Code : 1G237

R-11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET

(AUTONOMOUS)

II B.Tech. I-Semester *Regular Examinations, November 2012*

Electrical Engineering and Electronics Engineering

(*ME*)

Max. Marks: 70 **Time: 03 Hours**

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

All Questions carry equal marks (14 Marks each)

PART-A

1. a. Derive expressions for energy stored in an inductor and capacitor. **6M**

   b. Three capacitors 10μf, 20 μf, 40 μf are connected in series to a 399V source. Find equivalent capacitance, magnitude of charge across each, potential difference across each capacitor. **8M**

2. a. Give the classification of DC Generators with suitable diagrams. **8M**

   b. The armature of an 8 pole DC generator has 960 conductors and runs at 450 rpm, the flux per pole is 40mWb. Calculate the induced EMF if the armature is lap connected. Also find the speed at which it is to be driven to generate 400V if the armature is wave connected. **6M**

3. a. Explain the operation of an ideal transformer on its no load with phasor diagram. **6M**

   b. A1-Φ transformer has 800 turns on its primary and 480 turns on its secondary. Primary is connected to 230V, 50Hz supply. Calculate the secondary voltage. If the secondary supplies a current of 4A at full load, calculate kva rating and the current taken by the transformer, assuming it to be ideal. **8M**

4. a. Explain synchronous impedance method to find regulation of an alternator. **8M**

   b. Give the comparison between squirrel cage and slip ring induction motors. **6M**

PART-B

5. Explain operation of Half wave and bridge rectifier with neat circuit diagrams and wave forms. **14M**

6. a. Compare the characteristics of BJT in CE and CC configurations. **6M**

   b. Explain I/O characteristics of transistor in CB configuration. **8M**

7. a. Explain how flow detection is obtained using ultrasonic's. **8M**

   b. Enumerate the applications of induction heating. **6M**

8. How do you measure voltage, current and frequency using CRO in a circuit? **14M**

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Code : *1G534*

R-11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET

(AUTONOMOUS)

II B.Tech. I-Semester *Regular Examinations, November 2012*

Machine Drawing

(*ME*)

Max. Marks: 70 **Time: 04 Hours**

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I. Answer any TWO of the following questions **2 X 4=8M**

1. a) Draw the conventional representation of Steel & Concrete.
   b) Draw the conventional representation of Internal & External Threads.
2. Draw a Shaft with a taper of 30mm with 1:20
3. Draw a bush with Minor & Major Diameters of 25mm and 75mm internal Diameters wit 12mm thick.
4. Draw the square headed bolt with square neck with a dia. of 30mm.

II. Answer any TWO of the following questions 2X 10=20M

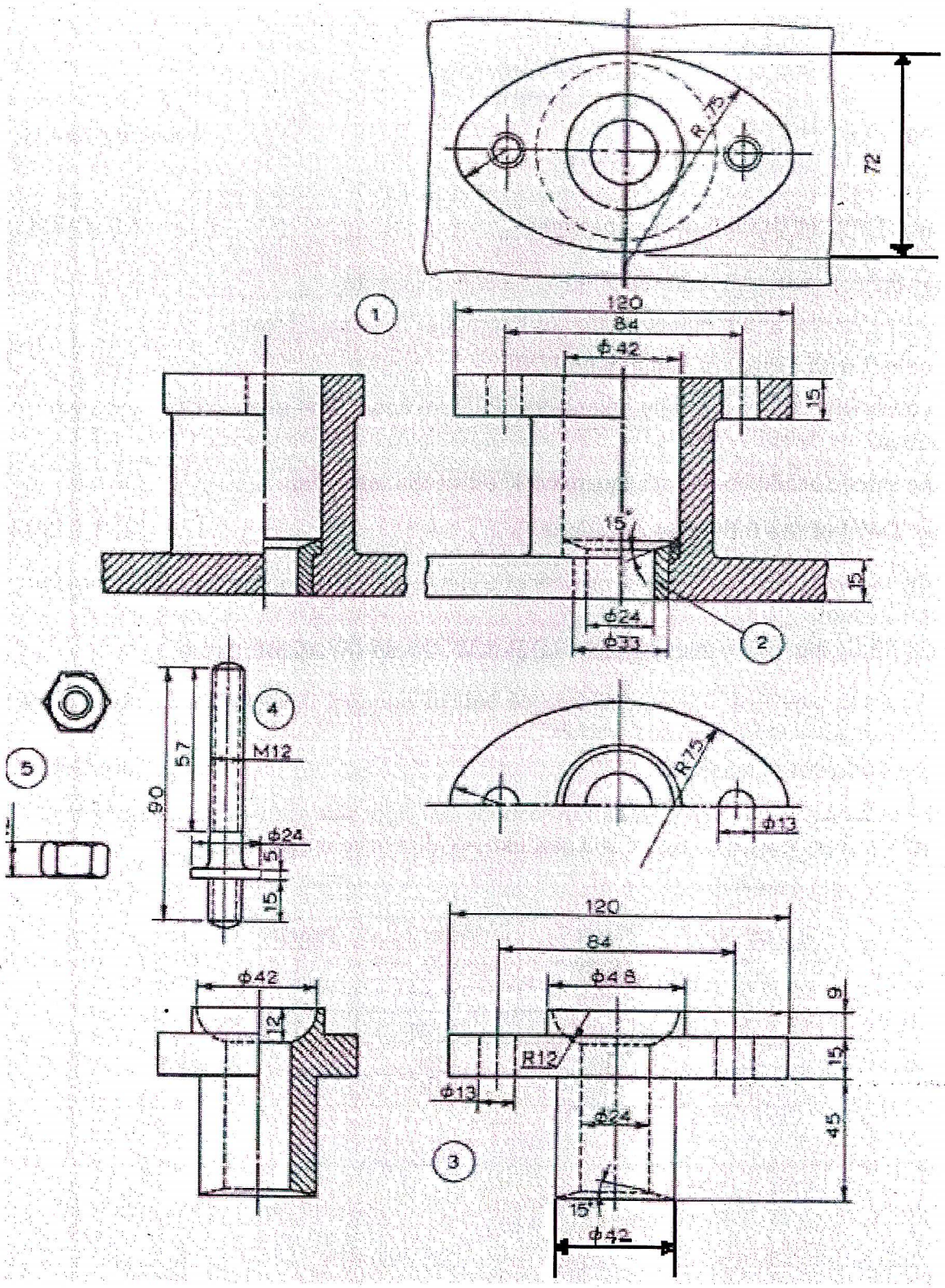
5. Draw the top view and sectional front view of a single riveted lap joint. Take the diameter of rivet = 24 mm.
6. Draw the following screw thread forms: (a) B.S.W. thread (b) ACME thread
7. Draw the three views of a hexagonal headed bolt of nominal diameter 25 mm and length 100 mm with a hexagonal nut and washer.

III. Answer the Following Question 1X42=42M

8. Draw the sectional front view (left half in section) and right side view of the assembled Stuffing Box from the given figure and part list. All dimensions are in mm.

Part list:

Part No	Name	Material	Quantity
1	Body	CI	1
2	Bush	Brass	1
3	Gland	Brass	1
4	Stud	MS	2
5	Nut	MS	2


R75
72
1
120
84
ϕ42
15
15°
15
ϕ24
ϕ33
2
R75
ϕ13
4
M12
57
90
ϕ24
5
15
5
120
84
ϕ48
9
15
R12
ϕ13
ϕ24
45
3
15°
ϕ42
ϕ42
12

Code : 1G531 **R-11**

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

Mechanics of Solids
(*ME*)

Max. Marks: 70 **Time: 03 Hours**

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

			Marks
1.	a.	Define the terms: Elastic limit, Volumetric strain, Bulk modulus and Poisson's ratio.	4
	b.	A mild steel bar 20 mm in diameter and 300 mm long is encased in a brass tube whose external diameter is 30 mm and internal diameter is 25 mm. The composite bar is heated through 60^0C. Calculate the stresses induced in each metal. Assume $\alpha_{steel} = 11.2 \times 10^{-6}$ per ^{0}C and $\alpha_{brass} = 16.5 \times 10^{-6}$ per ^{0}C. $E_{steel} = 2.0 \times 10^5$ N/mm^2 and $E_{brass} = 1.0 \times 10^5$ N/mm^2.	10
2.		Draw the shear force and bending moment diagram for a simply supported beam AB, 6m long, carrying a uniformly varying load 4 kN/m at end A to 6 kN/m at the end B. Determine the magnitude and position of the maximum bending moment.	14
3.		Derive the equation $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ for the simple bending of a beam by listing the assumptions made therein.	14
4.		A beam of **I** – section 500 mm deep and 200 mm wide, has equal flanges 20 mm thick and web 10 mm thick. It carries at a cross-section a shear force of 200 KN. Determine the shear stress distribution in the beam and the ratio of maximum shear to mean shear.	14
5.	a.	What are the assumptions made while deriving the shear stress equation for the circular shaft subjected to torsion.	4
	b.	A steel shaft of 25 mm diameter and 900 mm long is rigidly fixed at the ends. A twisting moment of 300 N-m is applied to it at a distance of 225 mm from one end. Calculate the fixing couples at the ends, the maximum shear stress induced and the angle of twist of the section where the twisting moment is applied. Assume G = 0.8 x 10^5 N/mm^2.	10
6.		Determine the deflection under the loads and slope at the supports in the beam shown in figure-1. Take E = 200 G Pa and I = 50 x 10^6 N/mm^2.	14

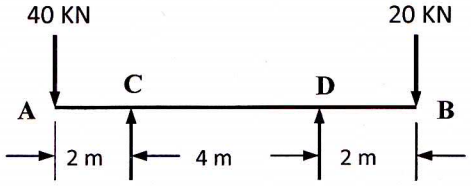

Figure – 1.

7. *a.* Differentiate between strut and column. What are the limitations of Euler's formula. **6M**

   b. A solid round bar of 60 mm diameter and 2.5 m long is used as a strut. Find the safe compressive load for the strut using Euler's formula if i both ends are hinged and ii both ends are fixed. Take E= 2x 10^5N/mm^2 and factor of safety = 3. **8M**

8. *a.* Prove that the longitudinal stress is equal to half of the hoop stress for a thin cylinder; diameter 'd', thickness 't' and is subjected to an internal pressure 'p'. **6M**

   b. At atmospheric pressure, a thin spherical shell has diameter 750 mm and thickness 8 mm. Find the stress induced and change in diameter and volume, when the fluid pressure is increased to 2.5 N/mm^2. Take E = 2 x 10^5 N/mm^2 and μ = 0.25. **8M**

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Code : 1G532

R-11

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

II B.Tech. I-Semester *Regular Examinations, November 2012*

Metallurgy & Material Science

(*ME*)

Max. Marks: 70 **Time: 03 Hours**

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

1. List out the factors promoting fine grains in a casting. Describe a method of obtaining uniform grain size in a casting which has both thin and thick sections. **14M**

2. What are the rules governing solid solubility? Explain.

   The atomic radius of Al and Si are 0.143 nm and 0.117nm respectively. Do they satisfy Hume Rothery's first rule for complete solid solubility. **14M**

3. Explain how a phase diagram can be constructed for an alloy system. What are the interpretations that can be made from a phase diagram? **14M**

4. Write notes on

   i) Grey cast iron ii) White Cast Iron and iii) Nodular cast iron **14M**

5. What are the different types of alloying elements affecting the important phases in a Iron – Iron carbide diagram? How do they affect the eutectoid temperature, composition and phase boundaries? **14M**

6. Discuss about the following.
   i. Types of brass and their applications
   ii. Seasonal cracking of brass **14M**

7. Compare composites with metals. **14M**

8. Explain the Basic Bessemer process of steel making. **14M**

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Code : 1GC31

R-11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET

(AUTONOMOUS)

II B.Tech. I-Semester *Regular Examinations, November 2012*

Mathematics -II

(*ME*)

Max. Marks: 70 **Time: 03 Hours**

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Answer *any five* questions

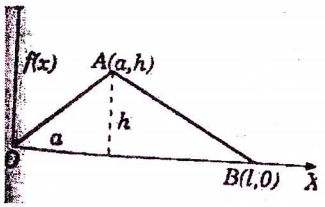
All Questions carry equal marks (14 Marks each)

1. a. Show that the Eigen values of an idempotent matrix are either zero or unity **6M**

   b. If $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$ evaluate A^{-1}, A^{-2}, A^{-3} by Cayley Hamilton theorem. **8M**

2. a. Write the Dirichlets conditions that the fuction f(x) can be developed as a Fourier series. Also give the reasons whether the function sin(1/x) can be expanded in Fourier series in the interval $-\pi \le x \le \pi$. **7M**

   b. For the function defined by the graph OAB in the fig., find the half-range Fourier series. **7M**



3. a. Form the partial differential equation form z = yf(x) + xg(x), by eliminating the arbitrary functions. **5M**

   b. A tightly stretched string of length *l* has its ends fastened at x = 0, x = *l*. The mid-point of the string is then taken to height h and then released from rest in that position. Find the lateral displacement of a point of the string at time t from the instant of release. **9M**

4. a. Use Newton-Raphson method to obtain a root, correct to three decimal places, of the equation 4(x – sin x) = 1. **7M**

   b. Find the missing term in the following table, and explain why the result differs from $3^3 = 27$? **7M**

x	0	1	2	3	4
y	1	3	9	-	81

5. a. Given $\frac{dy}{dx} - 1 = xy$ and y(0) = 1, obtain the Taylor series for y(x) and compute y(0.1) correct to four decimal places. **6M**

   b. Using Milne's method, find y(0.8) given that $\frac{dy}{dx} = x - y^2$, y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762, **8M**

6. a. The following table gives the angular displacements θ (radians) at different intervals of time t (seconds). Calculate the angular velocity at the instant t = 0.06. **7M**

θ	0.052	0.105	0.168	0.242	0.327	0.408	0.489
t	0	0.02	0.04	0.06	0.08	0.10	0.12

b. The velocities of a car (running on a straight road) at intervals of 2 minutes are given below. Apply Simpson's rule to find the distance covered by the car. **7M**

Time(min.)	0	2	4	6	8	10	12
Velocity(km/hr)	0	22	30	27	18	7	0

7. a. Show that f(z) = xy + iy is everywhere continuous but is not analytic. **7M**

b. Find the regular function whose imaginary part is $\frac{2\sin x \sin y}{\cos 2x + \cosh 2y}$. **7M**

8. a. Evaluate $\int_C \frac{e^z}{(z^2+\pi^2)^2} dz$ *where C is* $|z|=4$, using Cauchy's integral formula. **7M**

b. Expand the function f(z) = $\frac{1}{(z+1)(z+2)}$ in powers of (z +1) for the range $0<|z+1|<2$, by Laurent's series. **7M**

Code : 1G533 **R-11**

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

II B.Tech. I-Semester *Regular Examinations, November 2012*
Thermodynamics
(*ME*)

Max. Marks: 70 **Time: 03 Hours**

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

1. a. What is meant by thermodynamic equilibrium? How does it differ from thermal equilibrium? **7M**
   b. A mass of gas is compressed in a quasi static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3. Assuming that the pressure and volume are related by $PV^n=C$, find the work done by the gas system. **7M**
2. a. Show that energy is a property of the system. **7M**
   b. A closed system undergoes a reversible process at a constant pressure process of 3.5 bar and its volume changes from 0.15 m^3 to 0.06 m^3 . 25 kJ of heat is rejected by the system during the process. Determine the change in internal energy of the system. **7M**
3. a. Establish the equivalence of Kelvin-Planck and Clausius statements. **7M**
   b. Source 1 can supply energy at the rate of 12000 kJ/min at 320°C. A second source 2 can supply energy at the rate of 120000 kJ/min at 70°C. Which source (1 or 2) would you choose to supply energy to an ideal reversible heat engine that is to produce large amount of power if the temperature of the surroundings is 35°C? **7M**
4. a. State and prove Clausius inequality. **7M**
   b. Two reversible heat engines operate on Carnot cycle. They work in series between a maximum and minimum temperature of 550°C and 20°C. If the engines have equal thermal efficiencies and the first rejects 450kJ to the second, calculate:
      i. The temperature at which heat is supplied to the second engine,
      ii. the work done by each engine. **7M**
5. a. Why do isobars on Mollier diagram diverge from one another? **4M**
   b. Steam initially at 1.5 MPa, 300°C expands reversibly and adiabatically in a steam turbine to 40°C. Determine the ideal work output of the turbine per kg of steam. **10M**
6. a. Derive the relationship between the two principal specific heats and characteristic gas constant for a prefect gas. **4M**
   b. A container of 3 m^3 capacity contains 10 kg of CO_2 at 27°C.Estimate the pressure exerted by CO_2 using (i) perfect gas equation, (ii) Van der Waal's equation(take: a=362850 $Nm^4/(kg\text{-}mol)^2$, b=0.0423 m^3/kg-mol), and (iii) real gas equation. **10M**

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7. a. Explain briefly Dalton's law of partial pressures. **4M**
   b. A vessel contains at 1 bar and 20°C a mixture of 1 mole of CO_2 and 4 moles of air. Calculate for the mixture (i) the masses of CO_2, O_2 and N_2, (ii) the percentage carbon content by mass , (iii) the apparent molecular weight and the gas constant for the mixture, and (iv) the specific volume of mixture.
      Take volumetric analysis of air as 21% Oxygen and 79% Nitrogen. **10M**
8. a. For the same compression ratio and heat rejection, which cycle is more efficient: Otto or Diesel? Explain with p-v and T-s diagrams. **4M**
   b. In an Otto cycle, the pressure at the end of compression is 15 times that at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature is 1950°C. Determine: (i) compression ratio, (ii) thermal efficiency and work done. Take γ for air=1.4. **10M**

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