Hall Ticket Number :

Code : 1GC31 **R-11 / R-13**

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2015

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 $A=\begin{bmatrix}1 & 1 & 3\\ 1 & 5 & 1\\ 3 & 1 & 1\end{bmatrix}$. 7M

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

2. a) Find the Fourier series for $f(x)=e^{ax}$ in $(0, 2\pi)$. 7M

   b) Obtain the half range cosine series for $f(x)=x^3 \quad in \quad 0<x<L$. 7M

3. a) Form partial differential equation by eliminating the arbitrary functions from $z=f(x)+e^{y}g(x)$. 5M

   b) Solve the by the method of separation of variables $4u_x+u_y=3u \text{ and } u(0,y)=e^{-5y}$. 9M

4. a) Determine the root of $x^3-4x+1=0$ by method of false position. 7M

   b) Using Lagrange's formula, express the function $\frac{x^2+6x-1}{(x^2-1)(x-4)(x-6)}$ as a sum of partial fractions. 7M

5. a) Obtain Picard's second approximate solution of the initial value problem $\frac{dy}{dx}=\frac{x^2}{y^2+1}$, $y(0)=0$ .Find $y(1)$. 7M

   b) Given that $\frac{dy}{dx}=2+\sqrt{xy}$, $y(1)=1$. Find $y(2)$ in steps of **0.2** using the Euler's method. 7M

6. a) Determine $\frac{dy}{dx}$ at $x = 0$ from the following data

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

7M

b) Use Simpson's 1/3rd rule to find $\int_0^{\frac{®}{2}} \sqrt{\sin x}\ dx$ by taking $h = \frac{®}{12}$. 7M

7. a) Show that $f(z) = \begin{cases} \frac{x^2 y^5 (x + i\, y)}{x^4 + y^{10}}, & z \neq \\ 0 & z = \end{cases}$ is not analytic at $z = 0$ although the Cauchy-Riemann equations are satisfied at the origin. 7M

b) Find the analytic function whose real part is $e^{2x}(x\ \cos 2y - y\ \sin 2y)$. 7M

8. a) Use Cauchy's integral formula to evaluate $\int_C \frac{\sin ® z^2 + \cos ® z^2}{(z-1)(z-2)} dz$ where C is the circle $|z| = 3$. 7M

b) Find the Laurent series of $f(z) = \frac{z^2 - 1}{(z + \ )(z + \ )}$, for $|z| > 3$. 7M

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Hall Ticket Number :										

Code : 1G237 **R-11 / R-13**

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2015

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) Define ohm's law and Kirchhoff's laws 03M

   b) Calculate total resistance between ab terminals of fig 1 using star-delta and delta-star transformations.

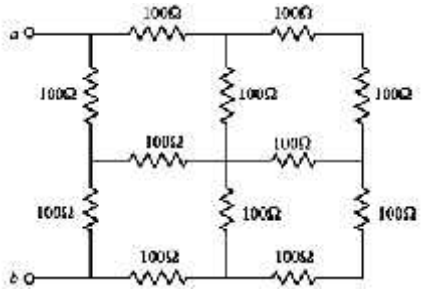

Fig 1 11M

2. Classify the different types of DC Motor. Explain the three point starter operation and its disadvantage(s). 14M

3. Explain Principle of operation of single phase transformers & define the voltage regulation of transformer 14M

4. a) Explain Regulation of an alternator by synchronous impedance method 10M

   b) Briefly explain the induction motor-slip-torque characteristics 4M

5. Explain half wave, full wave and bridge rectifier along with input & output waveforms 14M

6. a) Explain transistor as an amplifier 9M

   b) Explain the necessary conditions for oscillators 5M

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 :										

Code : 1G534 **R-11 / R-13**

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2015

Machine Drawing

(Mechanical Engineering)

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

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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. Assemble all parts of the Screw shown in figure 1, and draw the following views

   (i) Half sectional view from the front

   (ii) View from above

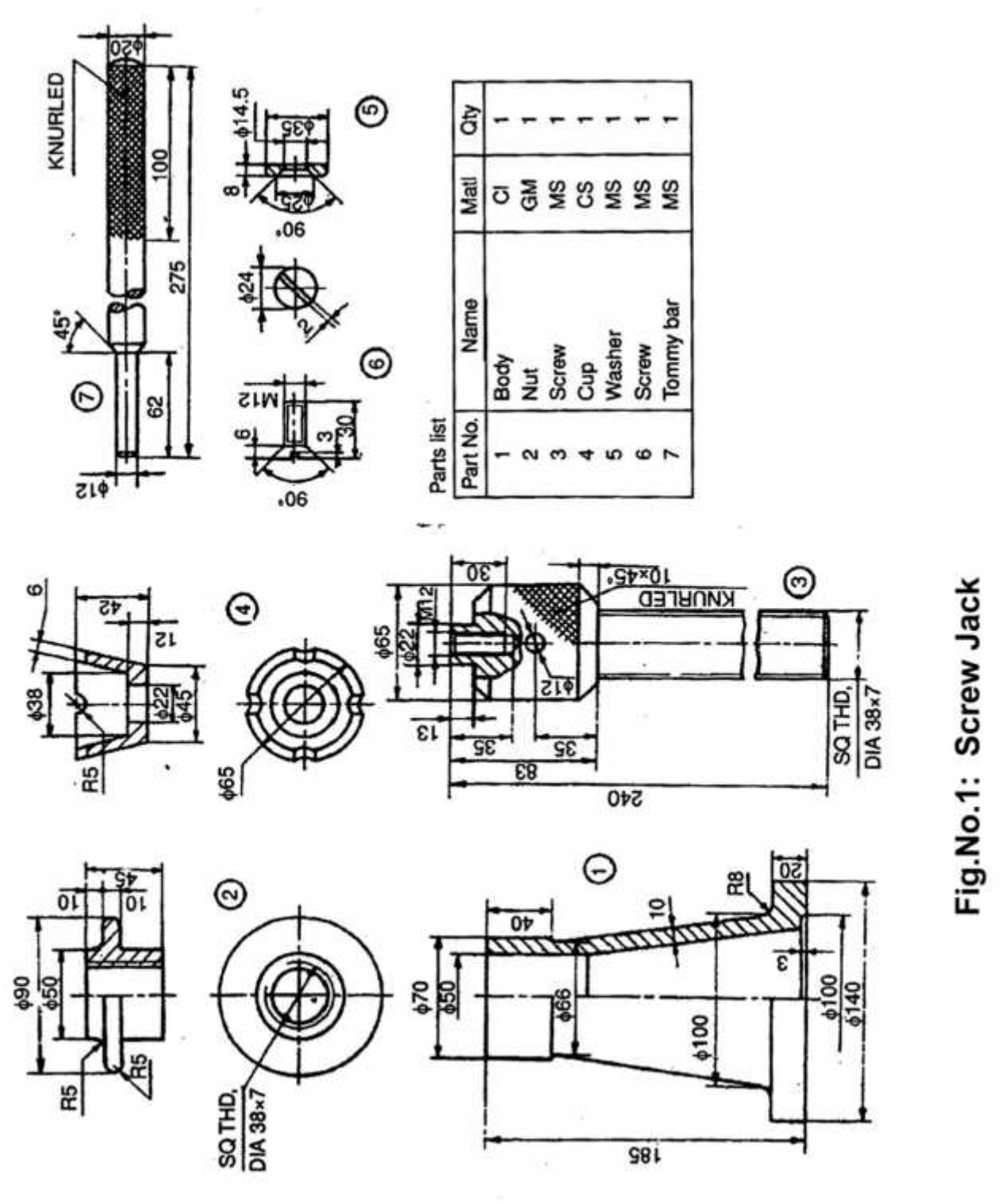

Fig.No.1: Screw Jack

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Hall Ticket Number :										

Code : 1G532 **R-11 / R-13**

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2015

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)	What are the different methods of determining grain size? Explain about each	9M
	b)	What is metallic bond? How is it different from other bonds?	5M
2.	a)	Write down the rules governing the solid solubility in metals. Explain about each.	7M
	b)	What are electron compounds? Give examples. What are their features?	7M
3.		Sketch the Iron – Iron Carbide equilibrium diagram and label all the details. What are phases seen and their properties? What are the invariant reactions observed?	14M
4.	a)	What is Malleable cast iron? How is it obtained from white cast Iron?	8M
	b)	Write down the effect of any four alloying elements on steels.	6M
5.	a)	Compare Normalising with annealing process.	6M
	b)	Describe the mechanism of heat removal in quenching process. What are the quenching media available?	8M
6.	a)	List out the properties and uses of Aluminum.	7M
	b)	Write a note on bearing alloys.	7M
7.	a)	Write down the applications of composites.	9M
	b)	Calculate the volume ratio of aluminum and boron in Al-Boron composite which has a Young's modulus equal to that of Iron. The Young's modulus of Al, Iron and Boron are respectively 71, 210 and 440 GPa.	5M
8.		Explain the Basic Bessemer process of steel making with neat sketches.	14M

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Hall Ticket Number :										

Code : 1G531 **R-11 / R-13**

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2015

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) Differentiate between:
   (i) Young's modulus and Rigidity modulus
   (ii) Yield stress and Working stress
   (iii) Limit of proportionality and Limit of elasticity 6M

   b) A rod of 12 mm diameter is subjected to an axial pull of 12 kN. Find the values of poisson's ratio, modulus of elasticity and bulk modulus if the observed change in the diameter of the rod is 3×10^{-3} mm. Given that the rigidity modulus of the material of the rod is 50 GPa. 8M

2. a) Distinguish between cantilever and simply supported beams. 4M

   b) Derive the expressions for shear force and bending moment for Cantilever beam carrying the Uniformly Distributed load of 'w' over the entire span of length 'L'. 10M

3. a) Derive the flexure formula. 7M

   b) A beam of length 6 m and of uniform rectangular section is simply supported at its ends. It carries a UDL of 8 kN/m run over the entire length. Calculate the width and depth of the beam if the permissible bending stress is 6 MPa and central deflection is not to exceed 8 mm. 7M

4. a) Sketch the distribution of shear stress across the depth of the beams of following cross sections.
   (i) T- Section
   (ii) I- Section 6M

   b) A beam of I- Section is 600 mm deep. Each flanges 250 mm wide and 25 mm thick. The web is 15 mm thick. The beam section is subjected to a shear force of 500 kN. Determine the shear stress distribution of the beam section when (**i**) When the web is vertical (**ii**) when the web is horizontal. 8M

5. A steel shaft ABCD having a total length of 3 m consists of three lengths having different sections as follows: AB is hollow having outside and inside diameters of 10 cm and 6.25 cm respectively, and BC and CD are solid, BC having diameter of 10 cm and CD a diameter of 8.75 cm. If the angle of twist is the same for each section, determine the length of each section. Find the value of the applied torque and total angle of twist if the maximum shear stress in the hollow portion is 47.5 MPa and modulus of rigidity = 82.5 MPa. 14M

6. A cantilever beam of span 2 m supports a UDL of 2 kN/m over a length of 1 m from the fixed end and a point load of 1 kN at 1 m from the free end. Find the slope and deflection at the free end if $EI = 1.4 \times 10^3$ kN.m^2. 14M

7. a) Define the following terms:
   (i) Column
   (ii) Strut
   (iii) Buckling load. 6M

   b) Derive the equation for Euler's critical load for a column with one end fixed and other hinged. 8M

8. a) Write short notes on (**i**) Lame's theory (**ii**) Thin and Thick cylindrical shell 6M

   b) A thin cylindrical shell 90 cm long, 15 cm internal diameter, having thickness of metal 8 mm is filled with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is pumped into the cylinder, find (**i**) the pressure exerted by the fluid on the cylinder, and (**ii**) the hoop stress induced. E = 200 GPa, $\mu = 0.3$. 8M

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Hall Ticket Number :										

Code : 1G533

R-11 / R-13

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2015

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) Discuss the macroscopic and microscopic and microscopic point of view of thermodynamics. 7M

   b) A mass of gas compressed in a Quasi-static process 80kPa,0.1m^3 to 0.4MPa, 0.03m^3. Assuming that pressure and volume are related by PV^n = Constant. Find the workdone by the gas system. Find the work done by the gas. 7M

2. a) Derive Steady Flow Energy Equation for Turbine 6M

   b) A systems receives 200KJ of heat at constant volume process and rejects 220KJ of heat at constant pressure and 40KJ of work is done on the system. The system is brought to its original state by an adiabatic process. Calculate the adiabatic work. If the initial internal energy is 240KJ then calculate the volume of internal energy at all points. 8M

3. a) Show that violation of Kelvin-Plank statement leads to violation of Clausius statement and vice-versa. 6M

   b) A reversible heat engine operating between the thermal reservoirs at 900 K and 300 K is used to drive a reversible refrigerator for which the temperature limits are 300 K and 250 K. The engine absorbs 1800 KJ of energy as heat from the reservoir at 900 K and the net output from the engine refrigerator system is 360 KJ. Make calculations for the heat extracted from the refrigerator cabinet and the net heat rejected to the reservoir at 300 K 8M

4. a) Define Clausius inequality and prove it. 7M

   b) Calculate Available energy and Unavailability of a system that absorbs 15,000KJ of heat from a heat source at 500K while the environment temperature is 290 K. 7M

5. a) Derive Clausius –Clapeyron equation. 7M

   b) Find the internal energy and enthalpy of unit mass of steam of a pressure of 7 bar when (**i**) its quality is 80 % (**ii**) it is dry saturated (**iii**) Superheated the degree of superheat being 65 ^{0}C 7M

6. Derive work transfer and heat transfer equations for the following processes.

   (i) Isobaric Process (**ii**) Isochoric process (**iii**) Isothermal process

   (**iv**) Adiabatic process (**v**) Ploytropic process 14M

7. A mixture of ideal gases consists of 3kg of Nitrogen and 5kg of Carbon dioxide at a pressure of 300 kPa and a temperature of 20^{0}C.Find (**i**) the mole fraction of each component (**ii**) the equivalent molecular weight of the mixture (**iii**) the equivalent gas constant of the mixture (**iv**) the partial pressures and the partial volumes (**v**) the volume and density of the mixture (**vi**) the C_p and C_v of the mixture. 14M

8. a) A Diesel cycle operating on air standard cycle has a Compression ratio of 15. The pressure and temperature at the beginning of compression are 1.04 bar and 15^0 C. The maximum temperature of the cycle is 2330 K. What is the efficiency of the cycle? 6M

   b) For the same compression ratio and 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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