Hall Ticket Number :										

Code : 1GC31

R-11/R-13

II B.Tech. I Semester Supplementary Examinations May/June 2016

Mathematics-II

(Common to CE & ME)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Find the Eigen values and Eigen vectors of the matrix $A=\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. 7M

   b) Verify Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$ and hence find its inverse. 7M

2. a) Given that $f(x)=\begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$. Find the Fourier series for $f(x)$. Also deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+\cdots\cdots=\frac{\pi^2}{8}$. 9M

   b) Obtain the half range sine series for $f(x)=e^x \text{ in } 0<x<1$. 5M

3. a) Derive the partial differential equation by eliminating the constants from the equation $2z=\frac{x^2}{a^2}+\frac{y^2}{b^2}$. 4M

   b) A tightly stretched string with fixed end points $x=0$ and $x=L$ is initially in a position given by $y=y_0\sin^3\left(\frac{\pi x}{L}\right)$ if it is released from rest from this position, find the displacement $y(x,t)$. 10M

4. a) Determine the root of $x\,e^x-2=0$ by method of false position. 7M

   b) Using Lagrange's formula, express the function $\frac{x^2+x-3}{x^3-2x^2-x+2}$ as a sum of partial fractions. 7M

5. a) Find the value of $y \text{ at } x=0.1$ by Picard's method, given that
   $$\frac{dy}{dx}=\frac{y-x}{y+x},\ y(0)=1.$$ 7M

   b) Apply Runge-Kutta method of 4th order, to find an approximate value of y when $x=0.2$ given that $\frac{dy}{dx}=x+y,\ y(0)=1$. 7M

6. a) Determine $\frac{dy}{dx}$ at $x = 2$ from the data below:

x:	0	1	2	3	4	5
y:	0	1	8	27	64	125

7M

b) Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2}\,dx$ by taking seven coordinates. 7M

7. a) Show that for $f(z) = \begin{cases} \frac{xy^2(x+iy)}{x^2+y^4}, & z \neq \\ 0 & z = \end{cases}$ the Cauchy-Riemann equations are satisfied at the origin but the derivative of $f(z)$ at origin does not exist. 7M

b) Find the analytic function $f(z) = u + iv$ where $u = \frac{\sin 2x}{(\cosh 2y - \cos 2x)}$. 7M

8. a) Use Cauchy's integral formula to evaluate $\int_C \frac{e^{2z}}{(z+1)^4}\,dz$ where C is the circle $|z| = 2$. 7M

b) Find the Laurent series of $f(z) = \frac{(z-2)(z+2)}{(z+1)(z+4)}$, for (**i**) $1 < |z| < 4$ (**ii**) $|z| > 4$. 7M

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Hall Ticket Number :										

R-11/R-13

Code : 1G237

II B.Tech. I Semester Supplementary Examinations May/June 2016

Electrical Engineering and Electronics Engineering

(Mechanical Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) In the circuit of Fig.1 there are eight circuit elements. Find V_{R2} (the voltage across *R*2) and the voltage labeled V_x.

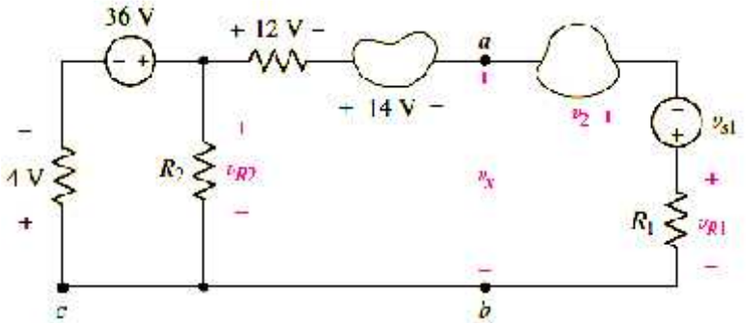

Fig.1 8M

b) Determine the Total resistance of the network between AB terminals shown in Fig 2.

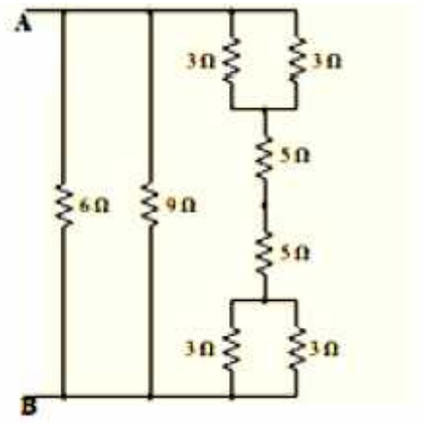

Fig. 2 6M

2. a) Derive emf equation for DC Generator. 8M

b) An 8 Pole,Lap Wound armature rotated at 350 rpm is required to generate 260V.The useful magnetic flux per pole is 0.05Wb.if the armature has 120 slots. Calculate the number of conductors per slot. 6M

3. a) Explain losses in the single phase transformer. Derive the formula for efficiency. 9M

b) In a 50KVA transformer,the iron loss is 500W and full load copper loss is 800W.Find the efficiency at full load at 0.8 p.f. lagging. 5M

4. a) Explain the Principle of operation of Alternator. 7M

b) Explain the principle of operation of Three phase Induction Motor. 7M

5. a) Explain the operation of PN junction diode with its VI characteristics. 10M

b) Explain diode applications. 4M

6. a) Explain working of PNP & NPN transistors 8M

b) Explain SCR Characteristics and its applications. 6M

7. Explain the concept of Induction Heating and also discuss about various Industrial Applications of Induction Heating. 14M

8. Explain the working and function of each block of CRO with the help of neat diagram 14M

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Hall Ticket Number :										

R-11/R-13

Code : 1G531

II B.Tech. I Semester Supplementary Examinations May/June 2016

Mechanics of Solids

(Mechanical Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Explain the following :

(i) Stress **ii**) Strain and **iii**) Bulk modulus 6M

b) A metal bar 5 cm x 5 cm section is subjected to an axial compressive load of 500 kN. The contraction on 20 cm gauge length is found to be 0.5 mm and the increase in thickness is 0.045 mm. Find the value of Young's modulus and Poisson's ratio. 8M

2. a) Explain the Shear force and Bending moment diagrams. 4M

b) Draw the complete shear force and bending moment diagrams for the beam shown in Figure 1, with all salient points.

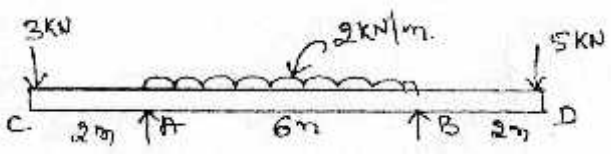

Figure 1 10M

3. a) What do you mean by simple bending? State the assumptions in the theory of simple bending. 6M

b) A rectangular beam 80 mm x 40 mm is 3 m long and simply supported at its ends. It carries a load of 1 kN at the mid span. Determine the maximum bending stress induced in the beam. 8M

4. A beam simply supported over a span of 2 m carries a UDL of 20 kN/m over its entire length. The cross-section of the beam is a T-section having flange 125 x 25 mm and web 25 x 175 mm. Draw the shear stress distribution over the depth of the beam section. 14M

5. a) Derive the torsion formula applied to circular shafts. 7M

b) What diameter of the shaft will be required to transmit 80 kW at 60 rpm, if the maximum torque is 30 percent greater than the mean and the limit of torsional stress is to be 56 Mpa. If the modulus of rigidity is 84 Gpa, what is the maximum angle of twist in 3 m length? 7M

6. A 2 m long cantilever made of steel tube of section 150 mm external diameter and 100 mm thick is loaded as shown in Figure 2. If E = 200 GN/m^2 then calculate

(i) The value of 'W' so that the maximum bending stress is 150 MN/m^2

(ii) The maximum deflection of the loading

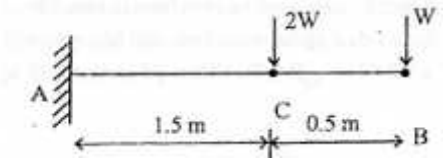

Figure2 14M

7. A bar of length 4 m when used as a simply supported beam and subjected to a uniformly distributed load of 30 kN/m over the whole span, deflects 1.5 cm at the center. Determine the crippling loads when it is used as a column with the following end conditions.
   (i) Both ends pin jointed
   (ii) One end fixed and the other hinged
   (iii) Both ends hinged 14M

8. a) Explain stresses in thin cylindrical shells. 4M

   b) A bronze sleeve of 20 cm internal diameter and 6 mm thick is pressed over a steel liner 20 cm external diameter and 1.6 cm thick, with a force fit allowance of 0.008 cm on diameter. Treating both as thin cylinders find (**i**) the radial pressure at the common surface (**ii**) the hoop stress and (**iii**) the percentage of the fit allowance met by the sleeve and liner. 10M

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Hall Ticket Number :										

R-11/R-13

Code : 1G532

II B.Tech. I Semester Supplementary Examinations May/June 2016

Metallurgy & Material Science

(Mechanical Engineering)

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

Answer *any five* questions

All Questions carry equal marks (14 Marks each)

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1. a) Explain in detail the stages of crystallization of metals. 9M
   b) Differentiate between a crystal, dendrite and a grain. 5M

2. a) Write down the classification of alloys. Explain briefly each alloy system. 10M
   b) What is the necessity of alloying when pure metals are available after extraction? 4M

3. a) Metal A melts at 650^0C and metal B melts at 450^0C. When alloyed together, A and B does not form any compound or intermediate phase. Solid solubility of metal A in B and B in A is negligible. The metal pair forms a eutectic at 300^0C with 40 % A and 60% B. Assume that the liquidus lines are straight. Draw the phase diagram for the alloy series and find:
      (i) temperature at which 70% of A and 30% of B starts and completes solidification
      (ii) for the same alloy, find the amount of solid phase and liquid phase at 400^0C 9M
   b) What is coring? How is it handled? 5M

4. a) What is S.G. Iron? What are its applications? 7M
   b) What is the effect of manganese as an alloying element in steel? What is Hadfield steel? What are its properties and applications? 7M

5. Explain in detail the procedure in construction of TTT diagram. Superimpose the cooling curves of annealing, normalizing and hardening on the TTT diagram for a typical eutecoid steel. 14M

6. a) Write down the properties and uses of copper. 7M
   b) Write notes on Brasses. 7M

7. Write notes on
      (i) Bullet Proof glasses
      (ii) Cermets
      (iii) Carbon composites. 14M

8. Explain the Electrical processes of steel making. 14M

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Hall Ticket Number :										

Code: 1G533 **R-11 / R-13**

II B. Tech. I-Semester Supplementary Examinations May/June 2016

Thermodynamics

(Mechanical Engineering)

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

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

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1. a) Show that work is a Path function and not a property. 4M
   b) A gas expands according to the equation PV=100 where P is the pressure in KPa and V is the specific volume .The initial pressure of the gas is 1000KPa and the final pressure is 500 KPa. The gas is then heated at constant volume back to its original pressure of 1000KPa. Determine the work of combined process .Also sketch the process on P-V coordinates 10M
2. a) Derive the relation between Centigrade scale and Fahrenheit scale. 7M
   b) A refrigerant vapour enters the condenser of a refrigeration plant with 223 KJ/Kg enthalpy and leaves with 65 KJ/kg enthalpy. Cooling water enters at 15^0C and leaves 20^0C .Calculate the mass flow rate of water per unit flow rate of refrigerant. Take C_{pw}= 4.186KJ/KgK 7M
3. a) Explain the two statements of Second law of Thermodynamics 6M
   b) Three Carnot Heat Engines HE1, HE2, HE3 are connected in series. They are working with same thermal efficiency. The heat supplied to the entire system is 2400 kW and heat rejected from entire system is 300 kW. Calculate work done for each engine. 8M
4. a) Water flows through a Turbine in which friction causes the water temperature to rise from 35^0C to 37^0C.If there is no heat transfer, how much does the entropy of the water change in passing through the Turbine? Assume that the process can be as constant volume process. 4M
   b) Derive Maxwell relations and deduce two “Tds” equations 10M
5. a) Describe the process of formation of steam 4M
   b) Two boilers one with super heater and other without super heater are delivering equal quantities of steam into a common main pipe. The pressure in the boilers and main pipe is 20 bar. The temperature of steam from boiler with super heater is 350^oC and in the main pipe is 250^0C. Determine the quality of steam supplied by the other boiler. 10M
6. a) Show that for and ideal gas $C_p - C_v = R$ 6M
   b) 0.5 kg of air is compressed reversibly and adiabatically from 80kPa, 60^0C to 0.4MPa, and is then expanded at constant pressure to the original volume. Calculate work transfer and heat transfer for the whole path. 8M
7. Two vessels A& B, both containing Nitrogen are connected by a valve which is opened to allow the contents to mix and achieve an equilibrium temperature of 27^0C.Before mixing the following information is known about the gases.
   Vessel A : P=1.5Mpa ,t= 50^0C ,contents = 0.5 kg mol.
   Vessel B : P=0.6Mpa ,t= 20^0C ,contents = 2.5 kg.
   Calculate the final equilibrium pressure, and the amount of heat transferred to the surroundings. If the vessel had been perfectly insulated, calculate the final temperature and pressure which would have been reached. 14M
8. a) What is an air standard cycles and why such cycles are conceived? What are the advantages of Helium as the working substance in the cycle? 6M
   b) For the same maximum pressure and temperature and same heat rejection which is cycle is most efficient? Otto, Diesel or Dual? Explain with P-V and T-S diagrams. 8M

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Hall Ticket Number :										

R-11/R-13

Code : 1G534

II B.Tech. I Semester Supplementary Examinations May/June 2016

Machine Drawing

(Mechanical Engineering)

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

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Section-I

Answer *any **Two*** of the following

2 x 4 = 8M

1 Sketch the conventional representation of the following materials
   (a) External Screw Threads
   (b) Internal Screw Threads

2 How do you diagrammatically represent the following
   (a) Half section
   (b) Local Section

3. Through sketches, illustrate the method of representing a rivet head having snap head. (Consider d=25mm)

Section-II

Answer any two of the following **2 x 10=20M**

4. Sketch any two types of cap screw with 25mm diameter?

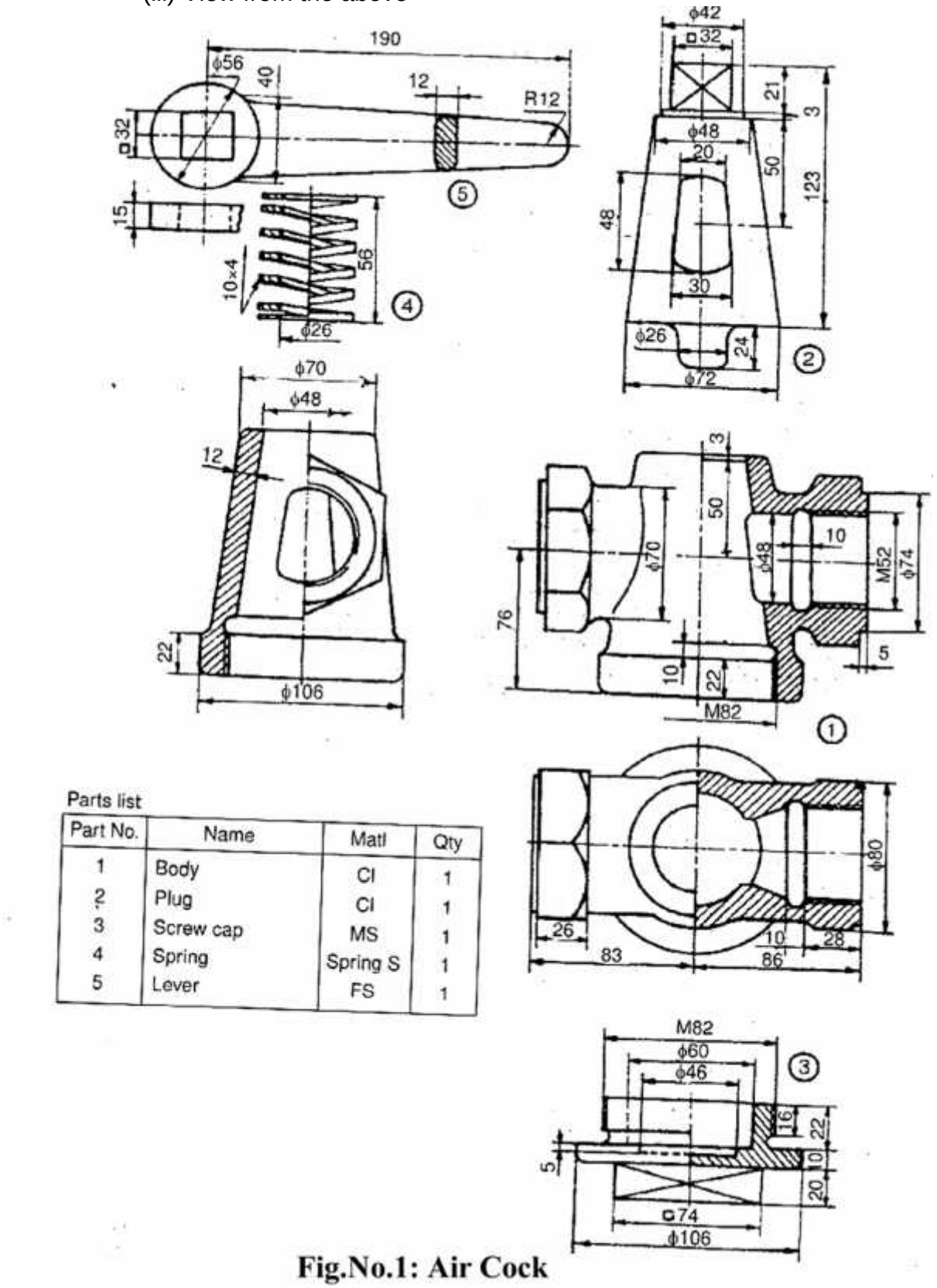
5. Draw the sectional view from the front of a cotter joint with sleeve used to connect two rods of 50mm diameter each?

6. Draw
   (a) sectional view from the front and
   (b) the view from above of double riveted chain lap joint to join plates of thickness 10mm.

Section-III

Answer the following question **1 x 42=42M**

7. The details of the air cock are shown in Figure 1, Assemble the parts and draw
   (i) Half sectional view from the front
   (ii) View from the right and
   (iii) View from the above



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Plug	CI	1
3	Screw cap	MS	1
4	Spring	Spring S	1
5	Lever	FS	1

Fig.No.1: Air Cock

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