Hall Ticket Number :										

R-11 / R-13

Code: 1G237

II B.Tech. I Semester Supplementary Examinations November 2017

Electrical Engineering and Electronics Engineering

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

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

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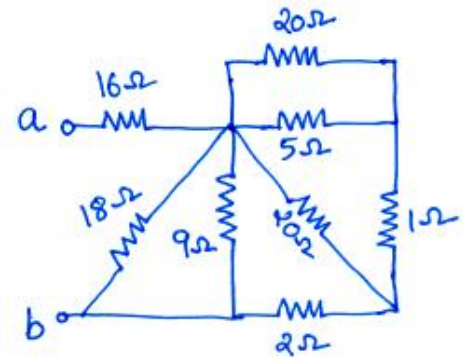
1. a) Explain resistance, inductance and capacitance parameters with necessary expressions. 9M

   b) Find the equivalent resistance between the terminal a and b for the circuit shown in figure below.



5M

2. a) Explain the types of DC motors with neat circuit diagrams. 8M

   b) A 4 pole generator having wave connected armature winding has 51 slots, each slot containing 20 conductors. What will be the voltage generated in the machine when driven at 1500 rpm assuming flux per pole to be 7 mWb. 6M

3. a) A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at full load of 600W. Determine the efficiency at 80% of full load. 7M

   b) Explain the various losses in a transformer. 7M

4. a) Explain the synchronous impedance method for determine regulation of an alternator? 7M

   b) Sketch and explain the typical torque slip characteristics of an induction motor? 7M

5. a) With a neat sketch explain operation of a PN junction diode? Draw its V-I characteristics 8M

   b) An a.c. supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10: 1. Find (i) the output d.c. voltage and (ii) the peak inverse voltage. Assume the diode to be ideal. 6M

6. a) Explain about the principle of operation of PNP transistor? Discuss how it is operated as an amplifier? 7M

   b) Explain basic concept of a feedback amplifier? 7M

7. a) Explain the principle of induction heating. 7M

   b) What are the applications of dielectric heating? 7M

8. a) Explain the principle of cathode ray tube with a neat sketch. 7M

   b) Explain the measurement of voltage and frequency using a cathode ray oscilloscope. 7M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G534

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2017

Machine Drawing

(Mechanical Engineering)

Max. Marks: 70 Time: 4 Hours

Section-I

Answer any Two of the following **2X4=8M**

1 Sketch the conventional representation of the following materials
   (a) Spur Gear
   (b) Concrete

2 Sketch the following thread profiles for a nominal diameter of 25mm and pitch 3mm.
   (a) Whitworth thread
   (b) Square thread

3 With a suitable example, Sketch the following
   (a) Revolved Section
   (b) Half section

Section-II

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

4. Draw the three views of a hexagonal headed bolt of nominal diameter 25mm and length 100mm with a hexagonal nut and washer?

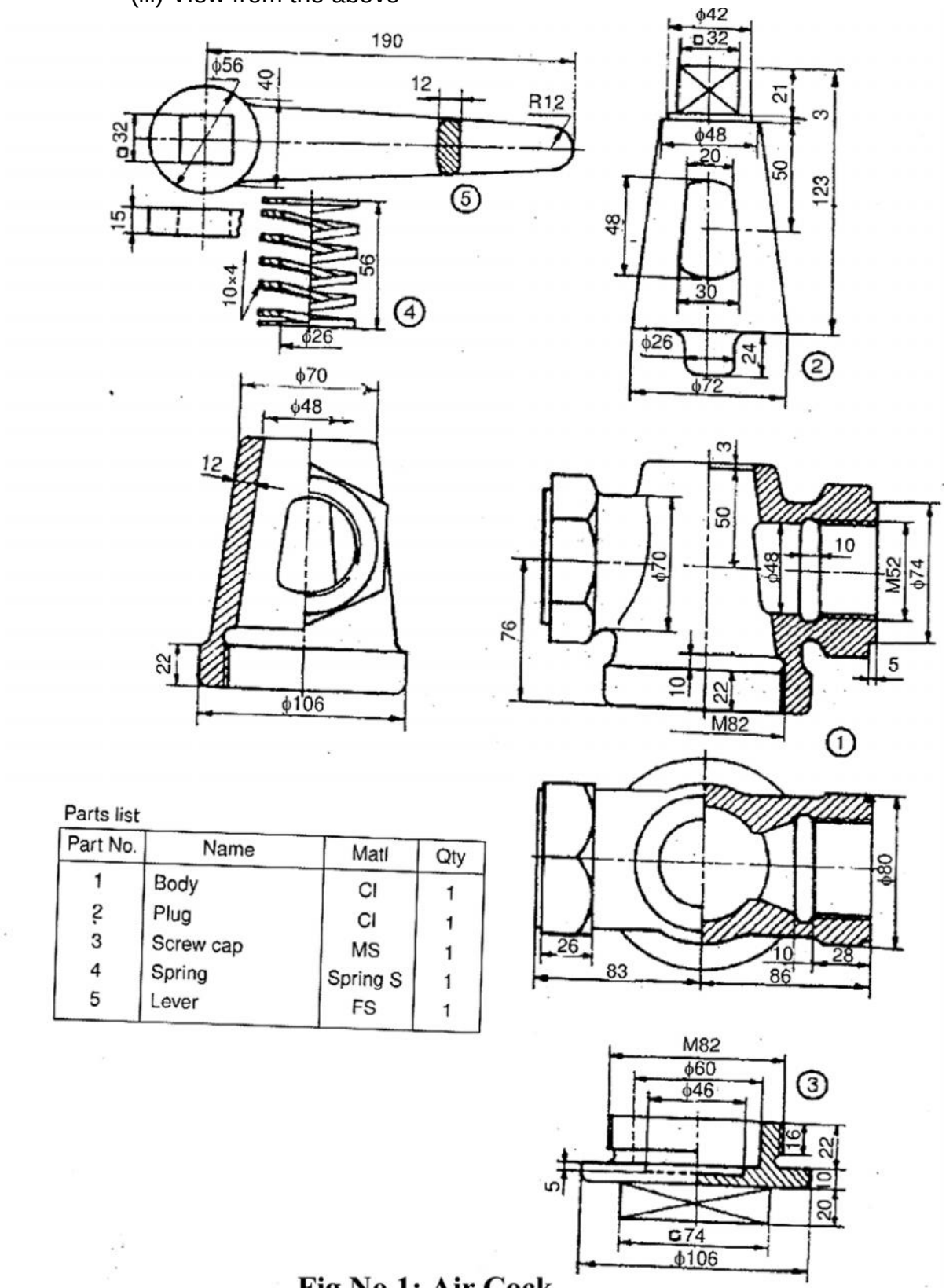
5. Draw sectional view from the front and the view from above of Single riveted lap joint riveted joints to join plates of thickness 10mm?

6. Draw
   (a) Half sectional view from the front with left half in section and
   (b) View from above of a solid journal bearing suitable for supporting a shaft of diameter 25mm.

Section-III

Answer the following question **1X42=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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Hall Ticket Number :										

R-11 / R-13

Code: 1GC31

II B.Tech. I Semester Supplementary Examinations Nov/Dec 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 and its transpose A^T have the same Eigen values 4M

   b) Diagonalize the matrix $A=\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ and hence calculate A^4. 10M

2. a) Expand the function $f(x) = x - x^2$ as a Fourier series in $[-\pi, \pi]$. 7M

   b) Find the half-range Fourier sine series for $f(x) = ax + b$ in $0 < x < 1$ 7M

3. a) Form the PDE by eliminating the arbitrary function $z = f\left(x^2 + y^2 + z^2\right)$ 7M

   b) Solve by 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 False position method 7M

   b) Use Lagrange's interpolation formula to find the value of y when x=10, if the following values of x and y are given 7M

x:	5	6	9	11
y:	12	13	14	16

5. a) Find the first and second derivatives of f(x) of x=0 if 7M

x:	0	1	2	3	4	5
y:	4	8	15	7	6	2

   b) Evaluate $\int_0^2 e^{x^2} dx$ using Simpson's rule taking h=0.25 7M

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

7. a) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though C-R equation are satisfied thereof. 7M

   b) If 'u' is a harmonic function, show that $w=z^2$ is not a harmonic function unless 'u' is a constant. 7M

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's expansion of $f(z) = \frac{7z - 2}{(z+1)z(z-2)}$ in the region $1 < z + 1 < 3$ 7M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G531

II B.Tech. I Semester Supplementary Examinations Nov/Dec 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) A tensile test was conducted on a mild steel bar. The following data was obtained from the test:
   i) Diameter of the steel bar : 3cm
   ii) Gauge length of the bar : 3cm
   iii) Load at elastic limit : 250kN
   iv) Extension at a load of 150KN : 0.21mm
   v) Maximum load : 380kN
   vi) Total extension : 60mm
   vii) Diameter of the rod at failure : 2.25cm

   Determine A) young's modulus B) the stress at elastic limit C) the percentage elongation and D) the percentage decrease in area 9M

   b) Define a 'composite bar'. How will you find the stresses and load carried by each member of a composite bar? 5M

2. a) A cantilever beam of length 2m carries a uniformly distributed load of 1.5kN/m run over the whole length and a point load of 2kN at a distance of 0.5m from the free end. Draw the S.F. and B.M. diagrams for the cantilever. 10M

   b) What do you mean by 'point of contraflexure'? How many 'points of contraflexure' will you have for a simply supported beam? 4M

3. a) What do you mean by 'simple bending'? What are the assumptions made in the theory of simple bending? 4M

   b) A timber beam of rectangular section of length 8m is simply supported. The beam carries a U.D.L. of 12kN/m run over the entire length and a point load of 10kN at 3m from the left support. If the depth is two times the width and the stress in the timber is not to exceed 8N/mm2, find the suitable dimensions of the section. 10M

4. a) Explain how shear stress develops in beams. Write an expression for maximum shear stress developed in beams of triangular section. 4M

   b) An I-section beam 350mm×150mm has a web thickness of 10mm and a flange thickness of 20mm. if the shear force acting on the section is 40kN, find the maximum shear stress developed in the section. 10M

5. a) Define the term 'polar modulus'. Write the expressions for polar modulus of a solid shaft and a hollow shaft, 4M

   b) A hollow shaft is transmit 300KW power at 80r.p.m. if the shear stress is not to exceed 60kN/m^2 and the internal diameter is 0.6 times the external diameter, find the diameters of the shaft assuming the maximum torque is 1.4 times the mean. 10M

6. a) Write expressions for slope and deflection of a cantilever beam carrying U.D.L. along its entire length. 4M

   b) A beam of length 10m is simply supported at the ends. It carries a uniformly distributed load of 10kN/m over a length of 6m from the right support. Determine the deflection of the beam at its mid-point and also the position of maximum deflection. 10M

7. a) Explain the assumptions made in the Euler's column theory. How far are the assumptions valid in practice? 4M

   b) A hollow alloy tube 5m long with external and internal diameters 40mm and 25mm respectively was found to extend 6.4mm under a tensile load of 60kN. Find the buckling load for the tube when used as a column with both ends pinned. Also find the safe load for the tube, taking a factor of safety 4. 10M

8. a) A thin cylindrical vessel made of steel plates 4mm thick plane ends carries fluid under a pressure of 3N/mm^2. The diameter of the cylinder is 25cm and the length is 75cm. Calculate the longitudinal and hoop stress in the cylinder wall and determine the change in diameter, length and volume of the cylinder. Take Young's modulus as 2.1×10^5N/mm^2 and Poisson's ratio as 0.26. 10M

   b) What do you mean by a thick compound cylinder? How will you determine the 'hoop stress' in a thick compound cylinder? 4M

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Hall Ticket Number :										

R-11/R-13

Code: 1G533

II B.Tech. I Semester Supplementary Examinations Nov/Dec 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) Differentiate between open system, closed system and isolated system with examples. 4M

   b) A cylinder contains 1 kg of a certain fluid at an initial pressure of 20 bar. The fluid is allowed to expand reversibly behind a piston according to a law pV^2 = constant until the volume is doubled. The fluid is then cooled reversibly at constant pressure until the piston regains its original position; heat is then supplied reversibly with the piston firmly locked in position until the pressure rises to the original value of 20 bar. Calculate the net work done by the fluid, for an initial volume of 0.05 m^3 10M

2. a) What is the mechanical equivalent of heat ? Write down its value when heat is expressed in kJ and work is expressed in N-m. 4M

   b) A fluid system, contained in a piston and cylinder machine, passes through a complete cycle of four processes. The sum of all heat transferred during a cycle is – 340 kJ. The system completes 200 cycles per minute. Complete the following table, showing the method for each item and compute the net rate of work output in kW.

Process	Q (kJ/min)	W (kJ/min)	ΔE (kJ/min)
1-2	0	4340	-
2-3	42000	0	-
3-4	-4200	-	-73200
4-1	-	-	-

   10M

3. a) State the limitations of first law of thermodynamics. 4M

   b) Two Carnot engines work in series between the source and sink temperatures of 550 K and 350 K. Determine the intermediate temperature, if **i**) both engines develop equal power **ii**) if efficiencies of both engines are same. 10M

4. a) Derive an expression for the change in entropy of the universe. 6M

   b) Derive any two Maxwell relations. 8M

5. a) A vessel having a volume of 0.6 m^3 contains 3 kg of liquid water and water vapour mixture in equilibrium at a pressure of 0.5 MPa. Calculate : (**i**) Mass and volume of liquid ; (**ii**) Mass and volume of vapour. 8M

   b) Explain and derive Clausius Clapeyron equation. 6M

6. a) Write a short note on Van der Waals' gas equation. 6M

   b) Determine the pressure of air at 205°C having a specific volume of 0.00315 m^3/kg by means of (***i***) Ideal gas equation (***ii***) Van der Waals' equation (***iii***) Beattie-Bridgeman equation. 8M

7. a) State and explain Amagat's law. 4M

   b) A mixture is made up of 25% N_2, 35% O_2, 20% CO_2 and 20% CO by volume. Calculate : (**i**) The molecular weight of the mixture. (**ii**) Cp and Cv for the mixture. (**iii**) γ for the mixture. (**iv**) The partial pressure of each constituent when the total pressure is 1.5 bar. 10M

8. a) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. (i) Determine the pressures and temperatures at all points of the air standard Otto cycle. (ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8:1. Take for air Cv = 0.72 kJ/kg K, and γ = 1.4. 10M

   b) Draw the P-v and T-s diagram of Brayton cycle showing all the processes. 4M

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