

5E1718

Total No. of Questions : 22

Total No. of Pages : 04

Roll No. :

5E1718**B.Tech. V-Sem. (Main/Back) Exam. - 2024****AUTOMOBILE ENGINEERING****5AE3-01 Mechatronic Systems****AE,ME****Time : 3 Hours****Maximum Marks : 70*****Instructions to Candidates :***

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. Nil

2. Nil

PART-A**[10x2=20]****(Answer should be given up to 25 words only)****All questions are compulsory****Q.1. What is the Mechatronic System?**

- Q.2. What is the basic function of control system?
- Q.3. What are the benefits of mechatronics in manufacturing?
- Q.4. Write the advantages of an FET over a BJT.
- Q.5. Write the selection criteria for sensors.
- Q.6. What is the role of PID controllers in Mechatronics systems?
- Q.7. How do transformers affect in Mechatronic Systems?
- Q.8. What do you mean by Signal Conditioning?
- Q.9. What is the role of a sensor in a Mechatronic System?
- Q.10. Why PLCs are preferred to use over microcontroller in industries?

PART-B

[5x4=20]

(Analytical/Problem Solving Questions)

Attempt any five questions

- Q.1. Describe the modeling of electromechanical systems.
- Q.2. What is the System Modeling? Explain the types of modeling in mechatronic system.
- Q.3. What is the difference between Verification and Validation in Mechatronic Systems?
- Q.4. Describe block diagram of 8085 microprocessor and the features of 8085 microprocessor.

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- Q.5. Draw the Architecture of PLC and explain it briefly.
- Q.6. Draw a block diagram of a basic microcontroller and explain the function of each subsystem and characteristics of microcontroller.
- Q.7. Describe the methods of fault analysis in mechatronic systems.

PART-C

[3x10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

- Q.1. What are the key elements of Mechatronic Systems? Describe the components of Mechatronic systems with block diagram.
- Q.2. Differentiate between sensors and actuators with the help of suitable examples. Explain various temperature sensors used and comment on their sensitivity and linearity.
- Q.3. Write short notes on the following :
- (a) Fluid Systems
 - (b) Displacement Sensors
 - (c) Data Acquisition Systems
- Q.4. Describe the working principle of Hydraulic and Pneumatic systems with suitable diagram.
- Q.5. Identify and explain the functions of the various control elements of an automatic camera.

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Total No. of Questions : 22

Total No. of Pages : 04

Roll No. :

5E1719**B.Tech. V-Sem. (Main & Back) Exam. - 2024****AUTOMOBILE ENGINEERING****5AE4-02 Heat Transfer****AE, ME****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates :**

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A**[10x2=20]****(Answer should be given up to 25 words only)****All questions are compulsory**

Q.1. What is Fourier law of conduction?

Q.2. Define fin effectiveness and fin efficiency.

Q.3. What is Wine's Displacement Law?

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- Q.4. Define Geometrical Shape factor.
- Q.5. What is Lumped Capacity?
- Q.6. Define film condensation.
- Q.7. Define Convection and Radiation.
- Q.8. Define filmwise condensation.
- Q.9. Write down assumption of Fourier's Law.
- Q.10. How Reynolds number is selected for dynamic similarity?

PART-B

[5x4=20]

(Analytical/Problem Solving Questions)

Attempt any five questions

- Q.1. A lake is covered with ice 2 cm thick. The temperature of ambient air is -15°C . Find the rate of thickening of ice. For ice $k=4 \times 10^{-4} \text{ k-cal-m}^{-1} (^{\circ}\text{C})^{-1}$. Density $=0.9 \times 10^3 \text{ kg/m}^3$ and latent heat $L=80 \text{ kilo cal/kg}$.
- Q.2. Show the 3-dimensional general heat conduction equation in Cartesian coordinates for the homogeneous material.
- Q.3. Explain the mechanism of thermal conduction in gases, liquids and solids. Discuss the effect of temperature on thermal conductivity.
- Q.4. State and explain the Planck's distribution law of radiation.
- Q.5. An electronic semiconductor device generates 0.16 kJ/hr . To keep the surface temperature at the upper safe limit of 75°C , it is desired that the generated heat should be dissipated to the surrounding environment, which is at 30°C . The task is accomplished by attaching aluminum fins, 0.5 mm^2 and 10 mm to the surface. Work out the number of fins if thermal conductivity of the fin material is 690 KJ/m-hr-deg and the heat transfer coefficient is $45 \text{ KJ/m}^2\text{-hr-deg}$. Neglect the heat loss from the tip of the fin.

- Q.6. Show the expression of fin efficiency for an extended rectangular surface.
- Q.7. Classify the different modes of the heat transfer with suitable examples and general governing laws.

PART-C

[3x10=30]

(Descriptive/Analytical/Problem-Solving/Design Questions)

Attempt any three questions.

- Q1. A furnace wall consists of 200mm layer of refractory bricks, 6mm layer of steel plate and a 100 mm layer of insulation bricks. The maximum temperature of the wall is 1150°C on the furnace side and the minimum temperature is 40°C on the outmost side of the wall. An accurate energy balance over the furnace shows that the heat loss from the wall is 400 W/m². It is known that there is a thin layer of air between the layers of refractory bricks and steel plate. Thermal conductivities for the three layers are 1.52, 45 and 0.138.
- Q.2 Analyze overall heat transfer coefficient and temperatures with development of an expression for the heat transfer for the parallel flow heat exchanger.
- Q.3. Two opposed, parallel, infinite planes are maintained at 420 K and 480 K respectively. Calculate the net heat flux between these planes if one has an emissivity of 0.8 and other an emissivity of 0.7. Does it matter which plate has which emissivity? How this heat flux will be affected, if (i) the temperature difference is doubled by raising the temperature 480 K to 540 K. (ii) The planes are assumed black.
- Q.4. Derive an expression for LMTD for counter flow heat exchanger.
- Q. 5. What is Critical thickness of insulation? Derive a expression for critical thickness of insulation for cylinder.

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Total No. of Questions : 22

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Roll No. :

5E1720**B.Tech. V-Sem. (Main/Back) Exam. - 2024****Automobile Engineering****5AE4-03 Manufacturing Technology****AE, ME****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates :**

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A

[10x2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

- Q.1. How are the cutting tools classified?
- Q.2. What are the popular tool designation systems in common use?
- Q.3. What is built-up-edge (BUE)?

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- Q.4. What are the conditions for using zero rake angle during metal cutting operation?
 - Q.5. What is the Machinability Index?
 - Q.6. What are the main factors which influence the tool life?
 - Q.7. Why are lathe beds made of cast iron?
 - Q.8. Draw a neat sketch of a twist drill.
 - Q.9. Which materials are used in the manufacturing of grinding wheels?
 - Q.10. Why truing and dressing are necessary in grinding wheels?

PART-B

[5x4=20]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1. Derive expressions for the cutting ratio. Also draw Merchant's Circle Diagram and show forces and angles acting on the cutting tool and different parameters involved in metal cutting.
- Q.2. What are the types of cutting tool wear patterns observed in single point cutting tools? How do they affect the metal cutting performance?
- Q.3. What is the difference between a Capstan and Turret Lathe? Explain Turret Lathe with suitable diagram.
- Q.4. A HSS tool is used for turning operation. The tool life is one hour when turning at 30 m/min, but reduces to 2 min if cutting speed is doubled. Find the suitable RPM for turning a 300 mm diameter rod so that tool life is 30 min.
- Q.5. Explain lapping operation with a suitable diagram.
- Q.6. Explain gear hobbing process over other gear generation processes.
- Q.7. Mention four important factors that influence the selection of grinding wheel.

PART-C**[3x10=30]****(Descriptive/Analytical/Problem Solving/Design question)****Attempt any three questions**

- Q.1. In an orthogonal cutting operation on a material with the shear yield strength of 250 N/mm^2 the following data is obtained : Rake angle = 15° . Uncut chip thickness = 0.25 mm , Width of chip = 2 mm . Chip thickness ratio = 0.46 , friction angle = 40° deg. Determine the shear angle, cutting force component and resultant force on the tool.
- Q.2 Explain the basis for the selection of a specific cutting fluid for a given application. Take the example of turning, milling and grinding and suggest the type of cutting fluid used.
- Q.3. What is the marking system followed in case of grinding wheels? Explain the individual elements of the marking system from the standpoint of the functioning of the wheel.
- Q.4. Describe step by step process of gear cutting by gear hobbing process with suitable figures.
- Q. 5. Determine the optimum cutting speed for an operation on a lathe machine using the following information :
- Tool change time = 3 min
- Tool regrind time = 3 min
- Machine running cost ₹ 0.50 per min.
- Depreciation of tool regrind ₹ 5.0 and
- The constants in the tool life equation are 60 and 0.2 .

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Total No. of Questions : 22

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Roll No. :

5E1721**B.Tech. V-Sem. (Main/Back) Exam. - 2024****Automobile Engineering****5AE4-04 Design of Machine Elements-I****AE, ME****Time : 3 Hours****Maximum Marks : 70*****Instructions to Candidates :***

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A**[10x2=20]****(Answer should be given up to 25 words only)****All questions are compulsory**

Q.1. Define the term "Stress Concentration" and explain its importance in design.

Q.2. List any two mechanical properties of materials and their relevance in design.

Q.3. What are the factors affecting fatigue failure in machine components?

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- Q.4. Write the significance of fits and tolerance in manufacturing.
- Q.5. State the purpose of using BIS codes in design.
- Q.6. Differentiate between cast and forged parts.
- Q.7. Define "eccentric loading" in bolts and its implications.
- Q.8. What is the role of a key in a keyed joint?
- Q.9. Explain the purpose of using preloading in bolts.
- Q.10. Mention any two safety factors considered in machine design.

PART-B

[5x4=20]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1. Write a short note on the effect of mechanical properties like hardness, toughness and ductility on material selection for engineering design.
- Q.2. Explain the design procedure of a cotter joint with the help of calculations and sketches.
- Q.3. What are the functions of a key in a mechanical assembly? Compare sunk keys and saddle keys with their applications.
- Q.4. What is Stress Concentration and how can it be reduced in machine components? Provide at least two practical methods with suitable sketches.
- Q.5. Explain the significance of fits and tolerances in the design of shafts and holes. Provide examples of where each type of fit (clearance, interference and transition) is applied.
- Q.6. A hollow shaft is transmitting 90 kW at 200 rpm. If the allowable shear stress is 60 MPa and the outer diameter is twice the inner diameter, calculate the dimensions of the shaft.

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- Q.7. Discuss the design principles for ensuring interchangeability in manufactured components. Why is this concept important in mass production systems?

PART-C

[3x10=30]

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q1. Design a muff coupling used to connect two steel shafts transmitting 50 kW at 400rpm. The material for the shafts and key is plain carbon steel, with allowable shear and crushing stresses of 45 MPa and 85 MPa, respectively, The material for the muff is cast iron, for which the allowable shear stress is 18 MPa.
- Q.2 Design a crane hook with a useful load-lifting capacity of the crane as 60 kN. The weight of the hook with grabbing tongs is 12 kN. Provide a sketch of the designed hook.
- Q.3. Explain in detail the design procedure of a screw jack for lifting a load of 25 kN. Include the material selection and a neat sketch.
- Q.4. Write short notes on **any three** of the following :
- (i) Mechanical properties of engineering materials
 - (ii) Bolt of uniform strength
 - (iii) Design for stiffness
 - (iv) Design for strength
- Q.5. Explain the design considerations for casting. Discuss factors like material selection, shrinkage allowance and gating system design with appropriate sketches.

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Total No. of Questions : 22

Total No. of Pages : 04

Roll No. :

5E1722

B.Tech. V-Sem. (Main & Back) Exam. - 2024

Automobile Engineering

5AE4-05 Principles of Management

AE, ME

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A

[10x2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. What is Social Audit? What are advantages?

Q.2. What are the steps in motivation process?

Q.3. How is a manager different from an entrepreneur?

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- Q.4. "Planning is essentially forward looking." Explain.
- Q.5. Define group decision-making in management.
- Q.6. Differentiate appraisal and reward.
- Q.7. Give the example of different levels of management.
- Q.8. Explain human resource management and selection method.
- Q.9. Distinguish between management and administration. How far is this destination justify in your opinion?
- Q.10. Write management practice skills and operation management.

PART-B

[5x4=20]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1. Explain the controlling process in management.
- Q.2. Distinguish between public and private limited companies.
- Q.3. Mention the various factors involved in using motivational techniques.
- Q.4. Explain the various forms of business organization.
- Q.5. Explain the functions of middle level management.
- Q.6. Explain the contributions of F.W. Taylor to Management.
- Q.7. How is a manager different from an entrepreneur? Explain.

PART-C

[3x10=30]

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1. Describe any four Quantitative forecasting techniques.
- Q.2. Explain the management practices of Narayan Murthy.

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- Q.3. What is Organization Structure? Describe its effect with respect to any two companies.
- Q.4. Prepare the leadership profile of any one business leader and their quality.
- Q.5. Explain the process involved in selecting and recruiting a graduate trainee in organization.

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Total No. of Questions : 22

Total No. of Pages : 04

Roll No. :

5E1724

B.Tech. V-Sem. (Main & Back) Exam. - 2024

AUTOMOBILE ENGINEERING

5AE5-12 Automobile Engineering (Elective-I)

AE, ME

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A

[10x2=20]

(Answer should be given up to 25 words only)

All questions are compulsory.

Q.1. What are the functions of clutch?

Q.2. Compare Pneumatic and Vacuum brakes?

Q.3. How many types of gearbox are generally used?

- Q.4. What is the purpose and features of all wheel drive?
- Q.5. What are the functions of steering gears in steering mechanism?
- Q.6. Define camber angle and its functions.
- Q.7. What is the function of suspension system?
- Q. 8 Explain the starting system of automobile.
- Q. 9 Differentiate between dead axle and live axle.
- Q. 10. Explain the importance of airbags.

PART-B

[5x4=20]

(Analytical/Problem-Solving Questions)

Attempt any five questions

- Q.1. Describe briefly the basic layout of chassis and explain the different types of chassis frames.
- Q.2 Draw and explain the hydraulic torque converter.
- Q.3. Explain the construction and working of synchromesh devices used in synchromesh gearbox.
- Q.4. Draw and indicate various parts in a starter motor. Why two different windings are used? Is there any capacitor in the circuit? If yes, why?
- Q 5. Explain the working of telescopic type of shock absorber.
- Q.6. Explain the working of Global Positioning System in automobile.
- Q.7. Explain the working of the air conditioning system of an automobile.

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PART-C

[3x10=30]

(Descriptive/Analytical/Problem-Solving/Design Question)

Attempt any three questions

- Q1. Draw hydraulic power brakes with complete details. What is the role of viscosity in hydraulic braking system? How bleeding can be done in such braking system?
- Q.2 What is the difference between convention steering and power steering? Explain the working of a power steering system with a neat sketch.
- Q.3. Explain the construction and working of lead acid battery. Write the different methods of testing.
- Q.4. Explain the requirements of safety devices with their working principle.
- Q. 5. What is the main purpose of transfer gearbox in four wheel drive? Explain the function and requirement of propeller shaft.

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Total No. of Questions : 22

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Roll No. :

5E1322**B.Tech. V-Sem. (Re Back) Exam 2024****AUTOMOBILE ENGG.****5AE4-02 / Heat Transfer****AE, ME****Time : 3 Hours****Maximum Marks : 120*****Instructions to Candidates :***

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and four questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A**[10×2=20]****(Answer should be given up to 25 words only)****All questions are compulsory**

Q.1. State Fourier's law of heat conduction.

Q.2 What is Newton's law of cooling?

Q.3. Define overall heat transfer coefficient.

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- Q.4. Define drop-wise condensation.
 - Q.5. What is meant by saturated liquid vaporization?
 - Q.6. Define fouling factor in heat exchangers.
 - Q.7. What is the Grashoff number used for in heat transfer?
 - Q.8. What is a thermal boundary layer?
 - Q.9. Define composite wall in heat conduction.
 - Q.10. What is meant by diffuse radiation?

PART-B

[5x8=40]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1. Derive expression of LMTD for parallel flow heat exchanger.
- Q.2. Explain the concept of critical thickness of insulation and its importance in thermal design.
- Q.3. Explain the use of Heisler charts for unsteady-state heat conduction problems.
- Q.4. Explain the various regimes of pool boiling with neat sketch.
- Q.5. Discuss the role of electrical analogies in solving complex radiation heat transfer problems.
- Q.6. An exterior wall of a house may be approximated by a 0.1m layer of common brick ($k = 0.7 \text{ W/m}$) followed by a 0.04m layer of gypsum plaster ($k = 0.48 \text{ W/m}$). What thickness of loosely packed rock wool insulation ($k = 0.065 \text{ W/m}$) should be added to reduce the heat loss or gain through the wall by 70%?
- Q.7. Calculate the rate of heat transfers per unit area through copper plate 45mm thickness, whose one face is maintained at 350 and the other face at 50. Take thermal conductivity of copper as 370 W/m .

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PART-C

[4x15=60]

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any four questions

- Q.1. Derive fin equation. Also apply conditions of insulated tip and find out expressions for temperature distribution and heat transfer rate for insulated tip fin.
- Q.2. Derive the energy equation for the laminar boundary layer on a flat plate. Explain its importance in heat transfer.
- Q.3. Derive the effectiveness-NTU relationship for a parallel-flow heat exchanger. Explain its applications in thermal systems.
- Q.4. Derive the general 3-dimensional conduction equation in Cartesian coordinates and explain its physical significance.
- Q.5. A steam condenser is transferring 250 KW of thermal energy-at a condensing temperature of 65°C. The cooling water enters the condenser at 20°C with a flow rate of 7500 kg/h. Calculate the LMTD. If overall heat transfer coefficient for the condenser surface is 1250 W/m²°C. What surface area is required to handle this load? What error would be introduced if the arithmetic mean temperature difference is used rather than the log-mean temperature difference?

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Total No. of Questions : 22

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Roll No. :

5E1324**B.Tech. V-Sem. (Re-Back) Exam. - 2024****AUTOMOBILE ENGG.****5AE4-04 / Design of Machine Elements-I****AE, ME****Time : 3 Hours****Maximum Marks : 120****Instructions to Candidates :**

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and four questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1.

2.

PART-A**[10×2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. What are the steps involved in the design process?

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- Q.2 What is factor of safety?
 - Q.3 What are the endurance strength modification factors?
 - Q.4 What is impact factor?
 - Q.5 Define the term stress and strain in terms of machine design.
 - Q.6 What is critical speed of a shaft?
 - Q.7 What is shock and fatigue factor?
 - Q.8 What is factor of safety?
 - Q.9 What is Allowable stresses?
 - Q.10 Define Interchangeability.

PART-B

[5x8=40]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1 Explain the procedure used to design a machine element.
- Q.2 Define endurance limit and explain the factors affecting it.
- Q.3 Explain self locking and overhauling in power screw.
- Q.4 What is stress concentration? Explain with neat sketches the methods of reducing stress concentration.
- Q.5 Determine the length of the key required in terms of shaft diameter taking width of key $b = d/4$ and thickness of key $h = (3/16)d$, If a shaft and key are made of same material.
- Q.6 Explain solid and hollow shafts.
- Q.7 Explain the design of muff coupling.

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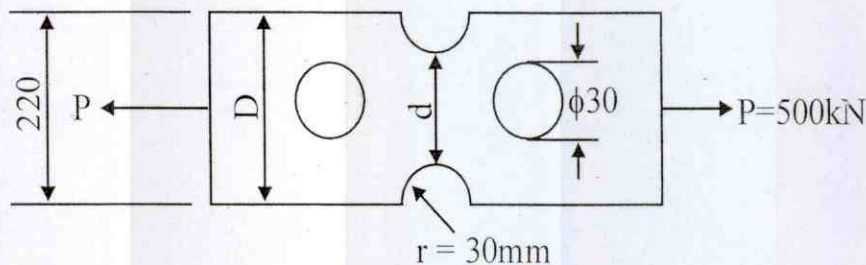
PART-C

[4x15=60]

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any four questions

- Q.1. A bar of rectangular section is subjected to an axial pull of 500 kN. Calculate its thickness if the allowable tensile stress in the bar is 200MPa.



- Q.2. A cantilever beam of width 60mm, depth 140mm is 1.2m long. A weight of 1kN is dropped from a height of 20mm at its free end. Determine :
- (i) Impact factor
 - (ii) Instantaneous maximum deflection
 - (iii) Instantaneous maximum stress
 - (iv) Instantaneous maximum load. Take $E = 200 \text{ Gpa}$.
- Q.3. A steel shaft is subjected to a bending moment varies from 120Nm to 220Nm and transmits 15kW at 200rpm. The torque varies over a range of $\pm 30\%$. The shaft is made of steel whose yield stress = 450 N/mm^2 and endurance stress = 350 N/mm^2 . Surface coefficient factor = 0.9, size factor = 1.2, factor of safety = 4 and stress concentration factor = 1.96. Determine the diameter of the shaft for infinite life.
- Q.4. Design a square key for a gear shaft of diameter 30mm. 30kW power at 1000 rpm is transmitted from the shaft to the gear. The yield strength of key material in tension is 400MPa and the factor of safety is 3. The yield strength in compression can be assumed to be equal to the yield strength in tension. Determine the dimension of the key.
- Q.5. Explain screw jack with the help of a neat sketch.

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