**Subject Code: G0402/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**COMPUTER AIDED MANUFACTURING**

**(Common to CAD/CAM and AMS)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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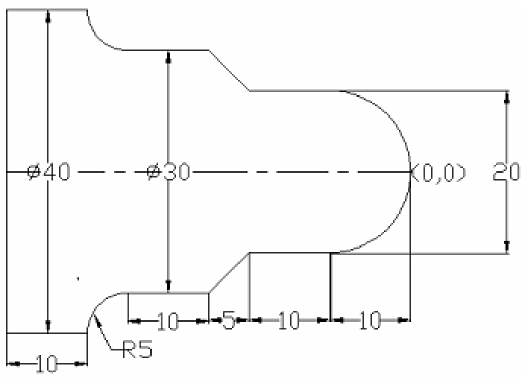
1. (a) Briefly explain any 3 types of geometry commands used in APT. (6+6)
   (b) Write a CNC part program on two axis turning center for the geometry as shown in figure 1.06




i. Fig.1 (All dimensions are in mm)

2. (a) Write short note on DNC with block diagram. (6M)
   (b) What is adaptive control? Explain the important constraints taken for ACC system. (6M)

3. (a) With help of neat sketch, explain the structure of a post processor in a NC system. (6M)
   (b) What is DAPP? Discuss about the major variables in the DAPP based post processor. (6M)

4. (a) What is a microcontroller? Explain the various the factors to be considered in the Selection of a microcontroller used in a CNC machine. (6M)
   (b) Explain the basic structure of PLC with block diagram. (6M)

5. (a) Explain the functioning of a CMM and also mention their advantages and limitations. (6M)
   (b) Explain any one optical inspection method with neat sketch. (6M)

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6. (a) Describe about automatic tool path generation. (6M)
   (b) Give a brief description of any one of the tool pre setter you are familiar with. (6M)

7. (a) Describe the functioning of a Hybrid CAPP system with a neat sketch. (6M)
   (b) Explain briefly timers and I/O interrupts. (6M)

8. Write short notes on the following: (4M+4M+4M)
   (a) Application of micro controllers in CNC machines.
   (b) Expert systems.
   (c) Interchangeable tooling systems.

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**Subject Code: G0501/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

**(Common to CS and CS&E)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. a. Prove that the premises **p**, $((p \rightarrow \neg q) \vee (r \wedge s))$ derives the conclusion $q \rightarrow r$ using **CP** rule?

   b. What are free and bound variables and prove that te premises $\forall x\,[H(x) \rightarrow G(x)]$, $\forall x\,[K(x) \rightarrow H(x)]$ lead to the conclusion $\forall x\,[K(x) \rightarrow G(x)]$.

2. a. Define Poset and draw the Hasse diagram of $[P(\{a,b,c,d\}),\subseteq]$?

   b. Define lattice and prove the Absorption law $a \wedge (a \vee b) = a$ ?

3. a. (i) How many 2-digit or 3-digit numbers can be formed using the digits 1,3,4,5,6,8,9 if no repetition is allowed?

   (ii) How many 3 digit numbers are there which are even and have no repetition of digits 0 to 9 ?

   b. What is the coefficient of $x^3y^7$ In $(2x-9y)^{10}$ ?

4. a Find Generating function for $a_r$ =The number of ways the sum **r** can be obtained when **10** distinguishable dice are rolled and **6** specified dice show an even number and remaining **4** show an odd number?

   b. Find coefficient of $X^{12}$ in generating function $(1-X^4-X^7+X^{11})/(1-X)^5$ ?

5. a Write an algorithm Depth First Search for a spanning tree and explain with an example?

   b. Define minimum spanning tree a explain How to obtain minimum spanning tree using Kruskals algorithm?



6. a. If A={1,2,3,4} and B={a,b,c,d} determine whether the following functions are on-one , onto ?

   f = {(1,a),(2,a),(3,b),(4,d)}

   g = {(1,d),(2,b),(3,a),(4,a)}

   h = {(1,d),(2,b),(3,a),(4,c)}

   b. Explain the law of duality with an example?

7. a. Prove that $C(n+1,k)=C(n,k-1)+C(n,k)$ ?

   b. Find the solution for recurrence relation $x_n = 6x_{n-1} - 9x_{n-2}$ where $x_0=2, x_1=3$ ?

8. a. Define Euler circuit, Hamiltonian graph and compare them with the help of an example?

   b. Explain Combinations and Permutations with examples?

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**Subject Code: G1502/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**ADVANCED MECHANICS OF SOLIDS**

**(Common to MD and MED)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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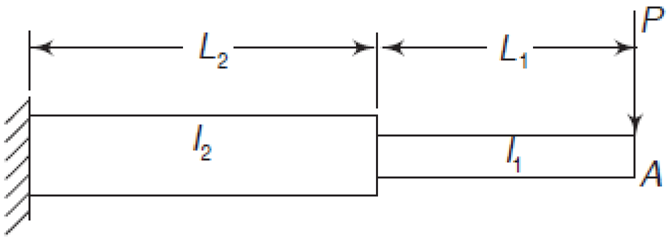
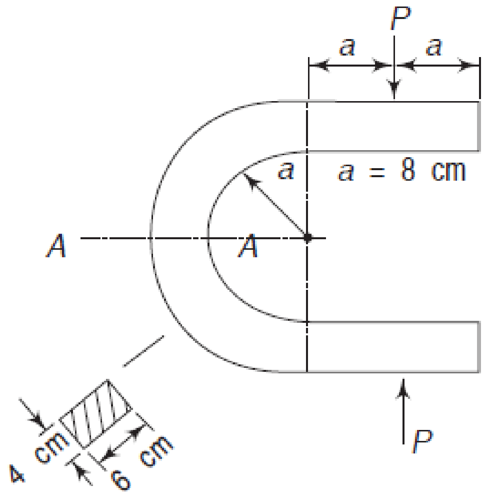
1. The state of stress at a point is characterized by the components in kPa
   $\sigma_x = 12.31$; $\sigma_y = 8.96$; $\sigma_z = 4.34$
   $\tau_{xy}=4.20$; $\tau_{yz}=5.27$; $\tau_{zx}=0.84$;
   Find the values of the principal stress and their directions. 12M

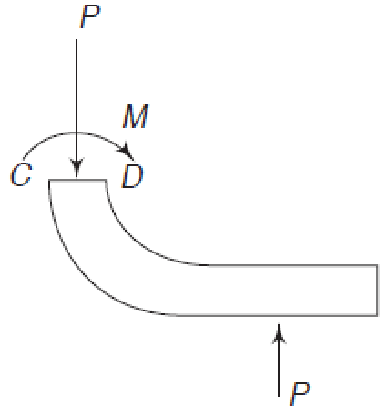
2. What are the modes of failure ? Explain failure criteria for Buckling? 12M

3. For the cantilever of total length L shown in Fig, determine the deflection at end A using Castigliono's theorem. Neglect shear energy. 12M



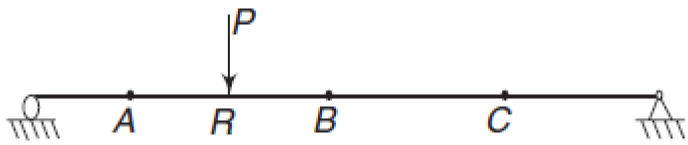

4. Determine the maximum tensile and maximum compressive stresses across the Sec. AA of the member loaded, as shown in Fig. Load P = 2000 kgf(19620 N). 12M



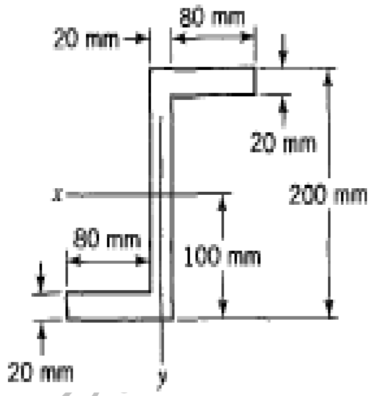



**Subject Code: G1502/R13**

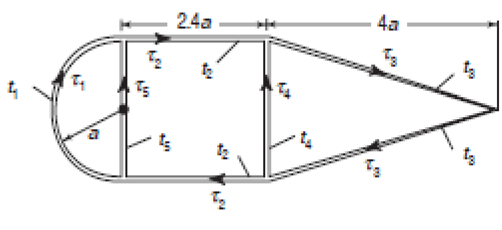
5. *A* load $P$ = 6000 N acting at point $R$ of a beam shown in Fig produces vertical deflections at three points $A$, $B$, and $C$ of the beam as $d_A$= 3 cm $d_B$= 8 cm $d_C$= 5 cm Find the deflection of point $R$ when the beam is loaded at points, $A$, $B$ and $C$ by $P_A$= 7500 N, $P_B$= 3500 N and $P_C$ = 5000 N. 12M




6. **A** steel Z-bar is used as a cantilever beam having a length of 2.00 **m.** When viewed from the free end toward the fixed endof the beam, the cross section has the orientation and dimensions shown in Figure. A concentrated load P = 14.0 **kN**acts at the free end of the beam at an angle **ø**= 1.25 rad. Determine the maximum flexure stress in the beam. 12M




7. A thin tubular bar shown in Fig is subjected to a torque $T$ = 113000 Nm (115455 kgf cm). The dimensions are as indicated. Determine the shear stresses in the walls. Given $a$ = 12.7 cm, $t1$ = 0.06 cm, $t2$ = 0.08 cm, $t3$ = 0.06 cm, $t4$ = 0.10 cm, $t5$ = 0.13 cm 12M




8. Two cylindrical steel rollers (E = 200 MPa and v = 0.29), each 80 mm in diameter and 150 mm long, are mounted on parallel shafts and loaded by a force P = 80 kN. The two cylinders are rotated at slightly different speeds so that the roller surfaces slide across each other. If the coefficient of sliding friction is p = 0.333, determine the maximum compressive principal stress, maximum shear stress, and maximum octahedral shear stress. 12M

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**Subject Code: G2102/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**ADVANCED THERMODYNAMICS**

**(Thermal Engineering)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. a) Explain about , Availability, unavailability and Exergy.
   b) Derive Mayer relation and explain the conclusions drawn from this relation.

2. a) Discuss about availability balance of a closed system.
   b) 8 kg of air at 650 K and 5.5 bar pressure is enclosed in a closed system. If the atmosphere temperature and pressure are 300 K and 1 bar respectively, determine :
   (i) The availability if the system goes through the ideal work producing process.
   (ii) The availability and effectiveness if the air is cooled at constant pressure to atmospheric temperature without bringing it to complete dead state.
   Take $C_v$ = 0.718 kJ/kg K, $C_p$= 1.005 kJ/kg K.

3. a) What is Joule - Thompson coefficient? Explain why it is zero for ideal gas.
   b) Derive the P-V-T relations of ideal gas and discuss about Daltons law of partial pressures and avogadro's law of additive volumes.

4. a) Saturated air leaving the cooling section of an air-conditioning system at $14^0$C at a rate of 50 $m^3$/min is mixed adiabatically with the outside air at $32^0$C and 60 percent relative humidity at a rate of 20 $m^3$/min. Assuming that the mixing process occurs at a pressure of 1 atm, determine the specific humidity, the relative humidity, the dry-bulb temperature, and the volume flow rate of the mixture.
   b) Explain the following psychrometric processes.
   i) Cooling and dehumidification, ii) Sensible heating and cooling.

5. a) What is enthalpy of formation? How does it differ from the enthalpy of combustion?
   b) Discuss about Gibbs phase rule. Explain why the Gibbs function remain constant during phase transition.

6. a) Explain about Phenomenological laws and discuss about its applicability.
   b) Explain about second law analysis of an actual cycle.

7. a) What do you understand by NHD? With a neat sketch explain the working of MHD and write its advantages.
   b) Explain the working principle of Photovoltaic cells. Write its advantages and disadvantages.

**Subject Code: G2102/R13**

8. Explain the following
   a) Thermo ionic conversion system.
   b) Generalized compressibility factor
   c) Adiabatic flame temperature.

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**Subject Code: G2202/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**PAVEMENT ANALYSIS, DESIGN AND EVALUATION**

**(Transportation Engineering)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. (a) How the pavements are classified based on the materials used? Draw typical sketche for each case.
   (b) Plot the ESWL chart for the following given conditions:
      i. Total load carried by a single axle with duals wheel assembly = 120 kN
      ii. Tire pressure = 0.55 N/mm$^2$
      iii. Centre to centre distance between the two tires = s = 457.2 mm
      iv. Determine the ESWL at depth, z = 500 mm?

2. (a) Calculate maximum warping stresses at the edge and interior of a slab of 4.5 m length and 3.5 m width. Take the elastic modulus of concrete as $3\times10^4$ MPa, radius of relative stiffness as 1.02 m, temperature difference between the top and bottom surface of the slab as 17 ºC, coefficient of thermal expansion of concrete as $10\times10^{-6}$ per ºC and Poisson's ratio of concrete as 0.15.
   (b) Calculate the rebound surface deflection on a single layer pavement under a wheel load of 40 kN with a tyre pressure of 0.8 MPa. The effective elastic modulus of sub-grade may be taken as 40 MPa and Poisson's ratio of the soil as 0.5.

3. (a) Design a flexible pavement according to the AASHTO 1993 Guidelines from the following data:Reliability, R = 90 %
   Standard deviation, $S_o$ = 0.40
   Estimated number of 18-kip ESAL repetitions over a design life of 20 years = 10 million
   The loss of serviceability = 2.0
   Resilient modulus of
      i. asphalt concrete = 400000 psi (400 ksi)
      ii. base course = 20000 psi (20 ksi)
      iii. sub-base course = 10000 psi (10 ksi)
      iv. sub-grade (mean value) = 3.3 % of CBR (1500×3.33 = 5000 psi = 5 ksi)

   It will take a duration of one day and a week respectively to drain-off the water from the base and sub-base courses. Time the pavement structure is exposed to moisture levels approaching saturation = 15 %
   (b) State the failure criteria adopted for thickness design of flexible pavement as per IRC:37? Explain the typical pavement layers composition with reference to the considered failure criteria?

**Subject Code: G2202/R13**

4. (a) Determine the stress in concrete due to friction between the slab and the sub-base layer and verify its tensile strength adequacy. Use the following data.
   Transverse joint spacing or slab length = 5.0 m
   Unit weight of plain concrete = 24.0 kN/$m^3$
   Coefficient of friction = 1.5
   Grade of concrete used for slab = M 40
   (b) Compare flexible pavement design methods as per AASHTO and IRC:37

5. (a) What is SAMI layer and write its significance of use in pavement? Draw a typical sketch and show its location in the pavement crust thickness?
   (b) Define faulting. Draw a sketch showing faulting of cement concrete slabs and describe how it can be measured using a digital fault meter.

6. (a) Determine Pavement Condition Index (PCI) value of the whole Road surveyed for the below given summary of randomly surveyed and additionally surveyed section's PCI values:
   i. Mean value of PCI obtained by randomly selecting the sections = 55.5
   ii. Mean value of PCI obtained by additionally selecting the sections=65.2
   iii. Area of the additionally selected sections=1150 $m^2$
   iv. Total area of the Road considered =2300 $m^2$
   (b) Define Deduct Value and state the factors affecting Deduct Value of different distress type with severity level? Also write why the total deduct value is adjusted for a given number of entries with deduct values over six points?

7. (a) Explain the Psycho Physical and Psycho Metric Scaling Techniques are used for pavement evaluation?
   (b) What is the need of a numerical indicator for representing present condition of pavement? State any two examples?
   (c) What is the intension of conducting visual distress condition surveys? List out the minor equipment used for distress data collection?

**Subject Code: G2202/R13**

8. The following are sample BB deflections and the bituminous pavement temperatures measured at every test station located at uniform intervals of 150 m.

| Test station | Benkelman beam deflection (mm) | Pavement temperature ($^oC$) |
|---|---|---|
| 1 | 1.002 | 34.0 |
| 2 | 0.915 | 34.2 |
| 3 | 0.881 | 34.3 |
| 4 | 1.002 | 34.6 |
| 5 | 0.984 | 34.7 |
| 6 | 0.967 | 34.8 |
| 7 | 1.105 | 34.9 |
| 8 | 1.123 | 35.1 |
| 9 | 1.036 | 35.2 |
| 10 | 1.002 | 35.5 |

Determine the bituminous macadam overlay thickness of a proposed state highway which is expected to cater to 20 msa. The highway site is located in a low rainfall region where annual rainfall is less than 1300 mm. The clay sub-grade is highly plastic having a PI value greater than 15%. Take seasonal correction factor (SCF) = 1.2 when average field moisture content = 11%. Any missing values may be suitably assumed.

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**Subject Code: G4301/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**ELECTRICAL MACHINE MODELING AND ANALYSIS**

**(Common to PE, P&ID, PE&ED, PE&D and EM&D)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. (a) Explain the effect of damper windings on the operation of a synchronous machine.
   (b) Derive the torque equation of a three phase induction machine.

2. Explain clearly about features and characteristics of Kron's primitive machine.

3. Derive the transfer function of a separately excited dc motor and explain the analysis part of the transfer function.

4. What is the need for phase transformation? Explain the technique used for two phase quantities to three phase transformation.

5. Discuss the modelling and explain the analysis part of single phase capacitor start induction motor.

6. Derive and explain the three phase induction machine modelling with synchronous rotating reference frame.

7. Discuss the state space model of a three phase induction motor and explain its advantages.

8. Derive the modelling of three phase PM synchronous motor and explain its analysis part from modelling.

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**Subject Code: G4502/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**TRANSFORM TECHNIQUES**

**(Common to S&SP, DIP, CE&SP, C&SP, SP&C, DECS, E&CE and DECE)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. a) Define Fourier series. Calculate the Fourier co-efficient of the rectified sine wave with a period of .
   b) What is a Fourier Transform?. State and prove any two of the properties of Fourier Transform.

2. a) With a neat derivation explain about sampling theorem.
   b) State and explain about Gibbs phenomenon.

3. a) Explain about walshTrasform.
   b) With necessary derivations explain about singular value decomposition.

4. a) Define CWT and explain how it can be used to replace correlation.
   b) Derive an expression for first order moment of a wavelet.

5. a) What is a spline function? List out its properties.
   b) Explain about digital filter implementation of the Haar wavelet decomposition.

6. a) Define DWT and explain about perfect reconstruction quadrature mirror filter.
   b) What is a Filter bank and discuss about its necessity. Explain with relevant diagrams

7. a) What is a wavelet Packet?. Derive necessary recursive formulae for wavelet packet generation.
   b) Discuss about Filtering relationships(G and H) of biorthogonal Filters.

8. Write short notes on
   a) KL Transform
   b) Shannon wavelet.

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**Subject Code: G5501/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**EMBEDDED SYSTEM DESIGN**

**(Embedded Systems)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. a) Draw the Embedded System design flow diagram and explain its operation in detail [6+6]
   b) Explain briefly about different hard ware and software development tools used in embedded system

2. a) Explain how to measure the processor performance of an embedded hardware in detail [6+6]
   b) Explain the concept of Auxiliary memory and memory management of external memory of an embedded hardware

3. a) Draw the interfacing diagram of the embedded bus is integrated with other board components and explain its operation [6+6]
   b) Explain the concept of serial versus parallel I/O configurations of a embedded hardware

4. a) Draw the internal block diagram of Device drivers and explain its importance in detail [6+6]
   b) Define the term interrupt and explain the interrupt handling concept for device drivers

5. a) Explain the concept of different file management systems of embedded software [6+6]
   b) List out the different OS performance guidelines in detail

6. a) Explain briefly about different issues in Hard ware software design with examples [6+6]
   b) Draw the internal architecture of host and target machines and explain its operation

7. a) Explain the case study of processor design approach of an embedded system in detail [6+6]
   b) Explain the concept of power pc processor based embedded system design on Xilinx platform in detail

8. Write short notes on following terms [3X4=12]
   a) Translation tools
   b) Laboratory tools
   c) System boot-Up

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**Subject Code: G6802/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**VLSI TECHNOLOGY AND DESIGN**

**(Common to VLSI & ES, ES & VLSI, VLSID & ES, ES & VLSID, VLSI, VLSID, VLSISD, VLSI&ME, DS&CE, DE&CS, E&CE and DECE)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. a) Explain various steps of high level design flow used in ASIC devices.
   b) Using necessary sketches, explain about photolithography process, in semi conductor device manufacture.

2. a) What are the different approaches for designing mixed signal systems? Briefly discuss about any one approach.
   b) Write a short note on clock mechanisms. Explain how it is applicable for VLSI design.

3. a) Determine the pull-up to pull-down ratio of an nMOS inverter driven by another nMOS inverter.
   b) Explain about the concepts of sheet resistance and standard unit of capacitance with suitable figure.

4. Draw the circuit topology and explain the operation of the following
   a) pseudo- nMOS logic b) Clocked CMOS logic c) CMOS domino logic.

5. a) Describe these operations in register-transfer form:
   i) $z = a + b$ ii) if (c) then $z = a + b$ else $z = c + d$ iii) $z = a + b$, $y = a - c$.
   b) What is BIST? Explain in detail.

6. a) Explain the FPGA design flow with a neat diagram?
   b) Explain the processing steps in fabrication of nmos technology with neat sketches.

7. a) Why scaling is required? Write the scaling factors for different types of device parameters?
   b) Explain the operation of BiCMOS inverter and discuss how its performance can be improved.

8. a) Explain two-phase clock generator using D flip-flops and draw the corresponding waveforms.
   b) Explain the Global and detail routing in floor planning.

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**Subject Code: G8701/R13**

**M. Tech –I Semester Regular/ Supply Examinations, February, 2016**

**THEORY OF ELASTICITY**

**(Common to SE and SD)**

**Time: 3 Hours** **Max Marks: 60**

**Answer any FIVE questions**

**All questions carry EQUAL marks**

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1. a) Derive expressions for Equations of equilibrium in three dimensions?
   b) Derive expressions for strain at a point in case of a body stressed in three dimensions?

2. a) Explain Plane Stress and Plane strain problem with applications?
   b) Derive the governing differential Equations in terms of stress function and for plain stress problem?

3. a) Explain Saint Venant's principle?
   b) Explain the application of Fourier series for two dimensional problems?

4. a) Discuss the effect of circular hole on stress distribution in plate?
   b) Explain the Strain components in polar co-ordinates?

5. a) Explain the Equations of equilibrium in terms of displacements?
   b) Derive the Expressions of compatibility for a two dimensional problems?

6. a) Explain the analogy of Torsion?
   b) Obtain the expression for torque and angle of twist of an elliptical shaft subjected to uniform torsion?

7. a) Discuss various applications for polar co-ordinates and advantages of considering problem using polar co-ordinates?
   b) Explain the general equations in polar co-ordinates?

8. Explain in detail about
   a) Uniqueness of solution
   b) Reciprocal theorem

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