machine member is made of plain carbon steel of ultimate strength 650 N/mm2 and endurance limit of 300 N/mm2. The member is subjected to a fluctuating torsional moment which varies from -200 Nm to 400 Nm. Design the member using

   i. modified Goodman's equation and
   ii. Soderberg equation.

UNIT-3

1. A. Explain with sketches the different types of failures and efficiencies of the riveted joints

   B. Two MS tie bars for a bridge structure are to be joined by means of a butt joint with double straps. The thickness of the tie bar is 12 mm and carries a load of 400 kN. Design the joint completely taking allowable stresses as 100 MPa in tension, 70 MPa in shear and 150 MPa in compression.
2. A. Explain briefly design procedure for circumference lap joint for a boiler

   B. Design a triple riveted longitudinal butt joint with unequal cover plates for a boiler seam. The diameter of the boiler is 2 m and the internal pressure is 2 MPa. The working stresses are 70 MPa in tension, 50 MPa in shear and 120 MPa in compression and the required efficiency of the joint is 80%.
3. A. What is the difference between caulking and fullering? Explain with the help of neat sketches.

   B. Design a triple riveted longitudinal double strap butt joint with unequal straps for a boiler. The inside diameter of the drum is 1.3 meters. The joint is to be designed for a steam pressure of 2.4 N/mm2. The working stresses to be used are σt=77N/mm^2, τ=62 N/mm^2; σc=120 N/mm^2. Assume the efficiency of the joint as 81 %.
4. A. Explain briefly the design considerations of welded assemblies

   B. How the strength of transverse fillet weld is evaluated?

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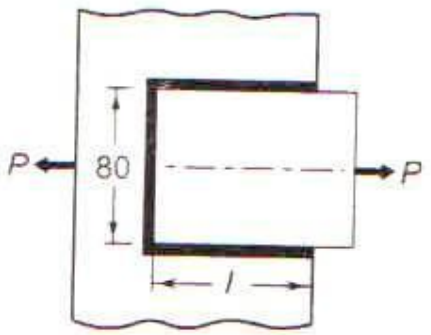
C. A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet weld, as shown below Fig. 1. The strength of the welded joint should be equal to the strength of the plate to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 MPa and 70 MPa respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds



5. A. Explain the design procedure for the eccentrically loaded bolted joint.

   B. Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm^2. Assume joint efficiency as 75 % , allowable tensile stress in the plate 90 MPa, compressive stress 140 MPa and shear stress in the rivet is 56 MPa

6. A. Explain bolts uniform strength.

   B. A bolt is subjected to a direct tensile load of 20 kN and a shear load of 15 kN Suggest the suitable size of bolt according to various theories of elastic failure, if the yield stress in simple tension is 360 MPa. A factor of safety of 3.5 should be used. Take Poisson's ratio as 0.25.

   C. Design a cotter joint of socket and spigot type which is subjected to a pull and push of 50 kN. All the parts of the joint are made of the same material with the permissible stress as 70 MPa in tension, 100 MPa in compression and 40 MPa in shear.

UNIT-4

1. A. Briefly explain the procedure to design a shaft based on any two theories of failures.

   B. A mild steel shaft transmits 20 KW at 200 rpm. It carries a central load of 900 N and is simply supported between the bearings 2.5 m apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. What size of the shaft will be required, if it is subjected to gradually applied loads?

2. A. Explain types of couplings

B. A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress in the shaft material is limited to 45MPa. Design a cast iron flange coupling. The shear stress in the coupling bolt is limited to 30MPa.

3. Design a sleeve and cotter joint to resist a tensile load of 60 KN. All parts of the joint are made of the same material with the following allowable stresses. σ_t = 60 MPa , τ = 70 MPa and σ_c =125 MPa.
4. A. Explain the design procedure for flexible coupling.

   B. Design a Cast Iron flange coupling for a steel shaft transmitting 15 KW at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25 % greater than the full load torque. The shear stress for Cast Iron is 14 MPa.
5. A. Explain briefly about the design of shafts subjected to combined bending and torsion

   B. A line shaft is to transmit 30 KW at 160 rpm. It is driven by a motor placed directly under it by means of a belt running on a 1m diameter pulley keyed to the end of the shaft. The tension in the tight side of the belt is 2.5 times that of the slack side and the centre of pulley overhangs 150 mm beyond the centre line of the end bearing. Determine the diameter of the shaft, if the allowable shear stress is 56MPa and the pulley weighs 1600 N.

UNIT-5

1. A. Explain the design procedure for the socket and spigot joint

   B. A circular steel bar 50 mm diameter and 200 mm long is welded perpendicularly to a steel plate to form a cantilever to be loaded with 5KN at the free end. Determine the size of the weld, assuming the allowable stress in the weld is 100 MPa.
2. A. Design a Knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression

   B. Explain briefly a design of shafts subjected to combined bending and torsion.
3. A. Explain different types of keys

   B. Design a cotter joint to connect two mild steel rods for a pull of 30 kN. The maximum permissible stresses are 55N/mm2 in tension, 40N/mm2 in shear and 70 N/mm2 in crushing. Draw a neat sketch of the joint.

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4. A. Explain stresses acting on keys.

   B. Two tie rods are to be connected by means of a sleeve and two steel cotters. The rods are subjected to a tensile load of 40kN. Design the joint using the permissible stress in tension as 60MPa, in shear as 50MPa and in crushing as 120MPa. Draw a neat sketch and show all the dimensions.

5. A shaft, 40 mm in diameter is transmitting 35 KW power at 300 rpm by means of Kennedy keys of 10X10 mm cross section. The keys are made of steel 45C8 (Syt = Syc = 380 N/mm2) and the factor of safety is 3.Determine the required length of the keys.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

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UNIT-1

1. What is managerial economics? Discuss the nature & Scope of Managerial economics.
2. Distinguish between Micro and Macroeconomic concepts
3. Explain Law of Demand with its exceptions.
4. What is demand forecasting? Explain various techniques/methods of demand forecasting.
5. Define Elasticity of demand. Sketch out the measurements of price elasticity of demand.

UNIT-2

1. Define production function. Explain the Cobb-Douglas production function.
2. Sketch out the concept of Iso Quant and Iso Cost in detail.
3. What do you mean by Economies of Scale? Discuss both the Internal and External economies of scale.
4. Explain the assumptions, advantages and limitations of Break Even Point (BEP) with suitable illustrations.
5. Practice simple problems on BEP.
6. Define Cost. Explain different cost concepts/Types.

UNIT-3

1. Define Market. Explain the structure and types of market with suitable examples.
2. What is perfect competition? Explain its features.
3. What is price? Explain different methods of Pricing.
4. Explain the features, advantages and limitations of sole proprietorship and partnership.
5. Explain the features of Joint Stock Company.

UNIT-4

1. What are the accounting concepts and conventions that govern accounting process? Explain in brief. (GAAP)
2. Explain the factors affecting the requirements of working capital
3. Define Financial Accounting. Explain the importance and Limitations of Financial Accounting.
4. Prepare the formats for Trail Balance and Final accounts (Trading A/c, Profit and Loss A/c and Balance Sheet)
5. What is capital? Explain different types of capital and sources of capital in detail.

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UNIT-5

1. What is capital budgeting? Explain methods of capital budgeting?
2. What is ratio analysis? Explain different types of ratios with formulas
3. Illustrate the advantages and Disadvantages of capital budgeting techniques.
4. Problems on payback period, ARR, NPV
5. Problems on ratio analysis

INTRODUCTION TO JAVA PROGRAMMING

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UNIT-1

1. A. Explain briefly about Object Oriented Programming concepts?
   B. Explain about Java Buzz words or Features and History of java
2. A. Explain briefly about type conversion and type casting with example program?
   B. Write a java program for finding the factorial of a given number using recursion?
3. A. Explain the differences b/w Procedure oriented programming and Object Oriented programming?
   B. Explain different Operators in Java with examples.
4. A. Explain different loop control statements with example program?
   B. Explain parameter passing Mechanism with example program?
5. A. Explain Constructor Overloading and Method Overloading with example program?
   B. Explain this keyword with example program?

UNIT-2

1. A. Explain different types of inheritances with example program?
   B. What is a package? Explain User defined package with program?
2. A. Explain method overriding with example program
   B. Explain super keyword with program?
3. A. Explain Method overriding and Abstract class with example program?
   B. What is an Interface? Explain how to extend one interface with another.
4. A. Difference between Interface and Abstract class?
   B. Explain final keyword with method and class?
5. A. Explain Dynamic binding with example program?
   B. What is an interface? Explain how to extend an interface with program?
6. A. Explain different Access Specifiers in java?
   B. Explain about this keyword and built-in packages?

UNIT-3

1. A. What is an Exception? Explain different types of Exceptions?
   B. Explain about try and catch with example program?
2. A. Explain how to create a Thread with example program?
   B. Explain about Thread Synchronization with program?

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3. What is a Thread? Explain Thread Life cycle with neat diagram?
4. A. Explain throw and throws keyword with example program?
   B. Explain nested try block with example program?
5. A. What is Exception? Explain Built in Exceptions in java
   B. Explain Tnter threded communication with Example.

UNIT-4

1. A. What is an Applet? Explain Applet life Cycle with neat diagram
   B. Explain differences between Applet and Application?
2. A. Explain File Input Stream and File Output Stream with program?
   B. Write a program for Handling Mouse Events?
3. A. Explain Event classes and Event Listeners with example?
   B. Write a program for handling Key Events?
4. A. Explain FileInputStream with program?
   B. Explain Adapter class with example program?
5. A. Explain different types of applets in java
   B. Explain how to pass parameters to an applet with program?

UNIT-5

1. A. Explain about AWT class hierarchy?
   B. Explain about AWT and Swing?
2. Explain different types of Layouts with example program?
3. A. Explain about Graphic class methods?
   B. Explain about Border, Grid, and Flow Layouts in java?
4. Explain about AWT controls with program?
5. A. Differences between AWT and Swings?
   B. Explain AWT components
      i) Label
      ii) Button
      iii) Text Field
      iv) Checkbox