Hall Ticket Number :										

R-15

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations November 2019

Engineering Mathematics-III

(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)

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UNIT–I

1. a) Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ 6M

b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 3 & 3 & 1 \end{bmatrix}$ and hence find A^4. 8M

OR

2. a) Solve the equations x+2y+3z=0;3x+4y+4z=0;7x+10y+12z=0 7M

b) Find the Eigen values and Eigen vectors $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ 7M

UNIT–II

3. From the following table of values of 'x' and 'y', obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=1.5

X	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

14M

OR

4. From the following table, estimate the number of students who obtained marks between 40 and 45 using Newton's interpolation formula

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

14M

UNIT–III

5. Using Euler's Method, find an approximate value of y corresponding to $x = 1$, given $\frac{dy}{dx} = x + y$ and $y = 1$ when x=0. 14M

OR

6. Using Picard's process of successive approximation, obtain a solution up to fifth approximation of the equation $\frac{dy}{dx} = x + y$ such that $y = 1$ when x=0.Check your answer by finding the exact solution. 14M

UNIT–IV

7. a) Find the half range cosine series for the function $f(x) = x$, when $0 < x < ®$ hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{®^2}{8}$ 8M

   b) Form a partial differential equation by eliminating the arbitrary function f from $z = f\left(x^2 + y^2\right)$. 6M

OR

8. Form the partial differential equation by eliminating arbitrary function from $F\left(x + y + z, x^2 + y^2 + z^2\right) = 0$ 14M

UNIT–V

9. a) Show that the polar form of Cauchy's Riemann equations are $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \_}, \frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial u}{\partial \_}$ 7M

   b) Evaluate $\int_c \frac{e^z}{(z-1)^3} dz$ with C: $|z-1| = \frac{1}{2}$ using Cauchy's Integral Formula 7M

OR

10. If $f(z)$ regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ 14M

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Hall Ticket Number :										

R-15

Code: 5G532

II B.Tech. I Semester Supplementary Examinations November 2019

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. a) Relate the phenomena of plastic deformation with crystal imperfections 7M
   b) Explain planimetric method of determination of grain size and relate mechanical properties with grain size 7M

OR

2. a) Summarize Hume-Rothery rules with examples 7M
   b) Explain various types of intermediate alloy phases with examples 7M

UNIT–II

3. a) Describe the construction of isomorphous alloy system and equilibrium cooling of a typical alloy in this system 7M
   b) Lead and tin form a eutectic at 183^0C with composition (38.1Pb-61.9Sn). The melting temperatures of lead and tin are 328^0C and 232^0C respectively. The maximum solubility of tin in lead is 19% and that of lead in tin is 2.5% both occurring at eutectic temperature. The room temperature solubility of tin in lead is 2% and that of lead in tin is 0%. Construct the lead and tin phase diagram on a graph sheet labeling lines and areas. Calculate the composition and relative amounts of eutectic and proeutectic constituents of an alloy containing 30% tin after eutectic temperature 7M

OR

4. a) Describe eutectic, peritectic, eutectoid and peritectoid reactions 7M
   b) Construct Fe-Fe_3C equilibrium diagram, mark compositions and temperatures, label areas and indicate important reactions occurring on it 7M

UNIT–III

5. a) Describe the composition, structure, properties and applications of malleable cast iron and grey cast iron 7M
   b) Explain the composition, microstructure, properties and applications of Hadfield manganese steel and duralumin 7M

OR

6. a) Classify brasses and explain the stress corrosion cracking and dezincification of brasses 7M
   b) What are the allotropic forms of titanium and describe the effect of alloying elements on these allotropic forms 7M

UNIT–IV

7. a) Discuss the details of full annealing and spherodizing of carbon steels 7M
   b) Explain age hardening process with an example 7M

OR

8. a) Describe the details of flame hardening and induction hardening 7M
   b) Distinguish between mechanical and diffusion coatings 7M

UNIT–V

9. a) Describe the types, properties and applications of glasses 7M
   b) Discuss various reinforcements used in composite materials 7M

OR

10. a) Elaborate steel making using Bessemer converter 7M
    b) Explain the steps involved in powder metallurgy 7M

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Hall Ticket Number :										

R-15

Code: 5G534

II B.Tech. I Semester Supplementary Examinations November 2019

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) What is pattern allowance? List and explain each one with neat sketches. 6M

   b) How die casting is different from others? Explain die casting with neat sketch? 8M

OR

2. a) Write the pattern materials and moulding materials? Explain. 6M

   b) Explain the major casting design considerations in casting processes? 8M

UNIT–II

3. a) Explain the Thermit welding process and write its specific applications? 10M

   b) Explain the kinds of polarities in welding? 4M

OR

4. a) Explain the Plasma welding process and write its specific applications? 10M

   b) What is flux? Why it is essential in some welding techniques? 4M

UNIT–III

5. a) List the various types of rolling mills and explain each one with neat sketch? 10M

   b) What are the specific merits of cold working over hot working? 4M

OR

6. a) Explain the progressive die with neat sketch and write its applications? 7M

   b) Explain the wire drawing and Tube drawing processes with neat sketches 7M

UNIT–IV

7. a) What are types of extrusion processes? Explain each one with neat sketches 10M

   b) How is upsetting different from fullering in forging? Explain 4M

OR

8. a) What are the common defects in forging? Write causes and remedies for them. 10M

   b) Explain the hydrostatic extrusion process and write the applications. 4M

UNIT–IV

9. a) Write about compression moulding process and transfer moulding process? 10M

   b) Write the applications of injection moulding process? 4M

OR

10. a) Explain the blow moulding process with neat sketch? 8M

    b) What are the two methods of polymerization methods in plastics? Explain 6M

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Hall Ticket Number :										

R-15

Code: 5G531

II B.Tech. I Semester Supplementary Examinations November 2019

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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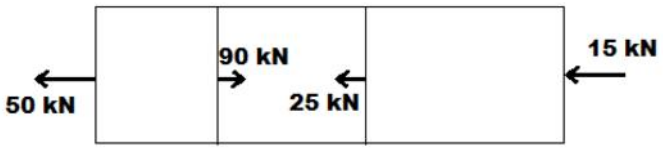
UNIT–I

1. a) A brass bar having cross sectional area of 1200 mm^2 is subjected to axial force as shown in figure. Find the total elongation of the bar. The modulus elasticity of brass is 110 GN/m^2



7M

b) A bar of 20mm diameter is tested in tension. It is observed that when a load of 37.7kN is applied, the extension measured over gauge length of 200mm is 0.12mm and contraction in diameter is 0.0036mm. Find the four elastic constants. 7M

OR

2. a) A bar of 30mm diameter is subjected to a pull of 60kN. The measured extension on gauge length of 200mm is 0.1mm and in diameter is 0.004mm. Calculate

i) Young's Modulus ii) Poison's Ratio iii) Bulk Modulus 7M

b) Explain the stress-strain diagram for ductile and brittle materials with help of legible sketches? 7M

UNIT–II

3. A Cantilever beam of length 4m carries a gradually varying load of zero at free end and 2 kN/m at a distance of 2m from the free end and a point load of 80 kN at a distance of 3m from free end. Draw the shear force and Bending Moment diagram for the beam. 14M

OR

4. A simply supported beam AB of 6 m span is carrying a uniformly distributed load of 6 kN/m over a length of 3 m from left end and a point load of 75 kN at a distance of 1.5 m from right end. Draw the shear force and Bending Moment diagram for the beam and also calculate maximum bending moment. 14M

UNIT–III

5. a) The cross section of a T-beam is as follows: Flange thickness=10mm; width of the flange=100mm; thickness of web=10mm; depth of the web=120mm. if a shear force of 2kN is acting a particular section of the beam. Evaluate and draw the shear stress distribution across the cross-section. 7M

b) A simply supported beam carries a concentrated load at the centre of the span. If the maximum stress due to bending is 150Mpa, Find the ratio of the depth of beam section to span in order that the central deflection may not exceed 1/500 of the span. 7M

OR

6. a) A channel section made with 120mmx10mm horizontal flange and 16mmx10mm vertical web is subjected to a vertical shearing force of 120kN. Draw the shear stress distribution diagram across the section. 7M

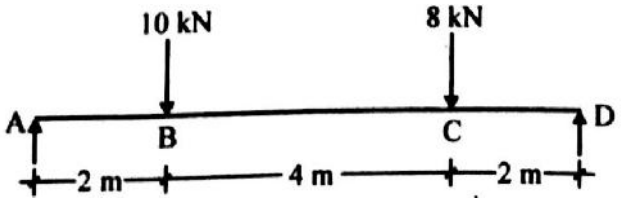
   b) Show from the first principles that is a beam of rectangular section is subjected to a transverse shearing force, the maximum shear stress at a cross-section is 1.5 times the mean shear stress. 7M

UNIT–IV

7. A steel girder of uniform cross-section section, 14m long is simply supported at the ends. It carries concentrated loads 90kN and 60kN at two points 3m and 4.5m from two ends respectively. Calculate: the deflection of the girder at the points under the two loads and the maximum deflection. Take: $E=2.1x10^5N/mm^2$ and $I=64x10^{-4}m^4$. 14M

OR

8. Determine the slope at the supports and maximum deflection for the beam given in the figure below using Macaulay's method. Take: $E=2x10^5N/mm^2$ and $I=80x10^{-4}\ m^4$



14M

UNIT–V

9. a) Derive the equations for the circumferential and longitudinal stresses induced in the thin spherical shells. 7M

   b) A shell 3.25m long and 1m diameter is subjected to an internal pressure of $1.2n/mm^2$. If the thickness of the shell is 10mm, find the circumferential and longitudinal stresses. Find also the maximum shear stress and changes in the dimensions of the shell. Take $E=200kN/mm^2$ and the poison's ratio is 0.3. 7M

OR

10. a) A cylindrical vessel is 1.5m diameter and 4m long is closed at ends by rigid plates. It is subjected to an internal pressure of 3Mpa. If the maximum principal stress is not to exceed 150Mpa, find the thickness of the shell. Also find the changes in the diameter, length and volume of the shell. Take: E=200Gpa and the poison's ratio is 0.25. 7M

    b) A shell of 4m long 1m in diameter is subjected to an internal pressure of $1N/mm^2$. If the thickness of the shell is 10mm; find the circumferential and longitudinal stresses. Find also the changes in the dimensions of the shell. Take: E=200Gpa and the poison's ratio is 0.3. 7M

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Hall Ticket Number :										

R-15

Code: 5G533

II B.Tech. I Semester Supplementary Examinations November 2019

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) Discuss the macroscopic and microscopic point of view of thermodynamics with examples 7M

   b) A non-flow reversible process will occur for which pressure and volume are correlated by $p = v^2 + (6/v)$ where p is in bars and v is in m^3. What amount of work will be done when the volume changes from 2 m^3 to 4 m^3. 7M

OR

2. a) Prove that the energy is the property of the system 7M

   b) 0.2 m^3 of ideal gas at a pressure of 2 Mpa and 600K are expanded isothermally to 5 times the initial volume. It is then cooled to 300K at constant volume and then compressed polytropically to its initial state. Determine the net work done and heat transfer during the cycle. 7M

UNIT–II

3. a) State the Kelvin plank and Clausius statements of second law of thermodynamics and prove their equivalence. 10M

   b) A heat engine receives heat at the rate of 1500 kJ/min and gives 8.2 kW work. Calculate the Thermal efficiency and heat rejected. 4M

OR

4. a) Derive the expression for change in entropy in terms of v-T, p-T 7M

   b) An iron cube at 400^0C is dropped into an insulated bath having 10 kg water at 25^0C. Final temperature of water is 50^0C. Assume the process as reversible and find the change in entropy of iron and water. Take C_{pw}=4.186 kJ/kgK. 7M

UNIT–III

5. a) What is superheating. Why superheated steam is recommended in steam power plants 6M

   b) Draw the layout of Mollier diagram and explain the important properties on it. 8M

OR

6. a) Explain the working of throttling calorimeter with neat sketch. 7M

   b) Steam initially at 1.5 MPa, 300^0C expands reversibly and adiabatically in a steam turbine to 40^0C. Evaluate the ideal work output of the turbine per kg of steam. 7M

UNIT–IV

7. a) Show that for an ideal gas C_p-C_v=R 7M

   b) With help of suitable example explain the differences between heat transfer and work transfer 7M

OR

8. a) Explain free expansion process with suitable sketch 7M

   b) Air at 250^0C and 300kPa is compressed reversibly and isothermally to 1/16th of its original volume. Find the final pressure, the work done and change in internal energy per kg of air 7M

UNIT–V

9. a) With the help of P-V and T-S diagrams explain OTTO cycle and derive an expression for air standard efficiency. 7M

   b) What is an Air standard cycle? What are the assumptions for Air standard cycles? 7M

OR

10. In an Diesel cycle the compression ratio is 15.Compression begins at 0.1MPa 40^0C.The heat added is 1.675MJ/Kg. Find i) Maximum temperature of the cycle ii) Temperature at the end of expansion iii) Work done /kg of air iv) Cycle efficiency 14M

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