Hall Ticket Number :										

Code: 4G533

R-14

II B.Tech. I Semester Supplementary Examinations May 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)

*****

UNIT–I

1. a) What do you mean by "Perpetual motion machine of first kind-PMM 1"? 5M

   b) A piston–cylinder device initially contains 0.8 m^3 of saturated water vapor at 250 kPa. At this state, the piston is resting on a set of stops, and the mass of the piston is such that a pressure of 300 kPa is required to move it. Heat is now slowly transferred to the steam until the volume doubles. Show the process on a *P-v* diagram with respect to saturation lines and determine (*a*) the final temperature, (*b*) the work done during this process, and (*c*) the total heat transfer. 9M

OR

2. a) Why only in constant pressure non-flow process, the enthalpy change is equal to heat transfer? 5M

   b) Steam flows steadily through an adiabatic turbine. The inlet conditions of the steam are 10 MPa, 450°C, and 80 m/s, and the exit conditions are 10 kPa, 92 percent quality, and 50 m/s. The mass flow rate of the steam is 12 kg/s. Determine (*a*) the change in kinetic energy, (*b*) the power output, and (*c*) the turbine inlet area. 9M

UNIT–II

3. a) A household refrigerator with a COP of 1.2 removes heat from the refrigerated space at a rate of 60 kJ/min. Determine (*a*) the electric power consumed by the refrigerator and (*b*) the rate of heat transfer to the kitchen air. 6M

   b) A heat pump is used to maintain a house at a constant temperature of 23°C. The house is losing heat to the outside air through the walls and the windows at a rate of 60,000 kJ/h while the energy generated within the house from people, lights, and appliances amounts to 4000 kJ/h. For a COP of 2.5, determine the required power input to the heat pump. 8M

OR

4. a) Using the Maxwell relations and the ideal-gas equation of state, determine a relation for $(\partial s/\partial V)_T$ for an ideal gas. 6M

   b) A house that is losing heat at a rate of 80,000 kJ/h when the outside temperature drops to 15°C is to be heated by electric resistance heaters. If the house is to be maintained at 22°C at all times, determine the reversible work input for this process and the irreversibility. 8M

UNIT–III

5. a) Determine the amount of heat, which should be supplied to 2 kg of water at 25°C to convert it into steam at 5 bar and 0.9 dry. 7M

   b) A quantity of steam at 10 bar and 0.85 dryness occupies 0.15 m^3. Determine the heat supplied to raise the temperature of the steam to 300°C at constant pressure and percentage of this heat which appears as external work.

   Take specific heat of superheated steam as 2.2 kJ/kg K. 7M

OR

6. a) Describe with a neat sketch a separating-throttling calorimeter for measuring the dryness fraction of steam. 6M

   b) The following data were obtained in a test on a combined separating and throttling calorimeter :

   Pressure of steam sample = 15 bar, Pressure of steam at exit = 1 bar,

   Temperature of steam at the exit = 150°C,

   Discharge from separating calorimeter = 0.5 kg/min,

   Discharge from throttling calorimeter = 10 kg/min.

   Determine the dryness fraction of the sample steam. 8M

UNIT–IV

7. a) Define the following terms:

   (*i*) Partial pressure (*ii*) Mole fraction (*iii*) Volume fraction of a gas constituent in a mixture. 6M

   b) A vessel of 0.35m^3 capacity contains 0.4 kg of carbon monoxide (molecular weight = 28) and 1 kg of air at 20°C. Calculate:

   (i) The partial pressure of each constituent,

   (ii) The total pressure in the vessel,

   The gravimetric analysis of air is to be taken as 23.3% oxygen (molecular weight = 32) and 76.7% nitrogen (molecular weight = 28). 8M

OR

8. a) Derive the relationship between the two principal specific heats and characteristic gas constant for a perfect gas. 6M

   b) One kg-mol of oxygen undergoes a reversible non-flow isothermal compression and the volume decreases from 0.2 to 0.08 m^3/kg and the initial temperature is 60°C. If the gas obeys Vander Waals' equation, find:

   (i) the work done during the process (ii) the final pressure. 8M

UNIT–V

9. a) What is the cut-off ratio? How does it affect the thermal efficiency of a Diesel cycle? 5M

   b) An air-standard Diesel cycle has a compression ratio of 16 and a cut-off ratio of 2. At the beginning of the compression process, air is at 95 kPa and 27°C. Accounting for the variation of specific heats with temperature, determine:

   (*i*) the temperature after the heat-addition process,

   (*ii*) the thermal efficiency, and

   (*iii*) the mean effective pressure. 9M

OR

10. a) Consider the ideal Otto, Stirling, and Carnot cycles operating between the same temperature limits. How would you compare the thermal efficiencies of these three cycles? 5M

    b) An ideal Stirling engine using helium as the working fluid operates between temperature limits of 300 and 2000 K and pressure limits of 150 kPa and 3 MPa. Assuming the mass of the helium used in the cycle is 0.12 kg, determine:

    (*i*) the thermal efficiency of the cycle,

    (*ii*) the amount of heat transfer in the regenerator, and

    (*iii*) the work output per cycle. 9M

***

Hall Ticket Number :										

R-14

Code: 4G236

II B.Tech. I Semester Supplementary Examinations May 2018

Electrical Engineering and Electronics Engineering

(Common to ME, CSE & IT)

Max. Marks: 70 Time: 3 Hours

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

****

UNIT–I

1. a) State and explain the Kichhoff's laws 6M

   b) Three resistances 2Ω, 5Ω and 10Ω are connected in series across a supply voltage of 25 Volts. Calculate
      (i) Total current supplied (ii) Voltage across each resistor 8M

OR

2. a) Derive expression for equivalent capacitance when three capacitors of capacitances of C_1,C_2 and C_3 are connected in series 7M

   b) Three inductances 10Ω, 20Ω and 30Ω are connected in a delta connection. Find the equivalent star connection 7M

UNIT–II

3. a) Derive the EMF equation of DC generator 6M

   b) A 4 pole generator having 51 slots with each slot containing 20 conductors. The machine is driven at 1500 rpm and assuming the flux per pole to be 7.0mWb. What will be the voltage generated in machine when the armature winding is (i) Lap connected (ii) Wave connected. 8M

OR

4. a) What is meant by starter and explain the principle of operation of three point starter 7M

   b) What are the different types of speed control methods and explain any one of the speed control methods in detail 7M

UNIT–III

5. a) Explain the principle of operation of single phase transformer with a neat diagram 6M

   b) A 250KVA single phase transformer has iron losses of 1.8KW and full load copper losses is 200 watts. Calculate
      (i) Efficiency at full load at 0.8 p.f lagging
      (ii) Efficiency at half load at 0.8 p.f leading
      (iii) Maximum efficiency at 0.8 p.f lagging 8M

OR

6. a) Explain the principle of operation of alternator with a neat sketch 7M

   b) Draw and explain the slip-torque characteristics of three phase induction motor 7M

UNIT–IV

7. a) With a neat circuit diagram explain the principle of operation of full wave diode bridge rectifier along with its input and output waveforms 8M

   b) What is meant by rectifier and list it's applications 6M

OR

8. a) Explain the following

   (i) PNP transistor (ii) NPN transistor 7M

   b) Draw the frequency response of CE amplifier and explain 7M

UNIT–V

9. Explain about different types of electric heating and mention its industrial applications 14M

OR

10. a) Draw and explain the principle of CRT 7M

    b) Explain the following

    (i) Voltage measurement of CRO

    (ii) Frequency measurement of CRO 7M

***

Hall Ticket Number :										

R-14

Code: 4GC31

II B.Tech. I Semester Supplementary Examinations May 2018

Mathematics-II

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

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

****

UNIT–I

1. a) Find the Rank of the matrix $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 5 & 6 \end{bmatrix}$ by reducing it to the normal form. 7M

b) Prove that the following set of equations are consistent and solve them.

$3x+3y+2z=1,\ x+2y=4, 10y+3z=-2,\ 2x-3y-z=5$ 7M

OR

2. If $A=\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ Verify Cayley-Hamilton theorem. Find A^4 and A^{-1} using Cayley-Hamilton theorem. 14M

UNIT–II

3. a) Find a real root of the equation $x\log_{10}x=1.2$ which lies between 2 and 3 by bisection method. 7M

b) Find $f(2.36)$ from the following table.

x	1.6	1.8	2.0	2.2	2.4	2.6
y	4.95	6.05	7.39	9.03	11.02	13.46

7M

OR

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

(**i**) Trapezoidal rule (**ii**) Simpson's 3/8th rule and compare it with the actual value. 14M

UNIT–III

5. Solve $y'=x^2-y,\ y(0)=1$ using Taylor's series method and compute $y(0.1), y(0.2), y(0.3)\ and\ y(0.4)$ 14M

OR

6. Use Milne's method to find $y(0.8)\ and\ y(1.0)$ from $y'=1+y^2,\ y(0)=0$. Find the initial values $y(0.2), y(0.4)\ and\ y(0.6)$ from the Runge-Kutta Method. 14M

UNIT–IV

7. Find the half-range cosine series for $f(x) = x(2-x)$, in $0 \le x \le 2$ and hence find sum of the series $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + - - - -$ 14M

OR

8. a) Form a partial differential equation by eliminating the arbitrary function $f(x)$ and $g(y)$ from $z = y\ f(x) + x\ g(y)$ 7M

   b) Solve by the method of Separation of Variables $u_x = 2\,u_t + u$ 7M

UNIT–V

9. Prove that $u = e^{-x}\left[\left(x^2 - y^2\right)\cos y + 2xy\ \sin y\right]$ is harmonic and find the Analytic function whose real part is u. 14M

OR

10. Evaluate $\int_C \frac{\cos® z^2}{(z-1)(z-2)^3}\, dz$ where C is $|z| = 3$ by using Cauchy's integral formula. 14M

***

Hall Ticket Number :										

R-14

Code: 4G531

II B.Tech. I Semester Supplementary Examinations May 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)

****

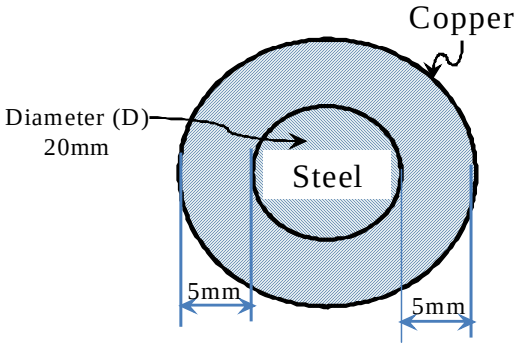
UNIT–I

1. a) Explain stress strain diagram for mild steel specimen for tensile test in detail. 7M

   b) A bar of 25 mm diameter is tightly fitted into a tube. Find the stresses in the bar and changes in its volume due to compressive force of 60 KN in the bar if the tube restrains 50 percent of expansion in diameter. Take length of the bar=400 mm, $E=2\times10^5$ N/mm^2 and $\mu=0.3$ 7M

OR

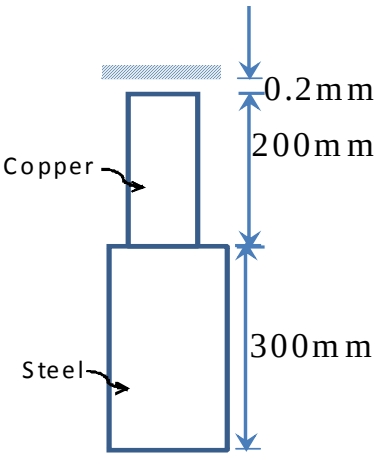
2. a) A compound bar consists of a circular rod of steel with diameter 20 mm rigidly fitted into a copper tube of internal diameter 20 mm and thickness 5 mm as shown in the figure. If the bar is subjected to a load of 100 KN, find the stresses developed in the two materials.



7M

   b) The composite bar shown in figure is 0.2 mm short of the distance between the rigid supports at room temperature. What is the maximum temperature rise which will not produce stresses in the bar? Find the stresses induced when the temperature rise is 40^{o}C.Given

   $A_s:A_c=4:3$, $\alpha_s=12\times10^{-6}/^0C$, $\alpha_c=17.5\times10^{-6}/^0C$, $E_s=2\times10^5 N/mm^2$, $E_c=1.2\times10^5 N/mm^2$

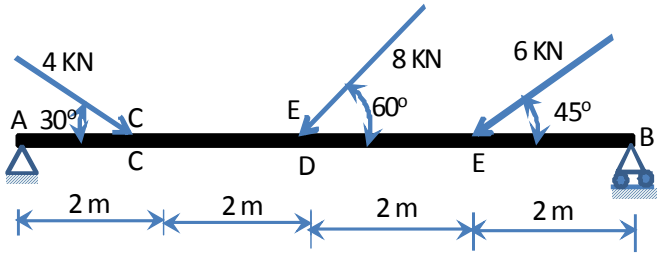


7M

UNIT–I

3. a) Draw S.F. and B.M. diagrams for a simple supported beam carrying a uniformly distributed load of w per unit length over the entire span. Also calculate the maximum B.M. 7M

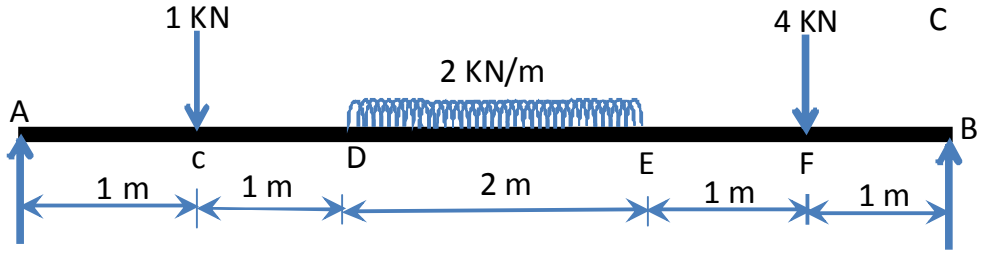
b) A horizontal beam AB of length 8 m is hinged at A and placed on the rollers at B. The beam carries three inclined point loads as shown in the figure. Draw the S.F.,B.M, and axial force diagrams of the beam.



7M

OR

4. Draw the shear force and bending diagrams for the beam shown loaded in fig. Clearly mark the position of the maximum bending moment and determine its value.

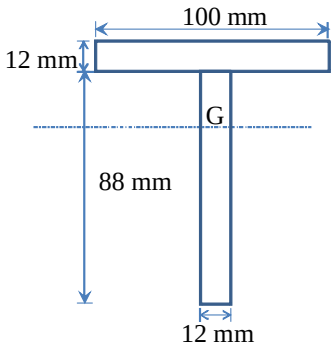


14M

UNIT–III

5. a) State the assumptions made in the theory of simple bending and derive the bending equation? 7M

b) Figure shows the cross section of a beam which is subjected to a shear force of 20 KN. Draw shear stress distribution across the depth marking values at salient points.



7M

OR

6. A cast iron beam has an I-section with top flange 80 mm ×40 mm, web 120 mm ×20 mm and bottom flange 160 mm × 40 mm. If the tensile stress is not to exceed 30 N/mm^2 and compressive stress 90 N/mm^2, what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6 m if the larger flange is in tension? 14M

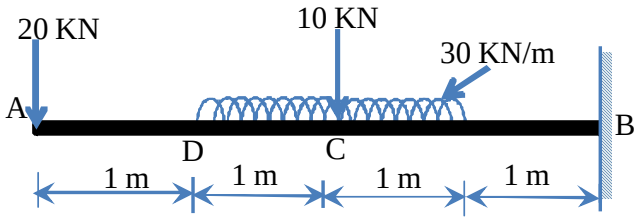
UNIT–IV

7. a) Write assumptions made in torsional equation. Derive the relation for a circular shaft when subjected to torsion as given below.

$\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L}$

Where T=torque transmitted
J=polar moment of inertia
τ= Maximum shear stress
R= radius of shaft
C= modulus of rigidity
Θ= Angle of twist
L=length of shaft 7M

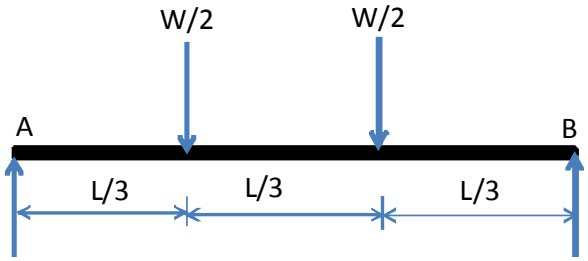
b) Plot the elastic curve and find the maximum deflection and maximum slope for the cantilever beam loaded as shown in the figure.



7M

OR

8. a) A simple supported beam of span L is subjected to equal loads W/2 at each of 1/3rd span points. Find the expression for deflection under the load and at mid-span.



7M

b) A composite shaft has an aluminum tube of external diameter 60 mm and internal diameter 40 mm closely fitted to a steel rod of 40 mm. If the permissible stress is 60 N/mm ^{2}in aluminum and 100 N/mm^2 in steel, find the maximum torque the composite section can take. Given G_a=27 KN/mm^2 and G_s=80 KN/mm^2 7M

UNIT–V

9. a) Show that in thin cylinder shells subjected to internal fluid pressure, the circumferential stress is twice the longitudinal stress. 7M

b) Find the thickness of metal necessary for a cylindrical shell of internal diameter 160 mm to withstand an internal pressure of 8 N/mm^2. The maximum hoop stress in the section is not to exceed 35 N/mm^2. 7M

OR

10. a) Explain the assumptions made in Euler's column theory. How far the assumptions valid in practice? 7M

b) A boiler shell is to be made of 15 mm thick plate having a limiting tensile stress of 12 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, Determine:

(i) The maximum permissible diameter of the shell for an internal pressure of 2 N/mm^2 and
(ii) Permissible intensity of internal pressure when the shell diameter s 1.5 m. 7M

***