Roll No. .....

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B. Tech. 4th Semester (ME) Examination – May, 2023

APPLIED THERMODYNAMICS

Paper : PCC-ME-202-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 Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. Explain the following : $2.5 \times 6 = 15$

(a) Adiabatic flame temperature

(b) Eco-friendly Refrigerants

(c) VCRS with diagram

(d) Condition of choked flow

(e) Degree of Reaction

(f) Subsonic and Supersonic flow

UNIT – I

2. Discuss the method of finding calorific values of solid and liquid fuel. 15

3. The following is the ultimate analysis of a sample of petrol by weight. Carbon = 85%, Hydrogen ⇒ 15%. Calculate the ratio of air to petrol consumption by weight if volumetric analysis of dry exhaust is $CO_2 \Rightarrow 11.5\%, CO \Rightarrow 1.2\%, O_2 \Rightarrow 0.9\%$ and $N_2 \Rightarrow 86\%$.

   Also find percentage of excess air. 15

UNIT – II

4. How Rankine cycle is differ from cannot cycle ? Explain the effect of reheat and intercooling on rankine cycle using suitable diagrams. 15

5. Explain Air-standard dual cycle with suitable diagram. Derive the equation for air standard efficiency, work output and mean effective pressure. 15

UNIT – III

6. Define Psychometry. Derive the relation between various types of psychometric term. 15

7. (a) Define Mach number. Explain the various types of stagnation properties during compressible flow. 10

   (b) Derive formulae to find out nozzle and diffuser efficiency. 5

UNIT – IV

8. Define steam turbine. Discuss the various method for velocity and pressure compounding of steam turbine using neat sketch/diagrams. 15

9. A trial on a two stage single acting reciprocating air compressor gave the following data : 15

   Free air delivered ⇒ $6m^3$/minute

   Atmospheric Pressure and temperature - 1 bar and 27°C.

   Delivery Pressure ⇒ 40 bar

   Speed ⇒ 400 rpm

   Intermediate pressure ⇒ 6 bar

   Temperature at inlet to second stage ⇒ 27°C

   Law of compression ⇒ $PV^{1.3}$ ⇒ constant

   Mechanical efficiency ⇒ 80%

   Stroke of L. P. ⇒ diameter of L. P ⇒ stroke of H. P.

   Calculate : (i) Cylinder-diameters

   (ii) Power required, neglect clearance

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B. Tech. 4th Semester (ME) Examination – May, 2023

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 Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. (a) Define Instrumentation. $2.5 \times 6 = 15$

(b) Differentiate between accuracy and precision.

(c) What do you mean by transducer element ? List its key attributes.

(d) Explain principle and uses of rotameter.

(e) What is thermal screening ? Explain its principle.

(f) List application of control system engineering.

UNIT – I

2. (a) Discuss in detail functional element of measurement system. 7

   (b) What are the criterion for the selection of an instrument ? 8

3. Classify instruments and discuss them with neat sketch. 15

UNIT – II

4. (a) Differentiate between analog and digital transducer. 7

   (b) What do you mean by resistance strain gauge transducer ? Classify and explain them. 8

5. (a) With neat sketch discuss the working of LVDT. Also discuss its application, advantages and limitation in measurement system. 7

   (b) Write short notes on : 8

   (i) Piezo-electric Transducer

   (ii) Opto-electrical Transducer

UNIT – III

6. (a) Discuss various electromechanical methods of force measurement. 7

   (b) List various types of Dynamometers for measurement of torque. Discuss them with neat sketch. 8

7. (a) Discuss various electrical types of temperature measuring instrument. 8

   (b) With neat sketch discuss selective radiation pyrometer. Also state its advantages and limitation. 7

UNIT – IV

8. List different flow meters. Explain operating principle of ultrasonic flow meter. Also list its advantages and limitation. 15

9. (a) Differentiate between open and closed loop control system. Also draw their block diagram. 7

   (b) What do you mean by Controllers ? Classify and explain them. 8

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B. Tech. 4th Semester (ME) Examination – May, 2023

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 Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. (a) Define resilience.

   (b) What is Hardness ?

   (c) What do you understand by non-destructive testing ?

   (d) Define an Alloy.

   (e) What is carburizing ?

   (f) Write about case hardening. $2.5 \times 6 = 15$

UNIT – I

2. Explain Interfacial and volume defects in detail. 15

3. Write in detail about Tensile, compression and torsion tests. 15

UNIT – II

4. Write in detail about stress intensity factor approach and Griffith criterion. 15

5. Discuss about :

   (a) Fracture with fatigue 10

   (b) SN curve 5

UNIT – III

6. Explain with neat sketches TTT-curve. 15

7. Write in detail about microstructural aspects of ferrite and cementite. 15

UNIT – IV

8. Discuss about :

   (a) Annealing and Tempering 8

   (b) Plasma hardening 7

9. Write about :

   (a) Properties of tool steel 8

   (b) Nickel based superalloys 7

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B. Tech. 4th Semester (ME) Examination – May, 2023

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 Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. (a) Define volumetric strain.

(b) Write bending stress equation with its notations.

(c) Define slenderness ratio.

(d) Define polar moment of inertia.

(e) Define section modulus.

(f) Define Hook's law. $2.5 \times 6 = 15$

UNIT – I

2. Derive the relationship between various elastic constants in details.

3. The bar shown in figure 1 is tested in universal testing machine. It is observed that at a load of 40 kN the total extension of the bar is 0.285 mm. Determine the Young's modulus of the material P = 40 kN. 15

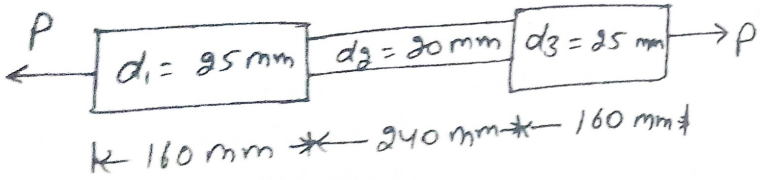

Figure 1

UNIT – II

4. The simply supported beam has been shown in fig 2. Draw the SFD and the BMD (shear force and bending moment diagrams). 15

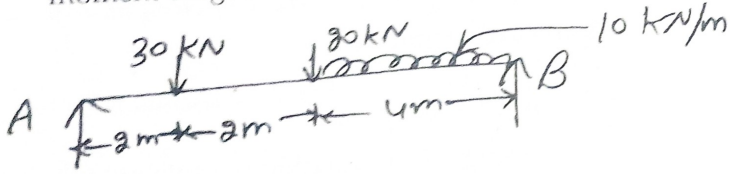

Figure 2

5. Derive the equation of bending stress also state the assumptions in simple theory of bending. 15

UNIT – III

6. Calculate the maximum intensity of shear stress induced and the angle of twist produced in degrees in solid shaft of 100 mm diameter, 10m long transmitting 112.5 kW at 150 rpm. Take G = 82 KN/ mm^2. 15

7. A simply supported beam as shown in figure 3. Calculate (i) the position and the value of max. deflection (ii) Deflection at load point 18 kN. 15

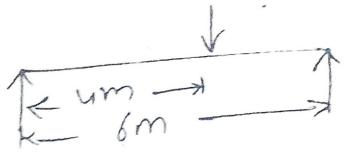

Figure 3

UNIT – IV

8. Explain the following : 15
   (a) Maxwell reciprocating theorem
   (b) Columns & struts

9. Explain the following : 15
   (a) Derivation of Euler's formula
   (b) Effective/Equivalent length

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B. Tech. 4th Semester (ME) Examination – May, 2023

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 Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. (a) Define Pascal's Law.

   (b) Define flow net.

   (c) State Euler's equation and Bernoull's theorem.

   (d) What is the difference between nozzle and diffuser.

   (e) Define hydraulic line and total energy line.

   (f) Define Turbulant flow. $2.5 \times 6 = 15$

UNIT – I

2. Derive the differential equation of continuity in cylindrical co-ordinates. 15

3. Explain the following : 15

   (i) Newton s Law of viscosity

   (ii) Different types of flows

   (iii) Vorticity and circulation

UNIT – II

4. Explain the principle of venturimeter with a neat sketch and establish a relation for the rate of flow through it. 15

5. Explain stagnation properties, isentropic flow and effect of area variation on flow properties. 15

UNIT – III

6. Give a proof of Hagen-Poiseuille equation for fully developed laminar flow in a pipe and hence show that the Darcy-friction coefficient is equal to 16/Re where Re is Reynolds number. 15

7. What are the different types of energy losses occur in pipes. Derive an expression for the loss of head due to friction in pipe. 15

UNIT – IV

8. Explain the following : 15

   (a) Momentum Thickness

   (b) Laminar and turbulent boundary layer flow

9. Explain the following : 15

   (a) Turbulant flow

   (b) Shear stress in turbulant flow, prandte mixing length hypothesis.
