GITAM INSTITUTE OF TECHNOLOGY
GITAM UNIVERSITY

(Declared as deemed-to-be-University u/s 3 of UGC Act, 1956)
Rushikonda, Visakhapatnam-530 045(AP)

Accredited by NAAC with 'A'Grade

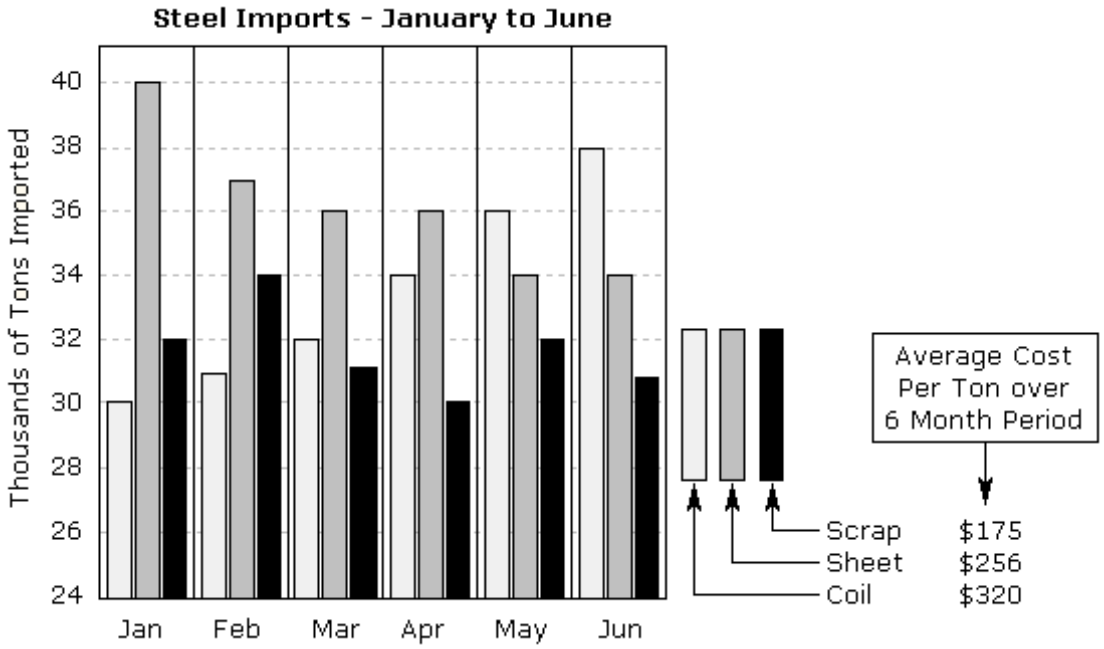
DEPARTMENTS OF MECHANICAL ENGINEERING and INDUSTRIAL ENGINEERING

Model Question Paper for Ph.D. Entrance Examination (2012-13)

Note: 1. Answer all questions **2. All questions carry equal marks.**
Maximum Marks: 60 **Time: 2hrs.**

1. What is the significance of Bibliography

2.

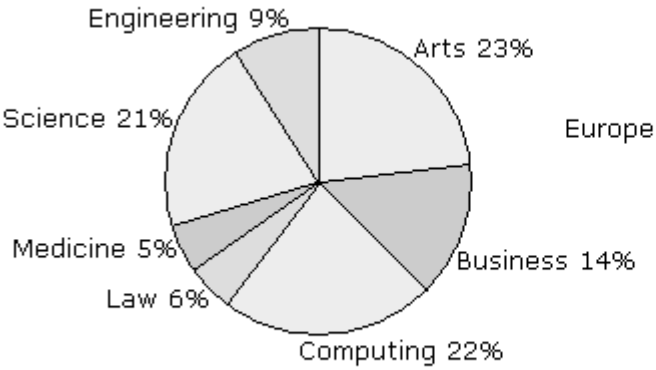


The figure above shows imports for three types of steel over a six month period. Use this information to answer the following questions.

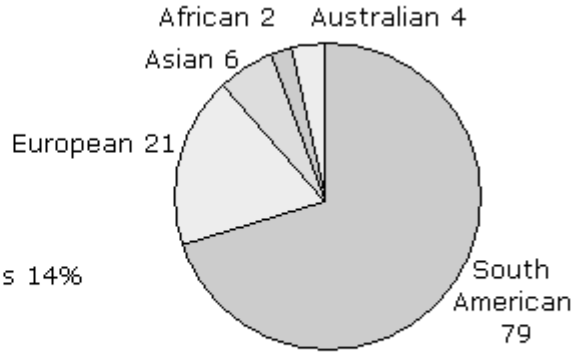
a) Which month showed the largest decrease in total imports over the previous month?

b) What was the percentage of scrap steel imported in the 6 month & period?

3.



Students by Faculty



Arts Students (Non-US)

The pie charts above show the percentage of students in each faculty at North West University and the number of non-US students in the Arts faculty. These percentages have been rounded to the nearest whole number. There are a total of 1049 students in the Arts faculty. Use this information to answer the following questions.

a) How many students are there in the Engineering faculty?

b) If six percent of Science students are Asian. How many Asian students are there studying Science?

4. If $A = \begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$. Find eigen values of A and A^2.

5. Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin(2\log(1+x))$.

6. A Particle is dropped with zero Initial Velocity down a friction less chute. What is the magnitude of its Velocity if the Vertical drop during the motion is 'h' m ?

7. Define true Stress and true Strain in a Simple tensile test. Explain their relation with the Corresponding nominal quantities.

8. What is hunting in a Centrifugal governor? When does it occurs?

9. Define distortion energy Theory of Failure.

10. Differentiate between Static & dynamic Characteristics?

11. Write Properties of Stiffness matrix.

12. Distinguish between Surface model & Solid model.

13. A horizontal water pipe of diameter 15 cm converges to 7.5 cm diameter. If the pressure at the two sections are 400 'k'Pa and 150 'k'Pa respectively. Calculate the flow rate of water.

14. A stream of gases at 7.5 bar , 750^0 C and 140 m/s is passed through a turbine of a jet engine. The stream comes out of the turbine at 2.0 bar, 550^0C and 280 m/s. The process may be assumed adiabatic. The enthalpies of gas at the entry and exit of turbine are 950 kJ/kg & 650kJ/kg of gas respectively. Determine the capacity of the turbine if the gas flow is 5 kg/s.

15. A steam is expanded in a set of nozzles from 10 bar and 200^0 C to 5 bar. What type of nozzle is it? Neglecting the initial velocity find minimum area of the nozzle required to allow a flow of 3 kg/s under the given conditions. Assume the isentropic expansion. (take dh = 120 'k'J/kg, $\upsilon = 0.345\ m^3$ / kg)

16. Water flows inside a tube 45 mm in diameter and 3.2 m long at a velocity of 0.78 m/s. Determine the heat transfer coefficient and the rate of heat transfer if the mean water temperature is 50^0C and the wall is isothermal at 70^0C. For water at 50^0C take k= 0.66 W/m K, $\upsilon = 0.478 \times 10^{-6}\ m^2$ /s and Prandtl number = 2.98.

17. Explain about pulse tube refrigeration system with a neat sketch.

18. A hydropower plant is to be used as peak load plant at as annual load factor of 30%. The electrical energy obtained during the year is 750×10^5 kWh. Determine the maximum demand. If the plant capacity factor is 24%. Find reserve capacity of the plant.

19. Explain about the working of a simple carburetor.

20. Name four types of Steel casting

21. Distinguish between electrochemical machinery and electro chemical grinding.

22. Name four locating devices for Jigs and fixtures.

23. In turning operation, determine the material removal rate, if depth of cut 2mm, feed per revolution = 0.05 mm and the surface velocity of the job piece = 50 m/min.

24. List four advantages of Numerical Control.

25. Define FMS?

26. List out any two advantages of Rowan plan.

27. Explain Transition Fit?

28. What is ABC Inventory system?

29. In a PERT, analysis, the critical path of a project is 120 days with a variance of 16 days. Determine, the 95% confidence limits for the project completion time.

30. What is MEMS?

SYLLABUS FOR Ph.D. ENTRANCE EXAMINATION IN MECHANICAL ENGINEERING and INDUSTRIAL ENGINEERING (2012-13)

General :

Basic elements of Research Paper and Thesis

Computer knowledge on development of graphs bar charts and pi charts

Linear differential equations of higher order with constant coefficients – Cauchy, Legender's homogeneous equations – simultaneous linear differential equations. Rank of a matrix – eigen values and eigen vectors – Caylgey Hamilton theorem – quadratic forms. Correlation – coefficient of correlation – lines of regression – rank correlation.

Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. irreversibility and availability; behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

Fluid Mechanics: Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Applications: Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes. Turbomachinery: Pelton-wheel, Francis and Kaplan turbines — impulse and reaction principles, velocity diagrams.

Engineering Mechanics: Free body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; strain energy methods; thermal stresses.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

Vibrations: Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

Metal Casting: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.

Forming: Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy.

Joining: Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.

Machining and Machine Tool Operations: Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures

Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools.

Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning.

Inventory Control: Deterministic and probabilistic models; safety stock inventory control systems.

Operations Research: Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.

Engineering Materials: Structure and properties of engineering materials, heat treatment, stressstrain diagrams for engineering materials.