P.T.U Question Papers
B.Tech Mechanical

Roll No. | | | | | | | | | | | | Total No. of Pages : (

Total No. of Questions : 09

B.Tech.(ME) (Sem.–3)

STRENGTH OF MATERIALS-I

Subject Code : BTME304-18

M.Code : 76421

Date of Examination : 11-01-2025

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :

a) What is elastic deformation?

b) Define yield strength.

c) How are bending moment and shear force diagrams related to each other?

d) Define point of contraflexure.

e) How does the location of the neutral axis affect the bending stress in a beam?

f) Define torsional rigidity and write its formula.

g) Define polar moment of inertia.

h) How does the slenderness ratio affect the critical load of a column or strut?

i) Write the relationship between moment, slope and deflection.

j) How does the load distribution affect the slope and deflection of a beam?

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SECTION-B

2. A 6 m long cantilever carries loads of 3 kN and 4 kN at 2 m and 5 m respectively from the fixed end and a U.D.L. of 3 kN/m over its entire length. Draw S.F. and B.M. diagrams.

3. A hollow shaft of diameter ratio 3/5 transmits 500 kW at 120 rpm. Maximum torque is 15% greater than mean torque, shear stress should not exceed 65 MN/m^2. The twist in 3 m length should not exceed 1°. Calculate the maximum size of the shaft. Take, C = 80 GN/m2.

4. How does the material properties of a beam affect its slope and deflection? Discuss the role of Young's modulus, moment of inertia and beam cross-sectional shape.

5. Draw and explain stress-strain diagram for a ductile material.

6. Determine the ratio of the buckling strengths of two columns of circular cross-section, one hollow and other solid, when both are made of same material, have the same length, same cross-sectional area and same end-conditions. The internal diameter of the hollow column is half of its external diameter.

SECTION-C

7. A solid steel bar of 70 mm diameter and 0.5 m long is placed inside an aluminium tube having 75 mm inside diameter and 100 mm outside diameter. The aluminium cylinder is 0.15 mm longer than the steel bar. An axial compressive load of 600 kN is applied to the bar and the cylinder through the rigid cover plates. Find the stresses developed in the steel bar and the aluminium cylinder. Take $E_s = 200\ GN/m^2$, and $E_c = 70\ GN/m^2$.

8. A timber beam 15 cm wide and 20 cm deep is to be reinforced by bolting on two steel flitches each 15 cm by 1.25 cm in section. Find the moment of resistance when a) the flitches are attached symmetrically at top and bottom; and b) the flitches are attached symmetrically at the sides. Allowable stress in timber is 6 MN/m^2. What is the maximum stress in steel in each case? Take $E_s = 20$ Ew.

9. **Write short notes on the following:**

   a) Johnson's empirical formula for axially loaded columns and its applications.

   b) Significance and applications of Macaulay's method.

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B.Tech.(ME) (Sem.–3)

BASIC ELECTRONICS ENGINEERING

Subject Code : BTEC305-18

M.Code : 76420

Date of Examination: 15-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly:

a) How a diode can work as a switch?

b) How does a transistor differ from a diode?

c) What is thermal runaway?

d) What do you mean by filters?

e) Draw the V-I characteristics of Zener diode.

f) What are the applications of LED?

g) Convert the hexadecimal number into octal: a) 5B.34 b) 3DE

h) Write the truth table of AND, OR and NOT gate.

i) What is function generator?

j) Convert the following in l's and 2's complement: 111100001010.

SECTION-B

2. Explain the circuit diagram of voltage divider bias configuration.

3. Draw the circuit of transistor in CE configuration. Sketch the input and output characteristics indicating active, saturation and cut-off regions.

4. Explain the operation of triangular-wave generator.

5. Convert the hexadecimal number into binary and octal:

   a. 5B.34 b. 3DE

6. What are the characteristics of Ideal op-amp?

SECTION-C

7. Draw and explain the three basic configurations of NPN and PNP transistors.

8. **Solve the following :**

   a) $(5735.20)_8 = (?)_2 = (?)_{16}$

   b) $(A152)_{16} = (7)_8 = (7)_2$

   c) Add $(100000.001)_2 = (11110.111)_2$

   d) $(1110) \times (0111)$

   e) $(0011) / (1011)$

9. **Write short note on the following :**

   a) D Flipflop

   b) Differentiator

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B.Tech.(ME) (Sem.–3)

FLUID MECHANICS

Subject Code : BTME301/18

M.Code : 76417

Date of Examination: 09-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly:

a) Differentiate Newtonian and Non-Newtonian fluids.

b) An oil of specific weight 0.8 is under a pressure of 137.2 kN/m^2, express pressure head in meters of water.

c) Why metacentric height of battleships is more than passenger ships?

d) Differentiate between normal and tangential acceleration.

e) What is energy correction factor?

f) How weirs are classified?

g) What is the importance of TEL and HGL?

h) What is Froude's model? Give examples of its applications.

i) Why divergent part length is more than convergent part in Venturimeter?

j) Define and distinguish rotational and irrotational flows.

SECTION-B

2. The velocity components in a flow are $u = 4x^2$ and $v = 4xyz$ and $w = -8xz - 2xz^2$. Whether the flow is possible?

3. Derive an expression for finding the metacentric height with the help of a neat sketch.

4. Show that the power P, developed by a hydraulic turbine can be correlated by the dimensionless parameters $P/\rho N^3D^5$ and N^2D^2/gh where ρ is the density of water. N is the rotational speed, D is the runner diameter, h is the head and g is the acceleration due to gravity.

5. Explain with a neat sketch the working of a Pitot tube.

6. A laminar flow is taking place in a pipe of diameter 200 mm. The maximum velocity is 1.5 m/s. Find the mean velocity and the radius at which this occurs. Also calculate the velocity at 4 cm from the wall of the pipe.

SECTION-C

7. Derive three dimensional mass conservation equation for an unsteady compressible flow in Cartesian coordinates. Simplify it for an incompressible flow.

8. In a 100 mm diameter horizontal pipe, a venturimeter of 0.5 contraction ratio has been fixed. The head of water when there is no flow is 3 m (gauge). Find the rate of flow for which the throat pressure will be 2 meters of water absolute. The coefficient of discharge is 0.97. Take atmospheric pressure head = 10.3 meter of water.

9. What is Hagen Poiseuille's formula? Derive an expression for it.

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B.Tech.(ME) (Sem.–3)

MACHINE DRAWING

Subject Code : BTME303/18

M.Code : 76419

Date of Examination : 23-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains THREE questions carrying FIVE marks each and students have to attempt any TWO questions.
3. SECTION-C contains TWO questions carrying THIRTY marks each and students have to attempt any ONE questions.

SECTION-A

1. Write briefly:

a) Mention any two means for prevention of rotation of brasses in a Plummer Block.

b) What is the difference between Blow off Cock and Feed check Valve?

c) Draw a symbol of Spot and Seam Weld.

d) Explain difference between Aligned and Unidirectional System of Dimensioning with suitable drawing.

e) Draw conventions for (i) internal threads (ii) external threads.

f) Why machining symbols are used?

g) Write two common materials which are being used for making bushes.

h) Draw the conventional representation of Insulating material and Liquid

i) What is difference between allowance and tolerance?

j) What are the disadvantages of Riveted Joints?

SECTION - B

2. Draw free hand the sectional front view and right-side view of the pin type flexible coupling.

3. Draw freehand the sectional front view and side view of spigot and socket joint used in pipe fittings.

4. Sketch freehand the top view and sectional front view of a double riveted lap joint (zig¬zag type).

SECTION - C

5. The part drawings of a Foot-step Bearing are shown in Figure 1. Assemble the parts and draw full sectional front view and top view.

6. The part drawings of a Feed check valve are shown in Figure 2. Assemble the parts and draw full sectional view from the front and top view.

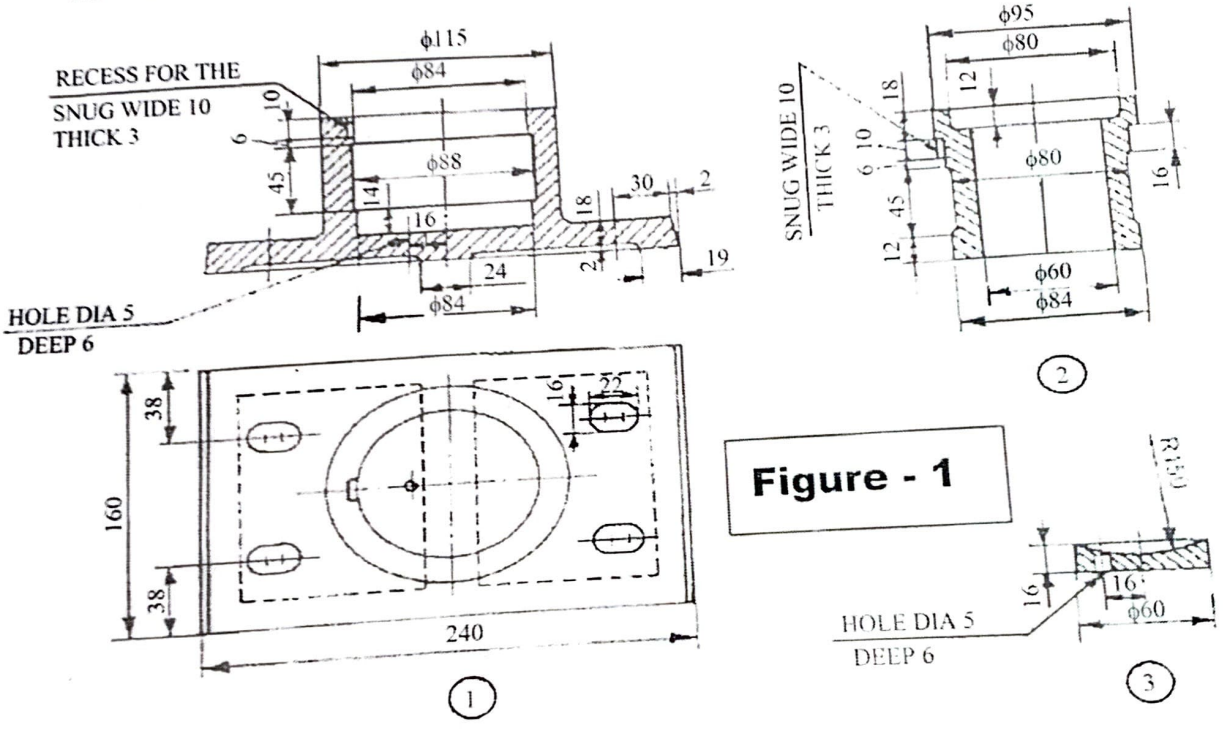

Figure - 1

Parts List

SL.No.	Name	Matl.	Qty.
1	Body	Cast Iron	1
2	Brush	Brass	1
3	Disc	P Bronze	1
4	shaft	Mild Steel	1
5	Pin	Mild Steel	1

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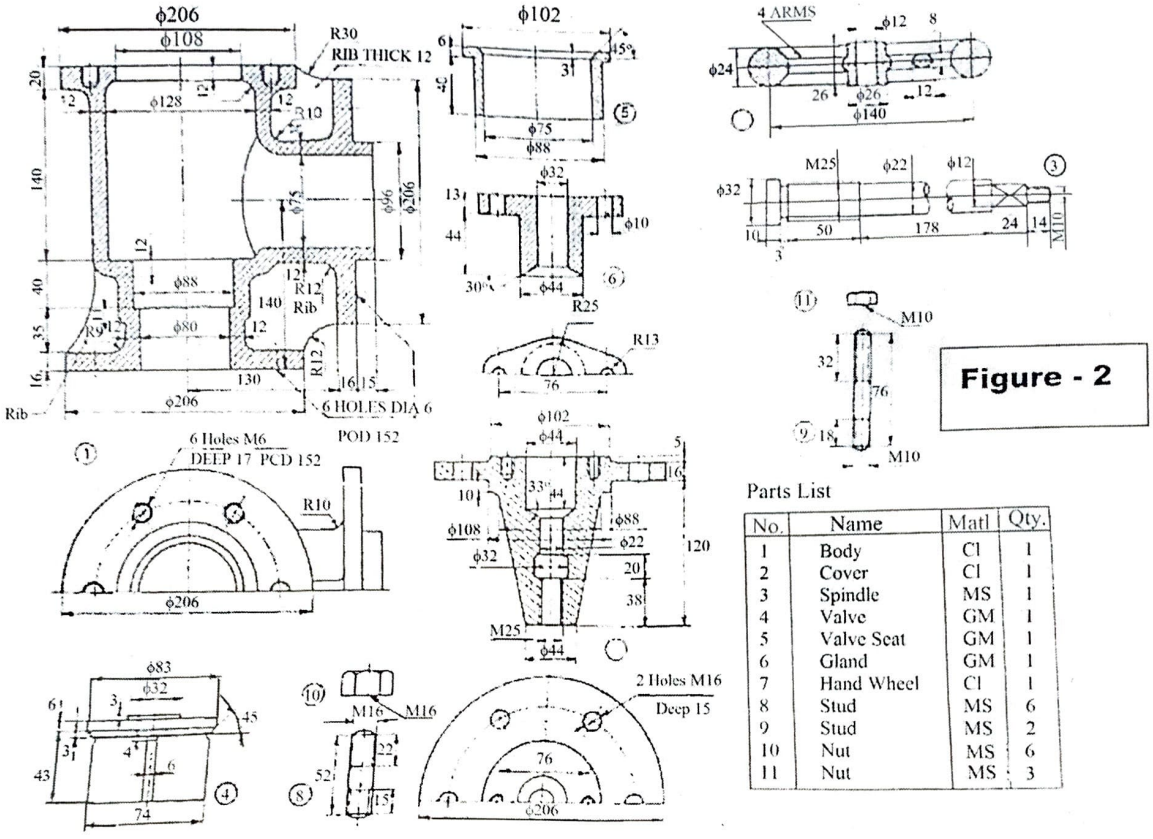

Figure - 2

Parts List

No.	Name	Matl	Qty.
1	Body	CI	1
2	Cover	CI	1
3	Spindle	MS	1
4	Valve	GM	1
5	Valve Seat	GM	1
6	Gland	GM	1
7	Hand Wheel	CI	1
8	Stud	MS	6
9	Stud	MS	2
10	Nut	MS	6
11	Nut	MS	3

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B.Tech.(ME) (Sem.–3)

THEORY OF MACHINES – I

Subject Code : BTME302-18

M.Code : 76418

Date of Examination: 16-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly:

a) Define mechanism.

b) What is screw pair? Give examples.

c) Write any two inversions of four bar chain.

d) What do you mean by straight line mechanism?

e) Define velocity ratio of belt drive.

f) What is chain drive?

g) What is flat faced follower?

h) What is friction clutch?

i) Name different spring loaded governors.

j) Discuss isochronous governor.

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SECTION-B

2. PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ = 62.5 mm; QR = 175 mm; RS = 112.5 mm; and PS = 200 mm. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS = 60° and Q and R lie on the same side of PS. Find the angular velocity and angular accelaration of links QR and RS.

3. Discuss Davis steering mechanism with neat diagram.

4. An open flat belt drive connects two parallel shafts 1.2 metres apart. The driving and the driven shafts rotate at 350 r.p.m. and 140 r.p.m. respectively and the driven pulley is 400 mm in diameter. The belt is 5 mm thick and 80 mm wide. The coefficient of friction between the belt and pulley is 0.3 and the maximum permissible tension in the belting is 1.4 MN/m^2. Determine: a) diameter of the driving pulley, b) maximum power that may be transmitted by the belting, and c) required initial belt tension.

5. A vertical shaft supports a load of 20 kN in a conical pivot bearing. The external radius of the cone is 3 times the internal radius and the cone angle is 120°. Assuming uniform intensity of pressure as 0.35 MN/m^2m. Determine the dimensions of the bearing. If the Coefficient of friction between the shaft and bearing is 0.05 and the shaft rotates at 120 r.p.m, Find the power absorbed in friction.

6. The turning moment diagram for a multicylinder engine has been drawn to a scale of 1 mm = 4500 N-m vertically and 1 mm = 2.4° horizontally. The intercepted areas between output torque curve and mean resistance line taken in order from one end are 342, 23, 245, 303,115, 232, 227,164 mm^2, when the engine is running at 150 r.p.m. If the mass of the flywheel is 1000 kg and the total fluctuation of speed does not exceed 3% of the mean speed, find the minimum value of the radius of gyration.

SECTION-C

7. A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion :

   a) Follower to move outwards through a distance of 30 mm during 120° of cam rotation;

   b) Follower to dwell for 60° of cam rotation;

   c) Follower to return to its initial position during 90°of cam rotation; and

   d) Follower to dwell for the remaining 90° of cam rotation.

The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile.

8. The arms of a Porter governor are 300 mm long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to a sleeve at a distance of 40 mm from the axis of rotation. The mass of the load on the sleeve is 70 kg and the mass of each ball is 10 kg. Determine the equilibrium speed when the radius of rotation of the balls is 200 mm. If the friction is equivalent to a load of 20 N at the sleeve, what will be the range of speed for this position?

9. **Write short note on:**

   a) Absorption dynamometer (any one type)

   b) Pendulum pump.

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B.Tech. (ME) (Sem.–3)

BASIC THERMODYNAMICS

Subject Code : BTME305-18

M.Code : 76422

Date of Examination:18-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly:

a. Define thermodynamics.

b. Define the concept of continuum.

c. Define the specific heats at constant volume and constant pressure.

d. How does Celsius temperature scale differ from absolute Kelvin scale?

e. What is an ideal gas? How does it differ from a perfect gas?

f. What are the two requirements for a process to be isentropic?

g. List the assumptions made in the analysis of air standard cycles.

h. What is meant by intercooling?

i. What do you understand by reheating?

j. What is meant by low grade and high grade energy?

SECTION-B

2. What is the relationship between a system and its environment when the system is a) adiabatic, b) isolated.

3. Define and explain with the help of neat sketch the Zeroth law of Thermodynamics. Why it is so called?

4. A reversible heat engine delivers 0.6 kW power and rejects heat energy to a reservoir at 300 K at the rate of 24 kJ/min. Make calculations for the engine efficiency and the temperature of the thermal reservoir supplying heat to the engine.

5. Show that COP of a heat pump is greater than COP of a refrigerator by unity.

6. Entropy is defined in terms of a reversible process. How can then it be evaluated for an irreversible process?

SECTION-C

7. An air standard Diesel cycle has compression ratio of 14. The pressure at the beginning of the compression stroke is 1 bar and temperature 27°C. The maximum temperature of the cycle is 2500°C. Determine the thermal efficiency of the engine.

8. What is meant by constant dryness fraction lines? How these are plotted on T-S diagram?

9. How we compare the gas turbines with steam turbines and internal combustion engines? Explain with neat and clean sketch.

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