

Code : 1G532

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)*II B.Tech. I Semester Regular Examinations, January 2014**Metallurgy & Material Science**(Mechanical Engineering)*

Time: 3 hours

Max Marks: 70

*Answer any FIVE Questions from the following  
All questions carry equal marks (14 Marks each)*

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|-------|--|-----|
| 1. a) | Differentiate between covalent bond and Metallic bond.   | 6M  |
| b)    | Calculate the packing efficiency of BCC structure.   | 8M  |
| 2. a) | Differentiate between pure metal and alloy.  | 4M  |
| b)    | What are the rules formulated by Hume-Ruthary for the formation of substitutional solid solutions? Explain them.   | 10M |
| 3.    | Draw neat sketch of Fe-Fe <sub>3</sub> C system and label its fields and explain the changes that occur during cooling of a hyper eutectoid steel and an hypo eutectoid cast iron. | 14M |
| 4. a) | With composition and properties explain the types of plain carbon steels.  | 7M  |
| b)    | With micro structure and properties differentiate between white cast iron and spheroidal graphite cast iron.   | 7M  |
| 5. a) | Explain the following :  | 7M  |
|       | i) Annealing   |     |
|       | ii) Normalizing  |     |
| b)    | Explain the following  | 7M  |
|       | i) Carburizing   |     |
|       | ii) Nitriding  |     |
| 6.    | Explain the following:   |     |
|       | a) Duralumin   |     |
|       | b) Silumin   |     |
|       | c) Avial   |     |
|       | d) Constantan  | 14M |
| 7. a) | Differentiate between glasses and cermets.   | 6M  |
| b)    | Explain the fibre reinforced composites with an example.   | 8M  |
| 8.    | List out various methods of steel making and with neat sketch explain acid and basic open hearth process of steel making   | 14M |

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Time: 3 hours

Max Marks: 70

Answer any FIVE Questions from the following  
All questions carry equal marks (14 Marks each)

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1. a) What is quasi static process? What is its characteristics features? 04M
- b) The pressure and specific volume of the atmosphere are related according to the equation  $PV^{1.4} = 2.5 \times 10^5$ , where P is in  $N/m^2$  and V in  $m^3/kg$ . What depth of atmosphere is required to produce a pressure of 1.033 bar at the earth's surface? Assume  $g=9.81 m/s^2$  10M
2. a) What do you understand by the ideal gas temperature scale? 04M
- b) A gas undergoes a thermodynamic cycle consisting of three processes beginning at an initial state where  $P_1= 1$  bar,  $V_1 =1.5 m^3$  and  $U_1 =512$  kJ. The processes are as follows:-
  - a. Process 1-2 : compression with  $PV=$  constant to  $P_2= 2$  bar,  $U_2= 690$  kJ.
  - b. Process 2-3 :  $W_{23} =0$ ,  $Q_{23} = -150$ kJ and
  - c. Process 3-1 :  $W_{31}= + 50$  kJ. Neglecting KE and PE changes , determine the heat interactions  $Q_{12}$  and  $Q_{31}$  10M
3. a) A reversible process should not leave any evidence to show that the process had ever occurred. Explain. 04M
- b) Which is the more effective way to increase the efficiency of a Carnot engine: to increase  $T_1$ , keeping  $T_2$  constant; or to decrease  $T_2$ , keeping  $T_1$  constant? 10M
4. a) Show that the entropy varies logarithmically with the disorder number. 06M
- b) Show that  $S_{gen}$  is not a thermodynamic property. 08M
5. a) Draw the phase equilibrium diagram for a pure substance on p-T coordinates. Why does the fusion line for water have negative slope? 08M
- b) Why do the isobars on Mollier Diagram diverge from one another? 06M
6. a) 0.5 kg of air, initially at  $25^\circ C$ , is heated reversibly at constant pressure until the volume is doubled, and is then heated reversibly at constant volume until the pressure is doubled. For the total path, find the work transfer, the heat transfer, and the change of entropy? 08M
- b) Express the changes in internal energy and enthalpy of an ideal gas in a reversible adiabatic process in terms of the pressure ratio. 06M
7. a) What is the mass of air contained in a room 6m X 9m X 4m if the pressure is 101.325 kPa and the temperature is  $25^\circ C$ . 06M
- b) Find the molar specific heats of monoatomic, diatomic and polyatomic gases , if their specific heat ratios are respectively 5/3, 7/5, and 4/3. 08M
8. a) With the help of P-V and T-S diagrams explain Diesel cycle and derive an expression for its air standard efficiency. 08M
- b) An engine operating on the air standard OTTO Cycle. The condition at the start of the compression are  $27^\circ C$  and 100 kPa. The heat added is 1840 kJ/kg. The compression ratio is 8. Determine the temperature and pressure at each point in the cycle, the thermal efficiency. 06M

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

*II B.Tech. I Semester Regular Examinations, January 2014*  
*Electrical Engineering and Electronics Engineering*  
*(Mechanical Engineering)*

Time: 3 hours

Max Marks: 70

*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) Derive the necessary equations for converting a Delta network into an Equivalent Star network 7M
- b) Derive the Voltage and Current expressions for three resistances are connected in Series and Parallel circuits 8M
2. a) With neat Sketch explain Three point Starter 7M
- b) Derive the expression for Torque Equation of a DC Motor 7M
3. a) What is the condition for Maximum Efficiency of a Transformer 4M
- b) A 200KVA, 3300/240 Volts, 50Hz, Single phase transformer has 80 turns on the secondary winding. Assuming an ideal transformer, calculate 10M
  - i. Primary and Secondary Current on full load
  - ii. Maximum value of flux
  - iii. The number of Primary turns
4. a) Explain the working Principle of Single Phase Alternator 7M
- b) Draw the slip torque characteristics of an Induction Motor 7M

**PART-B**

5. a) Draw the circuit diagram of a Full Wave Rectifier. Explain its working 7M
- b) Explain the P-N Junction Diode Operation and Write their Applications 7M
6. a) Draw the typical CE input & output characteristics curves for on p-n-p transistor 7M
- b) Draw the SCR Characteristics and write its applications 7M
7. Write Short notes on Ultrasonic Generation and its applications 14M
8. a) Write Short notes on Deflection Sensitivity, Electronic and Magnetic deflection 8M
- b) Write CRO Applications 6M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

*II B.Tech. I Semester Regular Examinations, January 2014*

**Machine Drawing**  
(Mechanical Engineering)

Time: 4 hours

Max Marks: 70

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**Section-I***Answer any two of the following***2X4=8M**

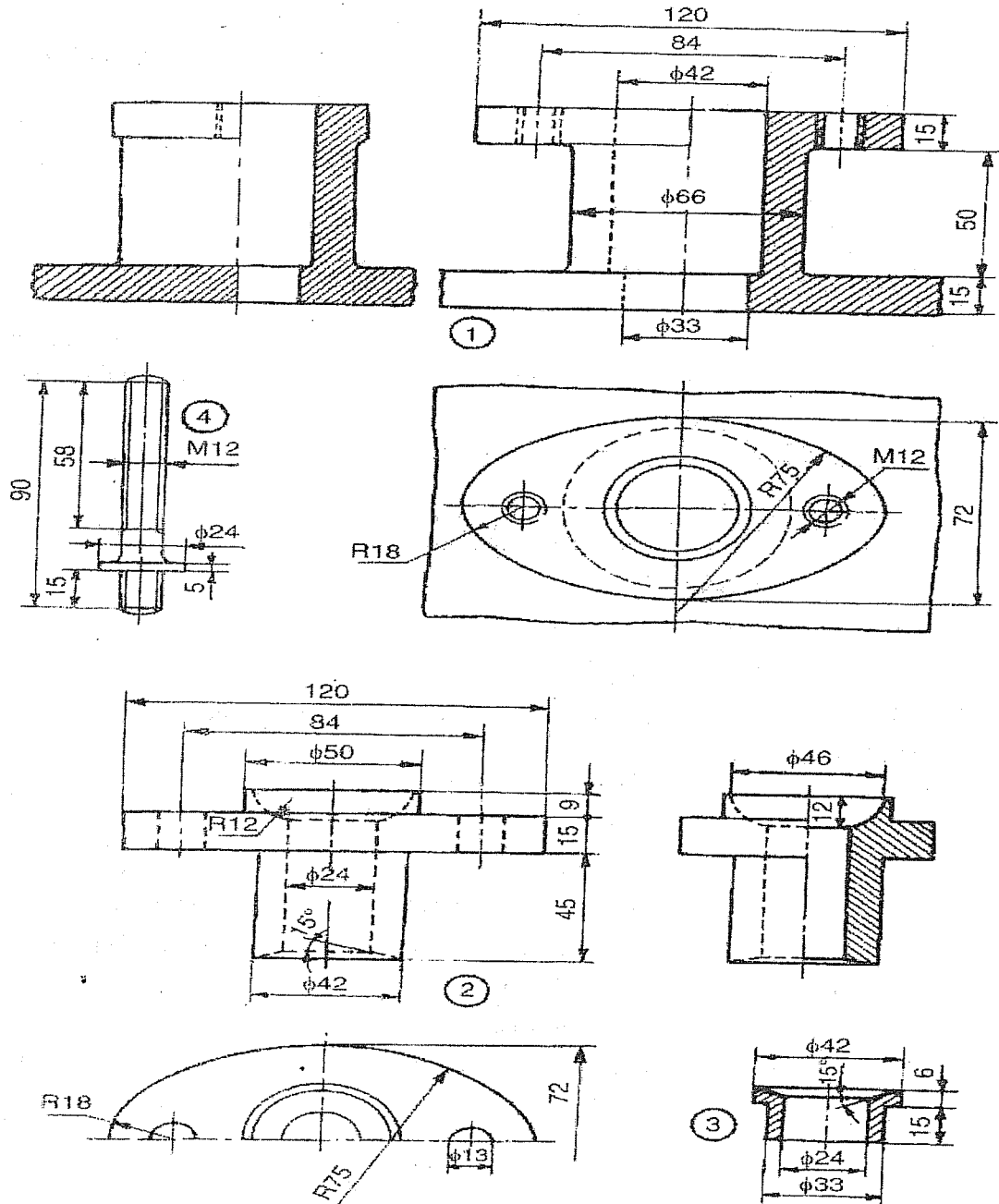
1. Sketch the conventional representation of 4M
  - (a) Internal threads and
  - (b) Assembled threads in section.
2. Sketch the woodruff key in two views, as fitted in a position between a shaft and the mounting. Choose the shaft diameter as 30 mm and the hub diameter of the mounting as 60 mm. 4M
3. Sketch any one type of machine screw of 10 mm diameter. 4M
4. Sketch any one type of bolt. 4M

**Section-II***Answer any two of the following***2X10=20M**

1. Draw 10M
  - (a) Sectional view from the front and
  - (b) View from the above of a double riveted, double strap, butt joint to join plates of thickness 10 mm.
2. Two square rods of side 50 mm each are connected by a cotter joint with a gib. Sketch half sectional view from the front of the assembly. 10M
3. Draw the sectional view from the front and view from the side of a protected flanged coupling; indicating proportions for connecting two shafts, each of diameter 30 mm. 10M
4. Sketch the necessary views of a foot-step bearing for supporting a shaft of diameter 50 mm. Give all important proportionate dimensions. 10M

**Section-III***Answer the following question***1X42=42M**

1. Assemble all parts of the stuffing box for a vertical steam engine, shown in Fig. and draw the 42M
  - (i) Half sectional view from the front, with left half in section,
  - (ii) Half sectional view from the right and
  - (iii) View from above.



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut. M12	MS	2

Stuffing box

Code : 1GC31

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

II B.Tech. I Semester Regular Examinations, January 2014

Mathematics-II

(Common to CE &amp; ME)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions from the following

All questions carry equal marks (14 Marks each)

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1. a) State Cayley-Hamilton theorem. Also verify it for the matrix  $A = \begin{bmatrix} 4 & -6 & -6 \\ 0 & -2 & 0 \\ 1 & -1 & -1 \end{bmatrix}$ , and hence 7M

find  $A^{-1}$ .

- b) Diagonalize the matrix  $A = \begin{bmatrix} 1 & -1 & 0 \\ -1 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix}$ . 7M

2. a) Obtain the Fourier series for  $f(x) = e^{-x}$  in the interval  $0 < x < 2\pi$ . 7M

- b) Express  $f(x) = x$  as a half-range cosine series in  $0 < x < 2$ . 7M

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

- b) Solve:  $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$  by the method of separation of variables 7M

4. a) Using Newton's forward interpolation formula, find  $y$  at  $x=8$  from the following data: 7M

$x:$	0	5	10	15	20	25
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$y:$	7	11	14	18	24	32
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- b) Find an appropriate root of the equation  $x^3 + x - 1 = 0$  using the method of false position.

5. a) Obtain Picard's second approximate solution for the initial value problem 7M

$$\frac{dy}{dx} = \frac{x^2}{y^2 + 1}, \quad y(0) = 0.$$

- b) Given  $\frac{dy}{dx} = x^2(1+y)$  and  $y(1)=1$ ,  $y(1.1)=1.233$ ,  $y(1.2)=1.548$ ,  $y(1.3)=1.979$ , evaluate  $y(1.4)$  by Milne's Predictor-Corrector method. 7M

6. a) Use Trapezoidal rule to evaluate  $\int_0^1 x^3 dx$  by considering five sub-intervals. Can you use any other formulae to evaluate the integral? Justify your answer. 7M

- b) Find the first, second derivatives of the function tabulated below, at the point  $x=1.5$ . 7M

$x:$	1.5	2.0	2.5	3.0	3.5	4.0
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$f(x):$	3.375	7.0	13.625	24.0	38.875	59.0
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7. a) Determine the analytic function whose real part is  $e^{-x}(x \sin y - y \cos y)$ . 7M

- b) If  $f(z)$  is an analytic function of  $z$ , prove that  $\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \log |f'(z)| = 0$ . 7M

8. a) Evaluate  $\oint_C \frac{z^3 + z + 1}{z^2 - 7z + 2} dz$ , where  $C$  is the ellipse  $4x^2 + 9y^2 = 1$ . 7M

- b) Find the Taylor's series expansion of the function  $\frac{z}{(z+1)(z+2)}$  about  $z=2$ . 7M

Code : 1G531

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

*II B.Tech. I Semester Regular Examinations, January 2014*

**Mechanics of Solids**

*(Mechanical Engineering)*

**Time: 3 hours**

**Max Marks: 70**

*Answer any FIVE Questions from the following  
All questions carry equal marks (14 Marks each)*

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1. a) Explain stress – strain diagram for mild steel 7M  
 b) A 10 mm diameter rod was subjected to an axial pull of 10 kN and the change in diameter was observed to be 0.003 mm. Calculate Poisson's ratio and modulus of elasticity. Find also bulk modulus, given rigidity modulus =  $5 \times 10^4 \text{ N/mm}^2$ . 7M
2. a) Write about types of beams and loads 4M  
 b) Draw shear force and bending moment diagrams for a simply supported beam of length 8 m and carrying a uniform distributed load of 12 kN/m for a distance of 4 m from the left end. 10M
3. A simply supported wooden beam of span 2 m having a cross-section of 150 mm wide by 250 mm deep carries a point load W at the centre. The permissible stresses are  $10 \text{ N/mm}^2$  in bending and  $2 \text{ N/mm}^2$  in shearing. Calculate the safe load W. 14M
4. Derive the section modulus for (a) rectangular section, (b) hollow rectangular section, (c) circular section and (d) hollow circular section 14M
5. State the assumptions made in torsion equation. Derive the shear stress produced in a circular shaft subjected to torsion. 14M
6. A rectangular reinforced concrete simply supported beam of length 2 m and cross section 100 mm x 200 mm is carrying an uniformly distributed load of 10 kN/m through its span. Find the maximum slope and deflection. Take  $F=2 \times 10^4 \text{ N/mm}^2$ . 14M
7. a) Differentiate column and strut. What are the limitations of Euler's formula? 4M  
 b) A hollow mild steel tube 6 m long 4 cm internal diameter and 6 mm thick is used as a strut with both ends hinged. Find the crippling load and safe load taking factor of safety as 3. Take  $E=2 \times 10^5 \text{ N/mm}^2$ . 10M
8. a) A spherical shell of diameter 600 mm and metal thickness 10 mm is completely filled with a fluid at atmospheric pressure. Find the maximum pressure that can be permitted if the efficiency of the joint is 75% and the permissible stress is  $80 \text{ N/mm}^2$ . 4M  
 b) A thick cylinder of internal diameter 160 mm is subjected to an internal pressure 40  $\text{N/mm}^2$ . If the allowable stress in the material is  $120 \text{ N/mm}^2$ , find the thickness required. 10M

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