Hall Ticket Number :										

R-15

Code: 5G533

II B.Tech. I Semester Supplementary Examinations November 2018

Basic Thermodynamics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain what do you understand by concept of continuum? How will you define density and pressure using this concept? 7M

   b) A balloon is filled with air (200 kPa and 300K) such that it becomes as sphere of diameter 1m. It is then gradually heated till the pressure rises to 500 kPa. Determine the amount of work done during the process, assuming that the pressure inside the balloon is proportional to the diameter of the balloon. 7M

OR

2. a) A spherical balloon holds 5 kg of air at 200 kPa and 450 K. If the air pressure inside is always proportional to the square of the balloon diameter, determine the work done when the balloon volume doubles due to heating. 7M

   b) A fluid contained in a horizontal cylinder fitted with a frictionless leak proof piston, is continuously agitated by means of a stirrer passing through the cylinder cover. The cylinder diameter is 0.4 m. During the stirring process lasting 10 minutes, the piston slowly moves out a distance of 0.485 m against the atmosphere. The net work done by the fluid during the process is 2 kJ. The speed of the electric motor driving the stirrer is 840 rpm. Determine the torque in the shaft and power output of the motor. 7M

UNIT–II

3. a) Is the Third law of thermodynamics, an extension of second law? Is it an independent law of nature? Explain? 7M

   b) A fluid contained in a cylinder receives 150 kJ of mechanical energy by means of a paddle wheel, together with 50 kJ in the form of heat. At the same time, the piston in the cylinder moves in such a way that the pressure remains constant at 200 kN/m^2 during the fluid expansion from 2 m^3 to 5 m^3. What is the change in internal energy and in enthalpy? 7M

OR

4. a) Describe the concept of Principle of Entropy increase. 7M

   b) A 4m x 6m x 6m room is provided with a 150 W fan. A person turns on the fan, closes the door and windows before he leaves the room one hot summer morning with a hope to keep inside the room cool when he will return in the evening, The doors and the windows are all made of wood are tightly closed to render heat transfer negligible. He returns 10 hours later to find that room was hotter than his expectation. Assume the room to be at 100 kPa and 288 K in the morning when he leaves the room. Determine the room temperature when he opens the door on his return. 7M

UNIT–III

5. a) Discuss the significance of Gibbs and Helmholtz functions. 7M

   b) Two blocks of metal, each having a mass of 10 kg and having a specific heat of 0.4 kJ/kg.K, are at a temperature of 40^0C. A reversible refrigerator receives heat from one block and rejects heat to the other. Calculate the work required to cause a temperature difference of 100^0C between the two blocks. 7M

OR

6. a) Derive Maxwell Equations. 7M

   b) A copper ball weighing 0.4536 kg and uniformly heated to 310.7 K is dropped in a cold bath where upon it cools down to 267 K. Calculate the entropy change of the ball. 7M

UNIT–IV

7. a) Why cannot a throttling calorimeter measure the quality if the steam is very wet? How is the quality measured then? 7M

   b) A steam boiler initially contains 5 m^3 of steam and 5 m^3 of water at 1 MPa. Steam is taken out at constant pressure until 4 m^3 of water is left. What is the heat transferred during the process? 7M

OR

8. a) One mole of air is compressed isochorically till its pressure gets doubled. Then it is allowed to expand reversibly and isothermally to regain its original pressure. Thereafter, it is subjected to isobaric cooling whereupon its volume decreases to restore its initial state. Find the net work done. Assume air behaves as an ideal gas. 7M

   b) Define Compressibility factor 'Z'. Discuss the significance of the compressibility factor. 7M

UNIT–V

9. a) A steam pressure of holding capacity 4 m^3 contains a mixture of saturated water and saturated steam at 250^0C. The mass of the liquid present is 1 ton. Determine (i) Quality; (ii) Specific Volume; (iii) Specific Enthalpy; (iv) Specific Entropy and (v) Specific Internal Energy of steam. 7M

   b) Two bodies of equal heat capacities C and temperatures T1 and T2 from an adiabatically closed system. What will be the final temperature be if one lets this system come to equilibrium (i) freely; (ii) reversibly. 7M

OR

10. a) A gas mixture consists of 0.4 kg CO, 1.1 kg of CO_2 and1.5 kg of N_2.
    Determine
    i) mass fraction of each component
    ii) mole fraction of each component
    iii) average molar mass of the mixture
    iv) gas constant of the mixture. 7M

    b) The volumetric analysis of a dry flue gas in a boiler trail is given in percentage as 13% CO_2 , 1.5% CO, 3.5% O_2 and 82% N_2. Determine the percentage gravimetric analysis. Also find the specific gas constant of the mixture. 7M

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Hall Ticket Number :										

R-15

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations November 2018

Engineering Mathematics-III

(Common to CE and ME)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ by reducing into Echelon form

   b) Find the Eigen values and eigenvectors of $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$

OR

2. a) Find the values of k for which the system of equations (3k-8)x+3y+3z=0; 3x+(3k-8)y+3z; 3x+3y+(3k-8)z=0 has a non-trivial solution.

   b) Using Cayley-Hamilton theorem, find A^8, if $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$

UNIT–II

3. Estimate the value of $f(22)$ and $f(42)$ from the following table by Newton's forward and backward interpolation formula.

x	20	25	30	35	40	45
y	354	332	291	260	231	204

OR

4. Evaluate $\int_0^6 \frac{1}{1+x}\,dx$ by using

   Trapezoidal rule (ii) Simpson's 1/ 3 rule (iii) Simpson's 3/ 8 rule.

UNIT–III

5. Solve $y' = y^2 + x$, $y(0) = 1$. Using Taylor's series Method, Compute $y(0.1), y(0.2)$ and $y(0.3)$.

OR

6. Using Runge-Kutta method of order 4, find y for x=0.1,0.2,0.3, given that $\frac{dy}{dx} = xy + y^2, y(0) = 1$.Continue the solution at x=0.4 using Milne's method

UNIT–IV

7. Obtain the Fourier series for the function $f(x)$ given by

$$f(x)=\begin{cases}1+\dfrac{2x}{\pi}, -\pi \le x \le 0\\ 1-\dfrac{2x}{\pi}, 0 \le x \le \pi\end{cases}$$ deduce that $\dfrac{1}{1^2}+\dfrac{1}{3^2}+\dfrac{1}{5^2}+\ldots=\dfrac{\pi^2}{8}$

OR

8. a) Find the Fourier series expansion for $f(x)=e^x$ in $0<x<2\pi$

   b) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from $z=ax+by+a^2+b^2$

UNIT–V

9. a) Show that $u=\dfrac{1}{2}\log\left(x^2+y^2\right)$ is harmonic and find its harmonic conjugate function

   b) Evaluate $\int_c \dfrac{\sin\pi z^2+\cos\pi z^2}{(z-1)(z-2)}dz$ with C: $|z|=3$ using Cauchy's Integral Formula

OR

10. Show that the function $f(z)=\sqrt{|xy|}$ is not analytic at the origin even though C-R equations are satisfied.

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Hall Ticket Number :										

R-15

Code: 5G534

II B.Tech. I Semester Supplementary Examinations November 2018

Manufacturing Technology

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain centrifugal casting process with a neat sketch. 7M

   b) A sprue is 300 mm long and has a diameter of 125 mm at the top. The molten metal level in the pouring basing (which is much larger than the top of the sprue) is taken to be 75 mm from the top of the sprue for design purposes. If a flow rate of 650 mm^3/s is to be achieved, what should be the diameter at the bottom of the sprue? Will the sprue aspirate? Explain. 7M

OR

2. a) State and explain the properties and types of moulding sands. 7M

   b) With the help of a neat sketch explain the cold chamber die casting process. 7M

UNIT–II

3. a) Explain Thermit welding Process with neat sketch. 7M

   b) Classify and enumerate the various welding defects with causes of occurrences. 7M

OR

4. a) Explain the various types of oxy-acetylene flames with sketches. 7M

   b) Compare and Contrast Brazing and Soldering Process. 7M

UNIT–III

5. a) Differentiate between hot working and cold working process. 7M

   b) Classify and write notes on various rolling stand arrangement in detail. 7M

OR

6. a) Explain in detail about wire drawing 7M

   b) Estimate the roll force, F, and the torque for an AISI 1020 carbon-steel strip that is 200 mm wide, 10 mm thick, and rolled to a thickness of 7 mm. The roll radius is 200 mm, and it rotates at 200 rpm. 7M

UNIT–IV

7. a) Explain the steps involved in drop forging with neat sketches. 7M

   b) Explain impact extrusion process with a neat sketch. 7M

OR

8. a) Explain the process involved in smith forging. 7M

   b) Classify the extrusion process and briefly explain the process of direct extrusion. 7M

UNIT–V

9. a) Summarise the various differences between thermoplastics and thermosetting plastics. 7M

   b) Explain the injection moulding process. 7M

OR

10. a) Explain the extrusion blow moulding process with a neat sketch. 7M

    b) Explain transfer moulding. Discuss its advantages and limitations. 7M

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Hall Ticket Number :										

R-15

Code: 5G532

II B.Tech. I Semester Supplementary Examinations November 2018

Metallurgy and Material Science

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. What is a solid solution? Discuss the similarities and differences between substitutional and interstitial solid solutions

OR

2. List the various types of bonds occurring in a crystal. Discuss the metallic bond and its characteristics.

UNIT–II

3. What is equilibrium diagram? State its importance and objectives. How is equilibrium diagrams classified?

OR

4. Define Eutectic systems. Explain about equilibrium cooling and heating of alloys.

UNIT–III

5. Explain the structure and properties of plain carbon steels and its applications

OR

6. Explain micro structure, properties and uses of the below.
   (a) White cast iron
   (b) spheroidal cast iron

UNIT–IV

7. Explain the role of solvus curve in phase diagrams for age hardenable alloys.

OR

8. Explain briefly
   (i) Full annealing.
   (ii) Isothermal annealing
   (iii) Sub critical annealing.

UNIT–V

9. Enumerate the characteristics, properties and applications of cermets, glass

OR

10. Write Short notes on
    a) Metal ceramic mixtures.
    b) Carbon composites

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Hall Ticket Number :										

R-15

Code: 5G531

II B.Tech. I Semester Supplementary Examinations November 2018

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) A specimen of steel 25 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.16 mm under a load of 80 kN and the load at elastic limit is 160 kN. The maximum load is 180 kN. The total extension at fracture is 56 mm and the diameter at the neck is 18 mm. Find (i) the stresses at elastic limit, (ii) Young's Modulus, (iii)Percentage elongation, (iv)Percentage reduction in area and, (v)Ultimate tensile stress 7M

   b) A stepped circular bar having diameters 20 mm, 15mm and 10 mm over axial lengths of 100mm, 80mm and 60mm is subjected to an axial tensile force of 5kN. If E= 100 x 10^3 N/mm^2 and 1/m =0.32 for the material of the bar, determine (i) Total change in length and (ii) Change in each diameter 7M

OR

2. a) A spherical ball of a material 10 mm in diameter goes down to a depth of 500 meters in sea water. If the weight density of sea water =1040 kg/m^3 and the bulk modulus of the material is 16 X 10^5 kg/cm^2, determine the change in the volume of the ball? 8M

   b) Define Hooke's law, Poisson's ratio and state their significance briefly? 6M

UNIT–II

3. a) Define beam? Discuss briefly about the types of beams with neat sketches? 4M

   b) Draw the SF and BM diagrams for the cantilever beam shown in fig.a.

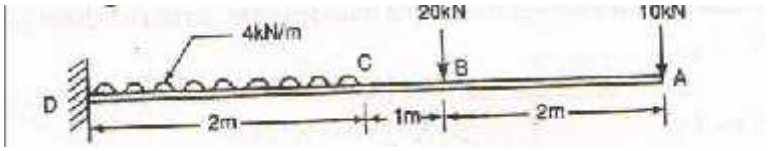

Fig a 10M

OR

4. a) Draw the SF and BM diagrams for the beam shown in fig.b and mark the salient points. Find the point of contraflexure and maximum bending moment?

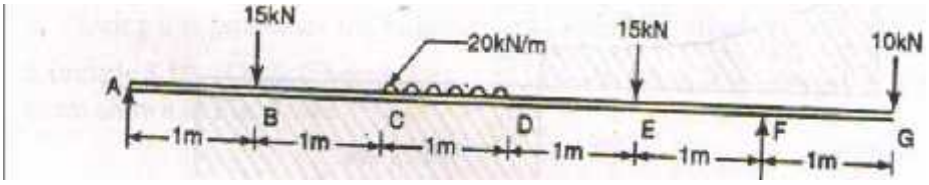

Fig b 5M

   b) A beam 6 m long, simply supported at ends carries a linearly varying load with maximum rate at the centre of the beam i.e. 1.5 tonne/m run. Assume the uniformly varying load is zero at the supports and maximum at the centre? Draw the SF & BM diagrams for the beam? 9M

UNIT–III

5. a) Derive an expression of simple bending equation and state the assumptions of it? 7M

   b) A cantilever of sq. section 20 mm x 20 mm x 2 m long, just fails in flexure when a load of 12KN is placed at its free end. A beam of the same material and having a rectangular cross section 150 mm wide and 300 mm deep is simply supported over a span of 3 m. Calculate the minimum central concentrated load required to break the beam? 7M

OR

6. a) Derive an expression for the shear stress across the circular cross section? 7M

   b) A simply supported beam has a span of 4m and a rectangular cross section of 100 mm x 200 mm. Find the UDL it can carry, if the maximum bending stress and the maximum shear stress are not to exceed 10 N/mm^2 and 0.6 N/mm^2 respectively. 7M

UNIT–IV

7. a) Derive an expression for the deflection of a cantilever beam subjected to UDL? 6M

   b) A simply supported beam of 6 m span is subjected to a concentrated load of 18 kN at 4 m from left support. Calculate (i) The position and the value of the maximum deflection, (ii) Slope at mid span, (iii) Deflection at the load point? Take, E= 200GPa and I= 15 $x10^6$ mm^4 8M

OR

8. a) A steel beam of circular section with diameter of 50 mm is used as a cantilever of length 3 m. How much load can be safely applied at the free end of the cantilever, if E=200 GPa, and deflection is not exceed 1 mm and the slope is not to exceeded 0.2° 7M

   b) While using Macaulay's method, explain how the location of a moment is specified in bending moment equation? 7M

UNIT–V

9. a) Derive an expression for the circumferential, longitudinal stresses and change in dimensions of the thin cylinder? 5M

   b) The diameter of the city water supply pipe is 750 mm. It has to withstand a water head of 60 m. Find the thickness of the seamless pipe, if the permissible stress is 20 N/mmr^2. Take the unit weight of the water as $9810N/m^3$. 9M

OR

10. a) State the assumptions made in Euler's theory for axially loaded elastic long columns? 4M

    b) A thick spherical shell of 400 mm external diameter and 50 mm thick is subjected to internal fluid pressure 0f 50 N/mm^2. Draw the variation of hoop stresses across the thickness. Draw the variation of hoop stress? 10M

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