Hall Ticket Number :										

R-11 / R-13

Code: 1G531

II B.Tech. I Semester Supplementary Examinations May 2017

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any ***five*** questions
All Questions carry equal marks (**14 Marks** each)

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1. a) Show that a body subjected to a pure shear is also acted upon by tensile and compressive stresses as well. 6M

   b) At a point in a steel bar, the stresses on two mutually perpendicular planes are 10Mpa tensile and 5MPa compressive where as shear stress across these planes is 2.5 Mpa. Determine using Mohr's circle, the normal as well as shear stresses on a plane making an angle of 30^0 with the plane of the first stress. Also find the principal stresses. 8M

2. a) A simply supported beam has a span of 4m and carries a uniformly distributed load of 60 kN/m, together with a central concentrated load of 40kN. Draw the S.F. and **B.M.** diagrams for the **beam** and hence determine the maximum **B.M.** acting on the beam. 8M

   b) How are beams classified? Give a brief account. 6M

3. **A** uniform T-section beam is **100** mm wide and **150** mm deep with a flange thickness of **25** mm and a web thickness of **12** mm. If the limiting bending stresses for the material of the beam are 80 MN/m^2 in compression and **160** MN/m^2 in tension, find the maximum u.d.l.that the beam can carry over a simply supported span of ***5*** m. 14M

4. a) Show that for a circular cross section the ratio between maximum transverse shear stress and mean transverse shear stress is 4/3. 8M

   b) State the limitations of the shear stress distribution theory. 6M

5. a) State the assumptions made in the simple torsion theory. 4M

   b) Determine the dimensions of a hollow shaft with a diameter ratio of 3:4 which is to transmit 60 **kW** at 200 rev/min. The maximum shear stress in the shaft is limited to 70 MN/m^2 and the angle of twist to 3.8^0 in a length of 4 m. For the shaft material G = 80 GN/m^2. 10M

6 a) What is macauly's method of beam deflection analysis? What are its advantages over direct integration method? 4M

   b) Determine the maximum deflection of a simply supported beam of 5m length and carrying a UDL from zero at both the ends to **8kN/m** at the centre. **$EI=2MN.m^2$**. 10M

7. a) State the assumptions made in Euler's theory of buckling. 6M

   b) A 5m long hollow cast iron column with fixed ends supports an axial load of 800kN. The external diameter of the column is 240mm. determine the thickness of the column using Rankines's formula with a constant of 1/6400. The working stress is 80MPa. 8M

8. A thick cylinder of 200 mm outside diameter and 140mm inside diameter I subjected to internal pressure of 40MPa and external pressure of 24MPa. Determine the maximum shear stress in the material of the cylinder at the inside diameter. 14M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G237

II B.Tech. I Semester Supplementary Examinations May 2017

Electrical Engineering and Electronics Engineering

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any five questions

(Minimum of **Two questions** from each part should be chosen for answering **five questions**)

All Questions carry **equal** marks (**14 Marks** each)

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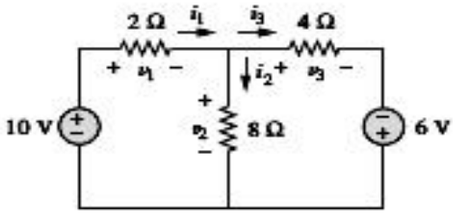
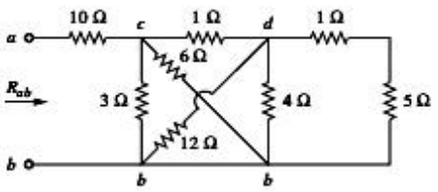
PART-A

1 a) Find current and voltages in the circuit shown? 7M



b) Calculate equivalent resistance R_{ab} in the circuit shown? 7M



2. a) Derive EMF equation of a DC generator? 7M

b) Explain the necessity of starter in a DC motor and describe three point starter with a neat sketch? 7M

3. a) Describe the operation of a single phase transformer, explaining clearly the functions of the different parts? 7M

b) A single phase transformer has a core whose cross sectional area is 150 cm^2, operates at a maximum flux density of 1.1 wb/m^2 from a 50 Hz supply. If the secondary winding has 66 turns, determine the output in KVA when connected to a load of 4Ω impedance. Neglect any voltage drop in the transformer? 7M

4. a) Explain the construction and working principle of a synchronous motor? 7M

b) Mention the applications of induction motor? 7M

PART-B

5. a) Explain the operation of full wave rectifier and draw its output waveforms. List out its applications? 7M

b) Explain the operation and V-I characteristics of PN junction diode with suitable diagram? 7M

6. a) With neat diagram explain the working principle of SCR and draw the transistor analogy of SCR? 7M

b) Explain the operation of NPN transistor? Compare three different configurations of transistors? 7M

7. a) Explain the concept of dielectric heating? 7M

b) Enumerate the industrial applications of induction heating? 7M

8. a) Explain the working of CRT with a neat sketch? 7M

b) Explain how voltage, current and frequency is measured using CRO? 7M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G534

II B.Tech. I Semester Supplementary Examinations May 2017

Machine Drawing

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Section-I

Answer any two of the following **2x4=8M**

1. a) Sketch the following types of lines: (i) centre line, and (ii) cutting plane line 2M
   b) Sketch the conventional representation of the following materials: (i) concrete and (ii) wood 2M

2. a) With a suitable drawing, explain the terms half section. 2M
   b) List out various principles to be followed while dimensioning a drawing. 2M

3. a) Explain the term ‘‘Machine drawing’’. 2M
   b) Define the term ‘‘Production drawing’’. 2M

Section-II

Answer any two of the following **2x10=20M**

4. Sketch any two types of machine screws of 10 mm diameter. 10M

5. Draw (*a*) sectional view from the front and (*b*) view from above, of single riveted lap joint to join plates of thickness 10 mm 10M

6 Draw the sectional view from the front of a knuckle joint used to connect two rods of 50 mm diameter each. 10M

Section-III
Answer the following 1x42=42M

7. The details of a crosshead of a steam engine are shown in Figure1. Assemble the parts and draw, (*i*) half sectional view from the front, showing top half in section and (*ii*) the view from the left. 42M

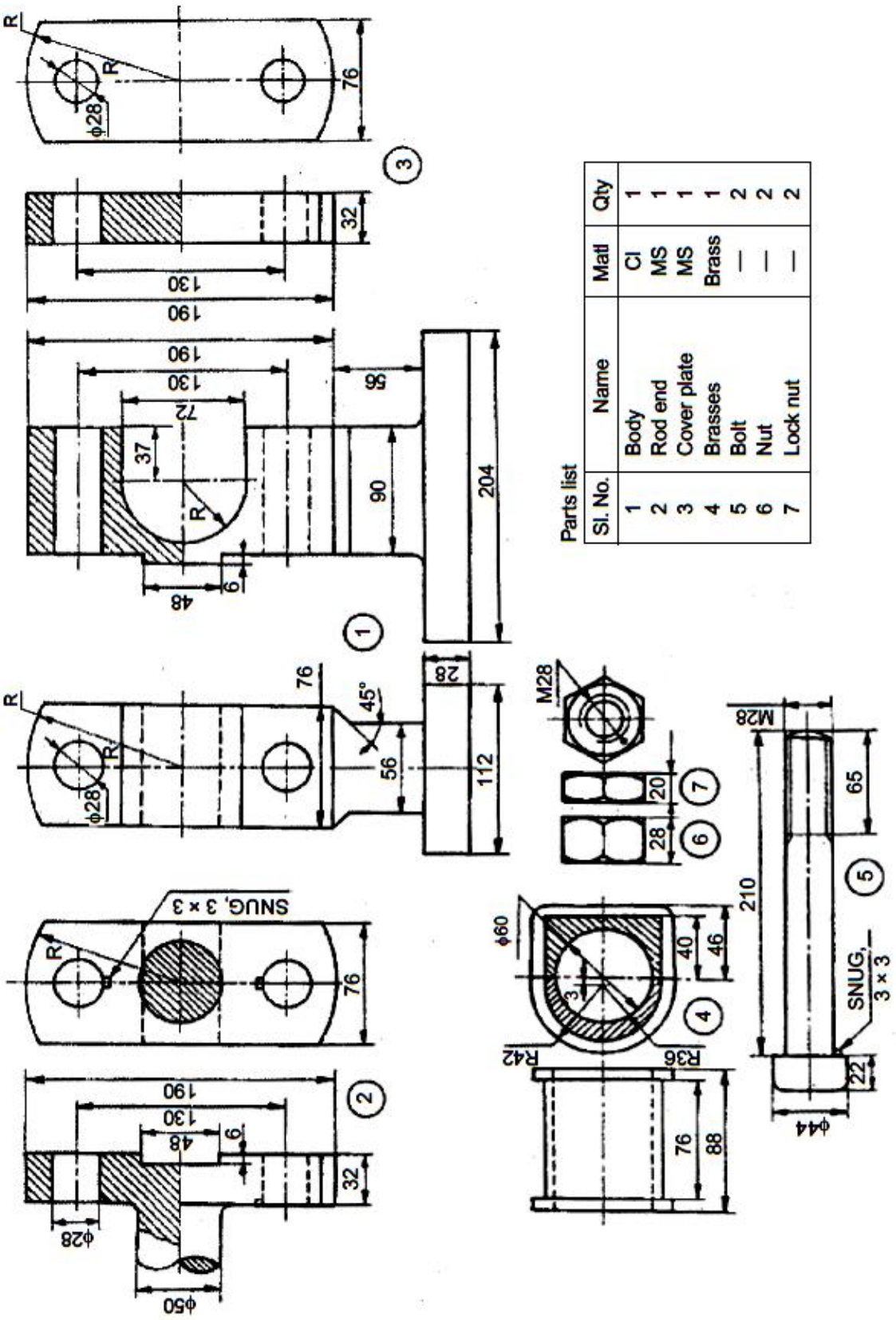

Figure 1 Cross Head

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Hall Ticket Number :										

R-11 / R-13

Code: 1GC31

II B.Tech. I Semester Supplementary Examinations May 2017

Mathematics – II

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

Answer any **Five** questions
All Questions carry equal marks (**14 Marks** each)

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1. a) Prove that a square matrix A am dots transpose A^T have the same Eigen values 4M

   b) Using Cayley-Hamilton theorem to find A^{-1} for $A=\begin{bmatrix}8 & -8 & -2\\ 4 & -3 & -2\\ 3 & -4 & 1\end{bmatrix}$ 10M

2. Expand the function f(x) = x sinx as a Fourier series in [-π, π] 14M

3. a) Form the partial Difference Equation by the eliminating the arbitrary function from $z= f(x^2 + y^2 + z^2)$ 7M

   b) Solve the Method of separation of variables $y^3\frac{\partial z}{\partial x}+x^2\frac{\partial z}{\partial y}=0$ 7M

4. a) Find a root of the equation $x^3 – 4x – 9 = 0$ using Bisection method in four stages 7M

   b) The values of a function f(x) are given below for certain values of x

x	0	1	3	4
f(x)	5	6	50	105

   Find the value of f(2), using Lagrange's Interpolation formula 7M

5. a) Find the first two derivatives at x=1.0 from the following data

x	1.0	1.2	1.4	1.6	1.8	2.0
y	0	0.128	0.544	1.296	2.432	4.0

   7M

   b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's ¼ rule 7M

6. Find y at x=0.1, 0.2 and 0.3 using Taylor's series method given that $\frac{dy}{dx}=x^2y-1,\ y(0)=1$ 14M

7. Prove that the function f(z) defined by $f(z)=\begin{cases}\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & ,(z\neq 0)\\ 0 & ,(z=0)\end{cases}$ is continuous and the Cauchy – Riemann equations are satisfied at the origin but *f'(0)* does not exist 14M

8. a) Evaluate $\int_c \frac{z^3-\sin 3z}{\left(z-\frac{®}{2}\right)^3}dz$ with C: |z|=2 using Cauchy's Integral formula. 7M

   b) Find the Laurent series expansion of the function $f(z)=\frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3 < |z+2|<5. 7M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G532

II B.Tech. I Semester Supplementary Examinations May 2017

Metallurgy and Material Science

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **Five** questions
All Questions carry equal marks (**14 Marks** each)

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1. a) Draw neat sketches of unit cells of SC, BCC, FCC and HCP crystal structures. 8M
   b) Define the following terms i) Average number of atoms per unit cell. ii) Co-ordination number iii) Atomic packing factor 6M

2. a) State Hume Rothery's rules for formation of substitutional solid solutions. Explain in brief. 8M
   b) Define the following terms i) System ii) State iii)Phase iv) Constituent v) degrees of freedom vi) Equilibrium 6M

3. Draw Iron-Iron carbide equilibrium diagram and mark on it all salient temperatures and composition fields. Write in brief. 14M

4. a) Give the classification of steels. Describe the typical applications of low, medium and high carbon steels. 7M
   b) Explain principle characteristics of cast iron and explain the factors which affect the structure of cast iron. 7M

5. a) What is the difference between TTT diagram and Iron- Carbon equilibrium diagram 5M
   b) Write a short notes on i) Annealing ii) Normalizing iii) Nitriding 9M

6. a) Discuss the composition , properties and applications of four copper alloys 7M
   b) Explain the composition , properties and applications of some alluminium alloys 7M

7. a) What are ceramics? List and briefly explain five important properties of ceramics that make them useful engineering materials? 7M
   b) Explain the strengthening mechanism of fiber –reinforced composites 7M

8. a) With a neat sketch explain the basic Bessemer Converter process for steel making. 7M
   b) With a neat sketch explain the electric arc furnace principle and process for steel making. 7M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G533

II B.Tech. I Semester Supplementary Examinations May 2017

Thermodynamics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **Five** questions
All Questions carry equal marks (**14 Marks** each)
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1. a) Define thermodynamic system, state, process and also differentiate between the cyclic process and non-cyclic process. 7M

   b) Distinguish between path function and point function and also Prove that heat and work are the path functions. 7M

2. a) Apply the first law of thermodynamics to steady flow system and derive the steady flow energy equation. 8M

   b) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m3to 0.4 MPa, 0.03 m3. Assuming that the pressure and volume are related by pvn = constant, find the work done by the gas system. 6M

3. a) Explain with the help of P-V diagram the different process in a Carnot cycle. 6M

   b) A reversible heat engine operates between two reservoirs at temperatures700°C and 50°C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 50°C and – 25°C. The heat transfer to the engine is 2500 kJ and the net work output of the combined engine refrigerator plant is 400 kJ.

      (i) Determine the heat transfer to the refrigerant and the net heat transfer to the reservoir at 50°C ;

      (ii) Reconsider (i) given that the efficiency of the heat engine and the C.O.P. of the refrigerator are each 45 per cent of their maximum possible values. 8M

4. a) Prove that entropy is a property of a system. 7M

   b) A system at 500 K receives 7200 kJ/min from a source at 1000 K. The temperature of atmosphere is 300 K. Assuming that the temperatures of system and source remain constant during heat transfer find out :

      i. The entropy produced during heat transfer;

      ii. The decrease in available energy after heat transfer. 7M

5. Draw and explain a P-T (pressure-temperature) diagram for a pure substance.

   A vessel having a capacity of 0.05 m3 contains a mixture of saturated Water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Find the following :

   (i) The pressure, (ii) The mass, (iii) The specific volume, (iv) The specific enthalpy, (v) The specific entropy, and (vi) The specific internal energy. 14M

6. a) Prove that the heat absorbed or rejected during a polytropic process is (γ-n/γ-1) x work done where γ is the ratio of specific heats and n is polytropic index. 7M

   b) What is the difference between throttling process and free expansion process? 7M

7. a) Write short notes on the following
      i) Mole Fraction
      ii) Mass friction
      iii) Dalton's Law of partial pressure
      iv) Avogadro's Laws of additive volumes 8M

   b) Following is the gravimetric analysis of air :

Constituent	Percentage
Oxygen	23.14
Nitrogen	75.53
Argon	1.28
Carbon dioxide	0.05

   Calculate the analysis by volume and the partial pressure of each constituent when the total pressure is 1 bar. 6M

8. a) Compare Otto, diesel and dual cycle performances under the conditions of
   (i) Equal compression ratio and least input.
   (ii) Constant maximum pressure and least input. 6M

   b) An engine working on Otto cycle has a volume of 0.45 m3, pressure 1bar and temperature 30°C at the beginning of compression stroke. At the end of compression stroke, the pressure is 11 bar. 210 kJ of heat is added at constant volume. Determine :
      (i) Pressures, temperatures and volumes at salient points in the cycle.
      (ii) Percentage clearance.
      (iii) Efficiency.
      (iv) Net work per cycle.
      (v) Mean effective pressure.
      (vi) Ideal power developed by the engine if the number of working cycles per minute is 210.

   Assume the cycle is reversible. 8M

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