

Roll No.

3112

B. Tech. 4th Semester (ME)

Examination – May, 2025

APPLIED THERMODYNAMICS

Paper : PCC-ME-202-G

Time : Three Hours]

[Maimum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What is adiabatic flame temperature. 2.5
- (b) Write a short note on 'excess air'. 2.5
- (c) Discuss the properties of an ideal refrigerants. 2.5
- (d) Difference b/w super critical and ultra super critical turbine. 2.5

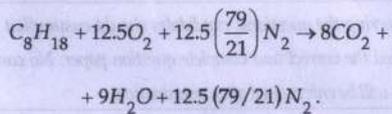
3112-2,400 -(P-3)(Q-9)(25)

P. T. O.

- (e) Define compressible flow. 2.5
 (f) Define optimal stage pressure ration for compressor. 2.5

SECTION - A

2. Describe with the help of neat sketch of Bomb calorimeter used for the determination of heating value. 15
 3. Calculate the theoretical air-fuel ration for the combustion of octane C_8H_{18} . The combustion equation is: 15



SECTION - B

4. Differentiate b/w otto, diesel and dual cycle with diagram. 15
 5. Discuss the vapour compression referigeration cycle with diagram. 15

SECTION - C

6. Describe the Psychrometrics chart with different operations involving heating/cooling and humidification and dehumidification. 15

7. Derive the relation for critical pressure ratio of nozzle. 15

SECTION - D

8. Derive the relation of efficiency for reciprocating compressor. 15
 9. Discuss the velocity and pressure compounding of steam turbine. 15

Roll No.

3113

**B. Tech. 4th Semester (ME)
Examination – May, 2025**

FLUID MECHANICS

Paper : PCC-ME-204-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Section. Question No. 1 is compulsory. All questions carry equal marks.

1. (i) Classify fluids.
- (ii) State Pascal's law.
- (iii) State the assumptions made for Bernoulli's theorem.
- (iv) Define the term buoyancy and centre of buoyancy.
- (v) Describe the use and limitations of the flow net.
- (vi) Define kinetic energy correction and momentum correction factor. 2.5 × 6 = 15

3113-2550 (P-3)(Q-9)(25)

P. T. O.

SECTION - A

2. (a) Define an expression for the metacentric height of a floating body. 7
- (b) A circular plate 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure. 8
3. Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow. 15

SECTION - B

4. Explain the principle of venturimeter with a neat sketch. Derive the expression for the rate of flow of fluid through it. 15
5. The pressure difference Δp in a pipe of diameter D and length l due to viscous flow depends on the velocity V , viscosity μ , density ρ . Using Buckingham's π -theorem, obtain an expression for Δp . 15

SECTION - C

6. Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section is parabolic in nature. Also prove that maximum velocity is equal to one and a half times the average velocity. 15

3113- (P-3)(Q-9)(25) (2)

7. Find an expression for the power transmission through pipes. What is the condition for maximum transmission of power and corresponding efficiency of transmission? 15

SECTION - D

8. Define momentum thickness. Derive an expression for the momentum thickness. 15
9. (a) Explain Hydrodynamically smooth and rough boundaries. 5
- (b) A rough pipe is of diameter 8 cm. The velocity at a point 3 cm from wall is 30% more than the velocity at a point 1 cm from pipe wall. Determine the average height of the roughness. 10

3113- (P-3)(Q-9)(25) (3)

Roll No.

3114

B. Tech. 4th Semester (ME)
Examination – May, 2025

STRENGTH OF MATERIALS

Paper : PCC-ME-206-G

Time : Three Hours] [Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What is Hook's Law ? 2.5
- (b) What is point of Contraflexure ? 2.5
- (c) Differentiate between Column and Strut. 2.5
- (d) Describe the Maxwell's reciprocal theorems. 2.5
- (e) What is hunting and surging of Spring. 2.5
- (f) Describe the Macaulay's method. 2.5

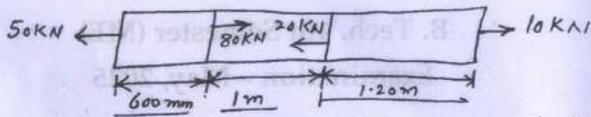
3114-2,400-(P-4)(Q-9)(25)

P. T. O.

SECTION - A

2. A brass bar, having cross sectional area of 1000 mm^2 is subjected to axial forces as shown in Fig. Find the total elongation of the bar. 15

Take $E = 1.05 \times 10^5 \text{ N/mm}^2$



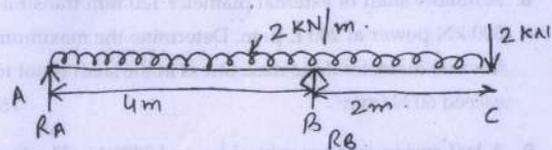
3. At a point in a strained material the principal stresses are 100 N/mm^2 (tensile) and 60 N/mm^2 (comp.) Determine the normal stress, shear stress and resultant stress on a plane inclined at 50° to the axis of major principal stress. Also determine the max. Shear stress at the point. 15

SECTION - B

4. A cantilever of length 2.0 m carries a uniformly distributed load of 1 kN/m run over a length of 1.5 m from the free end. Draw S. F. and B. M. diagrams for the cantilever. 15
5. Draw the S. F. and B. M. diagrams for the overhanging beam carrying uniformly distributed load of 2 kN/m

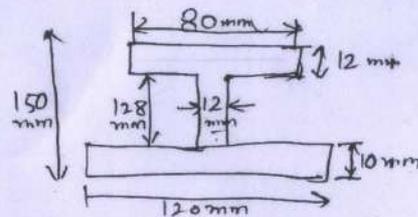
3114-2,400-(P-4)(Q-9)(25) (2)

over the entire length and a point load of 2 kN as shown in fig. : 15



SECTION - C

6. Determine the polar moment of inertia of I-section shown in Fig. : 15



7. Derive an expression for crippling load when both the ends of the column are hinged. 15

3114-2,400-(P-4)(Q-9)(25) (3)

P. T. O.

SECTION - D

8. A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r. p. m. Determine the maximum internal diameter if the max. Stress in the shaft is not to exceed 60 N/mm^2 . 15
9. A leaf spring carries a central load of 3000 N. The leaf spring is to be made of 10 steel plates 5 cm and 6 mm thick. If the bending stress is limited to 150 N/mm^2 determine :
- Length of the spring,
 - Deflection at the centre of spring if $E = 2 \times 10^5 \text{ N/mm}^2$.

Roll No.

3115

**B. Tech. 4th Semester (ME)
Examination – May, 2025**

MATERIALS ENGINEERING

Paper : PCC-ME-208-G

Time : Three Hours]

[Maximum Marks :75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Write short notes on the following : 2.5 × 6 = 15

- (i) Unit cells
- (ii) Griffith criterion
- (iii) Interstitial Solid solution
- (iv) Vacuum hardening

3115-2300-(P-3)(Q-9)(25)

P. T. O.

- (v) Yield point
- (vi) Case hardening

SECTION - A

- 2. Describe the dislocation strengthening mechanism and slip system. 15
- 3. What is Hardness ? How hardness test is carried out, discuss all test with diagram. 15

SECTION - B

- 4. Explain ductile and brittle failure mechanism and describe the Tresca and Von-mises theory of failure. 15
- 5. Write short notes on the following : 15
 - (i) SN curve
 - (ii) Endurance and fatigue limits

SECTION - C

- 6. Explain any one binary phase diagram in detail. 15
- 7. Explain TTT diagram in detail. 15

SECTION - D

- 8. Explain Annealing, tempering, normalizing and spherodising heat treatment. 15
- 9. Write short notes on the following : 15
 - (i) Induction hardening
 - (ii) Carburizing
 - (iii) Austempering

Roll No.

3116

B. Tech. 4th Semester (ME)

Examination – May, 2025

INSTRUMENTATION & CONTROL

Paper : PCC-ME-210-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Write short on following :

- | | |
|--------------------------------|-----|
| (i) Hot wire Anemometer. | 2.5 |
| (ii) Pitot-tube. | 2.5 |
| (iii) Bi-metallic Thermometer. | 2.5 |

3116-2,450-(P-3)(Q-9)(25)

P. T. O.

- (iv) Torque Meter. 2.5
- (v) Ionization Transducers. 2.5
- (vi) Classification of Instruments. 2.5

SECTION - A

- 2. What are primary, secondary and tertiary measurements ? Explain with examples. 15
- 3. Draw and discuss the block diagram representation of a generalized measurement system. 15

SECTION - B

- 4. What is a strain gauge ? What are the steps involved in measuring strain using resistance gauge. 15
- 5. Explain briefly (LVDT) with diagram. 15

SECTION - C

- 6. How the Absolute Motion devices are different from seismic devices. Explain 15
- 7. Explain the followings : 15
 - (a) Pressure thermometer
 - (b) Total radiation Pyrometer

SECTION - D

- 8. Explain the basic elements of closed loop control system. How PI is different from PID. Explain. 15
- 9. Explain the working of Electro-magnetic flow meter with diagram. 15