THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.301 ENGINEERING MATHEMATICS-II (ABCEFHMNPRSTU)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 4 marks*

1. A particle moves so that its position vector is given by

$\vec{r} = coswt\ \hat{\imath} + sinwt\ \hat{\jmath}$, show that the velocity $\overrightarrow{V}$ of the particle is perpendicular to $\vec{r}$.

2. If $f(x) = x\ ,\ o < x < \frac{\pi}{2}$

$= \pi - x\ ,\ \frac{\pi}{2} < x < \pi$. Show that $f(x) = \frac{4}{\pi}\ (sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \cdots)$

3. Find the cosine transform of $f(x) = sinx$ in $0 < x < \pi$.

4. Solve the partial differential equation if $\frac{\partial z}{\partial x} = 6x + 3y\ ;\frac{\partial z}{\partial y} = 3x - 4y$.

5. State the assumptions involved in the derivation of one dimensional Heat equation.

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. a) Find the constants a and b so that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$, may cut orthogonally at the point $(1, -1, 2)$.

b) If φ is a scalar point function, use Stoke's theorem to prove that $Curl(grad\ \varphi) = 0$.

c) Evaluate by Green's theorem in the plane for $\int_C (y - sinx)dx + cosx\ dy$ where C is the boundary of the triangle whose vertices are (0,0), $(\frac{\pi}{2}$,0) and $(\frac{\pi}{2}, 1)$.

7. a) If $\vec{r} = x\ \hat{\imath} + y\ \hat{\jmath} + z\ \hat{k}$ prove that $\nabla r^n = nr^{n-2}\ \vec{r}$ where $r = |\vec{r}|$.

b) Show that $\vec{F} = e^x\left[(2y + 3z)\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right]$ is irrotational and find its scalar potential.

c) Using divergence theorem, evaluate $\iint_S\ F.n\hat{}\ ds$ where $\overrightarrow{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ and S is the surface bounding $x^2 + y^2 = 4, z = 0$ and $z = 3$

MODULE-II

8. a) Obtain the Fourier series of the function $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $(0,2\pi)$

b) Find the Fourier transform of $f(x) = 1 \ , |x| < a$

$= 0 \, , |x| \geq a$

Hence evaluate $\int_0^\infty \frac{sinx}{x} dx$

9. a) Find the Fourier series of $f(x) = -x + 1 \ , -\pi \leq x \leq 0$

$= x + 1 \quad , \quad 0 \leq x \leq \pi$

b) Find the Fourier cosine transform of $f(x) = e^{-4x}$ and

hence show that $\int_0^\infty \frac{cos2x}{x^2+16} dx = \frac{\pi}{8} e^{-8}$

MODULE-III

10. a) Solve the pde $pxy + pq + qy = yz.$

b) Solve the pde $(D^2 - DD' + 2D'^2)z = e^{3x+4y} + \sin(x - y)$

11. a) Solve the partial differential equation $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$

b) Solve the pde $(D^2 + DD' - 6D'^2)z = \ ycosx$

MODULE-IV

12. a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial t} = u$ given that

$u = 3e^{-5x} + 2e^{-3x}$ when $t = 0$.

b) A string of length l is fixed at both the ends. The midpoint of the string is taken to a height b and then released from rest in that position. Find the displacement of the string.

13. a) Solve $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition, $u(0, t) = 0 = u(\pi, t)$ and

$u(x, 0) = \pi x - x^2$ in $(0,\pi)$

b) A rod of length l has its ends A and B kept at 0^0C and 100^0C respectively until steady conditions prevail. The temperature at A is suddenly raised to 25^0C and at the same time that B is lowered to 75^0C and the end temperatures are thereafter maintained. Find the temperature function $U(x, t)$.

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013Scheme)

13.302 FLUID MECHANICS AND HYDRAULIC MACHINES (P)

MODEL QUESTION PAPER

Time: 3Hours Max. Marks: 100

***Instructions**: Answer **all** questions from Part-A and any **one full** question from each module of Part-B*

Part-A

1. Distinguish between Newtonian and Non Newtonian fluid with suitable examples.
2. What are the conditions for the stability of a floating body?
3. What is meant by C_v, C_c and C_d with reference to an Orifice. Give the relation between them.
4. State the significance of Reynolds Number in pipe flow.
5. What is meant by Equivalent pipe? Write down the equation for the same.
6. With neat sketch state the constructional features of the bucket of Pelton Wheel.
7. What are the functions of Draft tube in reaction Turbines?
8. Define Unit speed, Unit discharge and Unit Power.
9. Differentiate between Separation and Cavitations in positive displacement Pumps.
10. What are the functions of an Accumulators and Intensifier?

(2Marks x10= 20 Marks)

Part-B

MODULE - I

11. a) Derive an expression for finding the meta-centric height of a floating body

b) A vertical cylinder of diameter 180mm rotates concentrically inside another cylinder of 181.2mm. The space between the cylinders is filled with oil whose viscosity is 8 poise. Find out the power required to rotate the cylinder at 100rpm.

12. a) Derive an equation for discharge through an Orifice meter with the help of neat sketch.

b) A Venturimeter having a throat diameter of 16cm is fitted in a pipe of 35cm diameter carrying water flowing from upward to downward. The pipe is inclined to the horizontal and an inverted U tube manometer is used to measure the head causing flow which reads 30cm. The loss of head between the main and the throat 0.25 times the kinetic head in the pipe. The liquid used in the manometer has 0.6 sp gravity. Find the discharge through the Venturimeter.

MODULE - II

13. a) Show that the velocity distribution is parabolic with respect to radius when viscous laminar flow of a fluid occurs through a horizontal pipe.

b) A pipeline of 20cm in diameter and 1600m long carries water from a tank where the height of water in the tank is maintained at 5m above the axis of the pipe. Another pipe of the same diameter is connected parallel to the original pipe after 800m. Find the percentage increase in flow. Take f = 0.012 for both pipes.

14. a) With suitable illustration, explain Moody's chart.

b) A pipe line is designed to carry an oil of 20kg/s whose is sp. gravity 0.9 and kinematic viscosity $2x10^{-4}m^2/s$. If the loss of head is limited to 8m of oil, find out the diameter of the pipe. Assume laminar flow.

MODULE - III

15. a) Derive an expression for the hydraulic efficiency of Pelton Wheel and hence show that the efficiency is maximum, when the bucket velocity is half the velocity of the jet.

b) A Francis Turbine is designed to develop 150kW. When working under a head of 8m and running at 150rpm. The hydraulic losses in turbine are 20% of available energy and overall efficiency is 80%. Taking $U_1/\sqrt{2gH} = 0.25$ and $Vf_1/\sqrt{2gH} = 0.95$, Find out the following

i) Guide blade angle and wheel vane angle at inlet

ii) Diameter and width at inlet.

16. a) With neat sketch, explain the working of a Kaplan turbine.

b) A conical draft tube 5m height and 2m in diameter at the top discharges water with a velocity of 1.5m/s with a rate of $30m^3/s$. The pressure head at inlet is 8m of water (vacuum). Taking atmospheric pressure as 10.3 m of water, find the height of the tube immersed in water. Neglect the pressure losses.

MODULE - IV

17. a) Show that the saving in work is 84.8% with the introduction of Air vessel in a reciprocating pump.

b) The diameter and stroke of a single acting reciprocating pump are 15cm and 30cm respectively. The water lifted through 22m above the centre of the pump. The diameter and length of the delivery pipe are 5cm and 25m respectively. Separation occurs if the absolute pressure falls below 2.8m of water. Find the maximum speed of the pump if the separation is to be avoided during delivery stroke. Take H_{atm} = 10.33m of water.

18. a) Derive an expression for the specific speed of a Centrifugal Pump.

b) The inlet and outlet diameter of a centrifugal pump are 30cm and 50cm respectively. The velocity of flow at outlet is 2.5m/s and vane angle at outlet is 45^0. Find the minimum speed of the pump to start the flow. Take manometric efficiency=0.75

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013Scheme)

13.303 MECHANICAL TECHNOLOGY (P)

MODEL QUESTION PAPER

Time: 3Hours Max. Marks: 100

Instructions*: Use of Approved data books is permitted.*

Part-A

Answer ***all*** *questions*

1. Define thermal conductivity. How does it vary with temperature?
2. Define thermal resistance. How does it vary from electrical resistance?
3. State Buckingham's Pi theorem. Mention its advantages.
4. Define absorptivity, reflectivity and transmissivity. Obtain the relation between them.
5. What are the different efficiencies of IC engines?
6. Differentiate between LMTD and NTU with reference to heat exchangers.
7. With the help of P-v diagram, state the advantages of intercooling in reciprocating air compressors.
8. What is meant by maximum specific work output with reference to Gas turbines?
9. What are refrigerants? How are they designated?
10. Define GSHF with the help of Psychrometric chart.

(2Marks x10= 20 Marks)

Part-B

Answer any ***one full*** *question from each module*

MODULE-I

11. a) Derive an expression for general heat conduction in Cartesian co-ordinate. What are the assumptions for the same?

b) The thermal conductivity of insulating material used over 20cm diameter pipe carrying hot gases varies as k = 0.065(1+ 15x10^{-4} T) W/m-^{0}C where T is in ^{0}C. The pipe surface temperature is 250^{0}C and insulation outer surface temperature is 60^{0}C. Find the heat flow through the pipe and the temperature at mid –thickness of insulation.

12. a) Establish the functional relation Nu = f (Re,Pr) for forced convection heat transfer with the help of dimensional analysis.

b) A cylinder 8cm in diameter and 1.2m high having a surface temperature of 50^0C is placed vertically in water at 15^0C. Find the heat transfer from the cylinder per hour.

MODULE-II

13. a) With the help of diagram and working cycle, explain the working of a 4-stroke cycle diesel engine.

b) The following readings were obtained from a test on a single cylinder oil engine working on the four stroke cycle.

Area of indicator diagram=4.1 cm^2, length of indicator diagram=6.25cm, indicator spring rating=0.9mm, cylinder bore and stroke=105mm & 150mm, respectively, mean diameter of brake wheel=0.6m, brake load=18kg, spring balance reading=3kg, engine speed=480rpm. Calculate: (a) brake power, (b) indicated power, and (c) mechanical efficiency.

14. a) Derive an expression for LMTD of parallel flow heat exchanger.

b) In a double pipe heat exchanger hot fluid is entering at 220°C and leaving at 115°C. Cold fluid enters at 10 deg c and leaves at 75°C. Mass flow rate of hot fluid 100 kg/hr, C_p of hot fluid 4.62 kJ/kg°C. C_p of cold fluid 4kJ/kg°C. Calculate LMTD

i) If the flow is parallel

ii) If the flow is counter current.

iii)Find the mass flow rate of cold fluid if the heat loss during the exchange is 5%.

MODULE-III

15. a) Explain what is meant by volumetric efficiency of a compressor. Derive an expression for volumetric efficiency of a single stage air compressor.

b) 2-stage compressor delivers air at a rate of 1.5 kg/sec. the suction pressure is 1.013bar. The inter-stage pressure is 7bar and the delivery pressure is 45bar. Air enters the low-pressure cylinder at 280K and is niter cooled to 300K before inlet to the high pressure cylinder and delivers at 420K. The clearance volume of low pressure and high cylinders are 6% and 8% of the stroke volume. Assume law of compression and expansion same for low and high pressure cylinder.

Determine i). Swept volume of cylinder ii). Amount of heat removed in jacket cooling for each cylinder iii). The ideal power required to drive the compressor.

16. a) Compare Roots blowers with vane blower in respect to

i) Working principles ii) P-V diagram iii) Efficiency.

b) A gas turbine plant receives air at a pressure of 1 bar and 290K. The air is then compressed in a rotary compressor to a pressure of 4 bars and then heated to a temp of 840K. The isentropic efficiencies of compressor and turbine are 82% and 85% respectively. Neglecting the pressure drop, find overall efficiency of the plant.

MODULE-IV

17. a) Derive an expression for the COP of Bell- Coleman cycle?

b) A Carnot refrigerator and a heat pump are supplied with equal amount of work. The refrigerator operates between -270 ^{0}C and +270 ^{0}C and the heat pump operates between + 450 ^{0}C and + 270 ^{0}C. The refrigerator absorbs 4000 kJ/ min at -270 ^{0}C. The heat pump absorbs all the heat rejected by the refrigerator and supplies at 450^{0}C. Compute

(i) COP of refrigerator

(ii) COP of heat pump

(iii) Heat available at + 450 ^{0}C and

(iv) Work input to each unit

18. a) Write short note on: i). Ozone depletion ii). Global warming.

b) An auditorium of 100 seating capacity of conditioned for the given specifications Outdoor conditions - 35 and 65% RH; Required air inlet conditions - 15^o C and 40 RH. The required condition is achieved first by cooling and dehumidifying, and then by heating.

Find the following (a) The capacity of the cooling coil in tons of refrigeration

(b) Capacity of the heating coil in kW

(c) By-pass factor of the heating coil if the surface temp of the coil is 22^o C.

THIRD SEMESTER BTECH DEGREE EXAMINATION

(SCHEME: 2013)

13.304 MECHANICS OF SOLIDS (MNPSU)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 4 marks*

1. Define elastic constants.
2. Define thermal stress and derive an expression for the stress developed in a bar restrained at both ends subjected to an increase in temperature.
3. Define Principal stress and principal planes.
4. What is meant by pure torsion. Write down torsion equation and explain the terms.
5. Differentiate between short and long column. (5 x 4 Marks = 20 Marks)

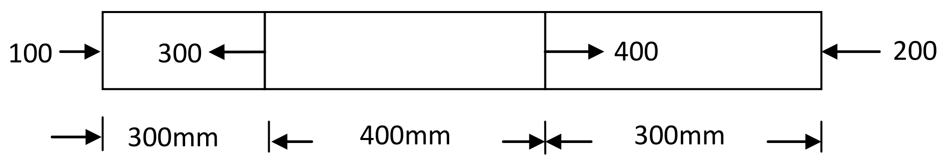
PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. (a) Explain the principle of superposition to evaluate total strain of axially loaded bars. (**5**)

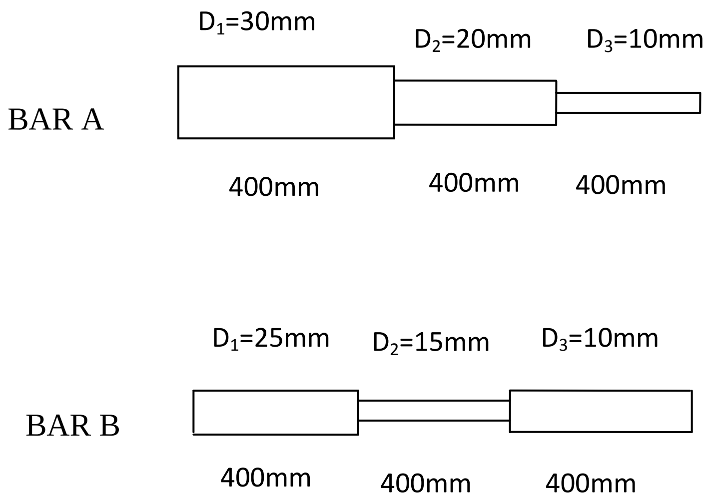
(b) A bar of uniform cross sectional area $100 mm^2$ carries forces in Newton as shown in fig. Calculate the relative movement of end A with respect to D. Take E=200GPa. (1**5**)



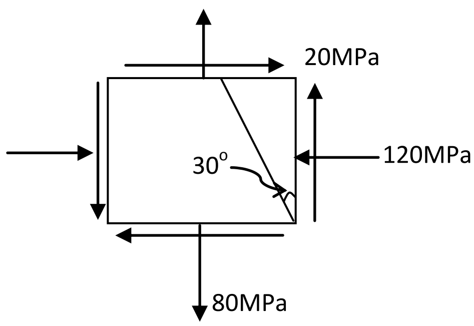
7. A rigid cross bar is supported horizontally by two vertical bars, A and B of equal lengths and hanging from their tops. The bars A and B are 0.6m apart. The cross bars stays horizontal even after a vertical force of 6kN is applied to it at a point 0.4m from B. If the stress in A is 200 MPa, find the stress in B and the area of cross section of the two rods. E_A=200 GPa, E_B=130 GPa. (20)

MODULE II

8. Compare the strain energy stored in the bar A with that of bar B ,when the maximum stress produced in both bars is the same. (20)



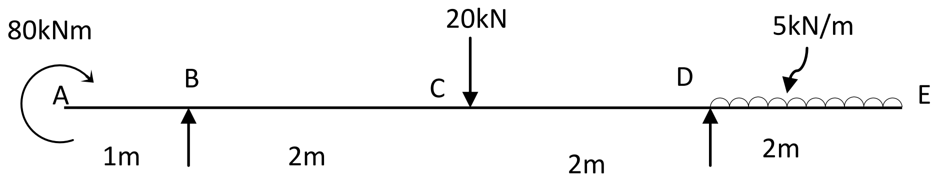
9. Determine the principal stresses and principal planes in an element subjected to stresses as shown in figure below. Also calculate i) Maximum shear stress and its plane ii) Stress conditions in the plane shown. (20)



MODULE III

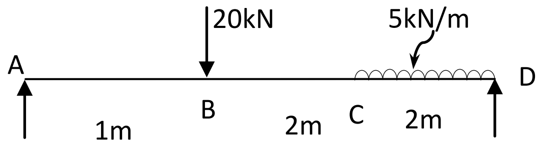
10. Draw shear force and bending moment diagram for the beam shown in figure and mark the salient points. What is the maximum bending stress produced in the beam? The cross section of the beam is hollow rectangular with 150x300mm external and thickness 25mm.

(20)



11. Calculate the maximum deflection and maximum slope for the beam shown in fig. below.

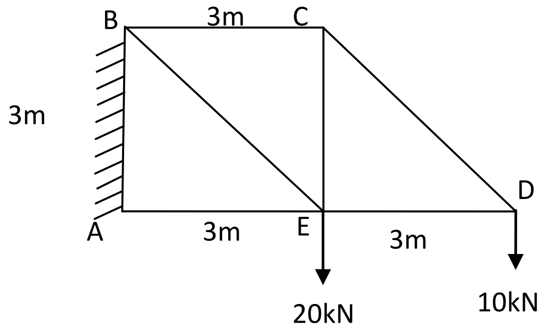
(20)



MODULE IV

12. a) Determine the diameter of the hollow shaft which will transmit 100 kW at 200 rpm if the shear stress is limited to 60 MPa. Take diameter ratio 0.6. (10)

b) Analyse the truss given below by method of joints. (10)



13. a) A hollow rectangular column of external depth 1000mm and external width 800mm is 100mm thick. Calculate the maximum and minimum stresses in the section if load of 200kN is acting with an eccentricity of 150mm wrt YY axis. (10)

b) Determine the buckling load for a strut of T-section, the flange width being 150mm, overall depth 100mm and both flange and web 13mm thick. The strut is 3m long and is hinged at both ends. Take E = 200 GPa. (10)

III SEMESTER B. TECH. DEGREE EXAMINATION

(2013 Scheme)

13.305 COMPUTER PROGRAMMING & NUMERICAL METHODS (MP)

MODEL QUESTION PAPER

Time : 3 Hours Max. Marks : 100

PART –A

Answer all questions, Each question carries 4 Marks.

1. Differentiate between procedure oriented and object oriented programming
2. With an example, explain conditional operator
3. Differentiate between character and string data type
4. What are inline functions?
5. With an example, explain the use of continue statement.
6. Differentiate between private and public member functions
7. What are predefined classes?
8. What is data encapsulation?
9. Write down the normal equations to fit the curve, $y = ax^2+bx+c$
10. Define the terms consistency and stability with respect to Finite difference method.

PART- B

Answer one full question from each module. Each full question carries 15 marks

MODULE-I

11. a) Explain internal representation of data in computer.

b) Give a flow chart to find leap year

OR

12. a) Explain with example, any four unary operators in C++

b) Explain Input and output streams in C++

MODULE-II

13. a) Differentiate between while and do-while structure with examples.

b) Write a C++ program to print all prime numbers less than 100.

OR

14. a) What do you mean by recursion? Explain with a suitable program.

b) Write an overloaded function *Area()* to find area of circle and rectangle.

MODULE-III

15. a) Differentiate between data member and member function in C++. How do you declare a member outside the class definition?

b) What are predefined classes? Explain with an example.

OR

16. a) Explain the concept of inheritance with a suitable example.

b) Explain the use of friend declaration in C++.

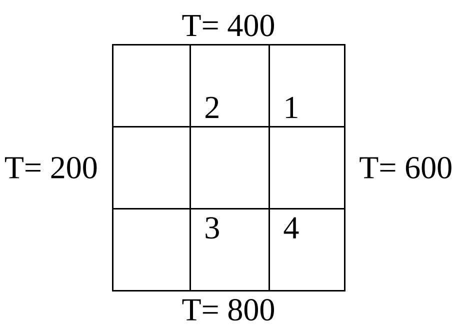
MODULE-IV

17. Fit a parabola of the form v = atb. for the following data.

V (m/s)	350	400	500	600
t (sec)	61	26	7	2.5

OR

18. Find the temperatures at the nodes 1, 2, 3 and 4 of the square metal plate shown below using Finite difference method. Assume 2-D steady state heat conduction.



THIRD SEMESTER B. TECH. DEGREE EXAMINATION

(2013 Scheme)

13.306 ENGINEERING DRAWING (MP)

MODEL QUESTION

Time : 4 Hrs Marks : 100

Instructions: ***Part A and Part B are to be answered in separate answer books***

Part – A

Machine Drawing

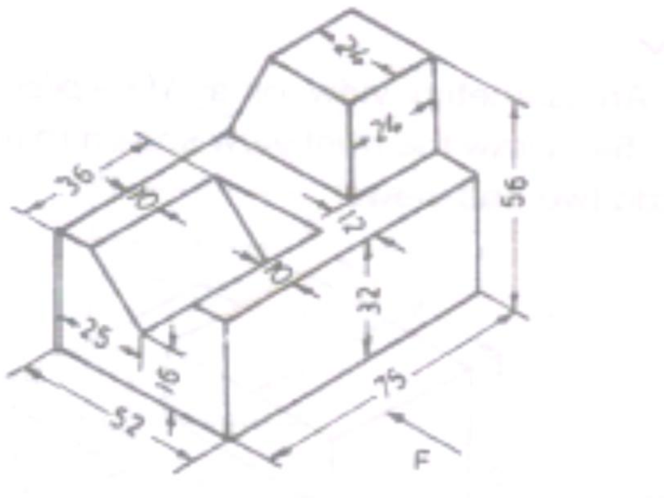
Time : 2 Hrs Marks : 50

Answer any two questions from Module -I and the question from Module – II

Assume missing dimensions if any

MODULE I

1. Draw the three orthographic views of the figure given below



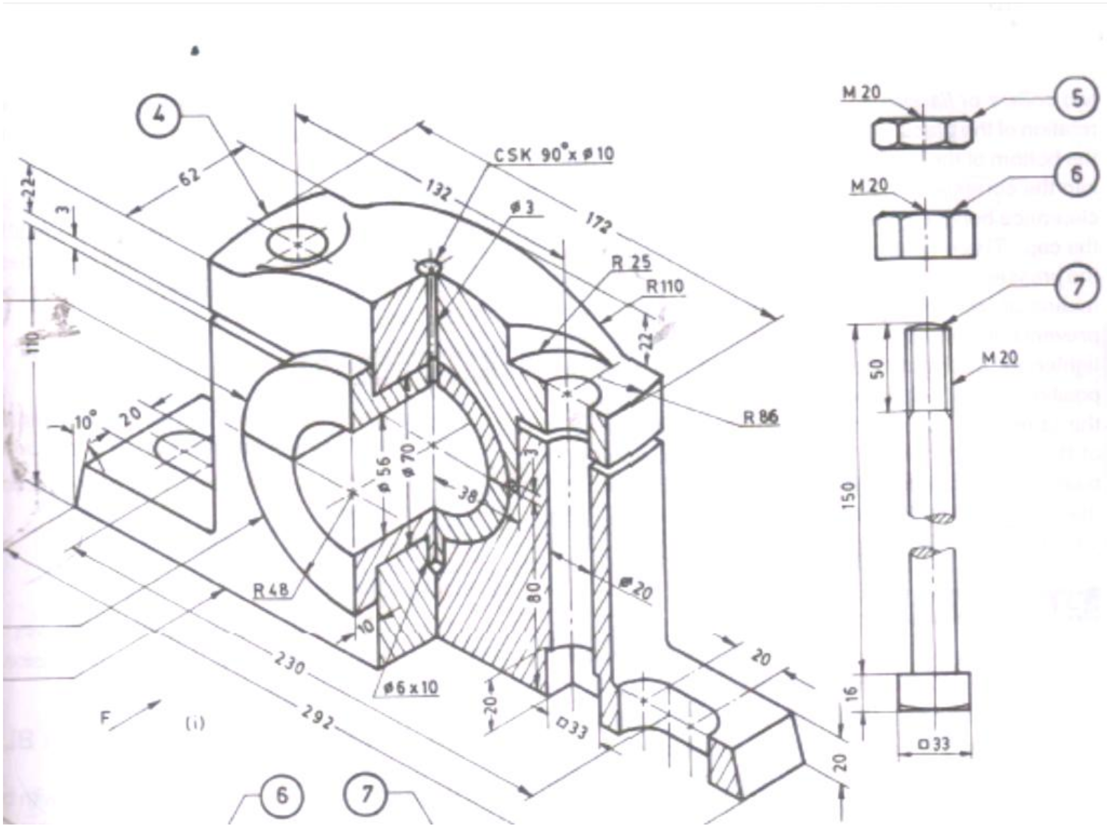
2. Sketch a detachable type of foundation bolt proportionally

3. Draw two views of single riveted double strap butt joint with 10mm thick plate.

(10 marks x 2 =20 Marks)

MODULE II

4. Draw the full sectional front view, simple plan and left side view of the Plummer block given below. 30 Marks



THIRD SEMESTER B. TECH. DEGREE EXAMINATION (2013 Scheme)

13.306 ENGINEERING DRAWING (MP)

MODEL QUESTION

Time : 4 Hrs   Marks : 100

Instructions: ***Part A and Part B are to be answered in separate answer books***

Part – B

Civil Engineering Drawing and Estimation

Time : 2 Hrs   Marks : 50

Answer any one question each from Module -III and IV

Assume suitably missing data if any.

MODULE - III

5. The line sketch of a small hospital is shown in Fig. 1. Draw to a suitable scale the following:

i) Plan at sill level
ii) Section on XY
iii) Front elevation (30 Marks)

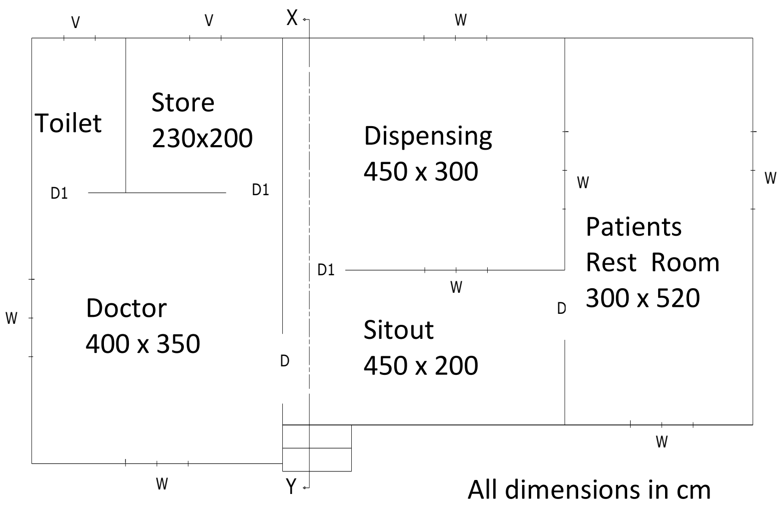


Fig. 1

Specifications: *Foundation is of RR Masonry in CM 1:6, 60 x 60 cm over a PCC bed of 90 x 20cm. Basement is of RR masonry 45 x 45 cm, in CM 1:6. Walls are made of brick masonry in CM 1:5, 20cm thick to a height of 300cm. RCC lintels of 15 cm thickness, may be provided wherever necessary. Roofing is of RCC slab 10cm thick.*

Assume suitable sizes for doors, windows, ventilators and openings.

6. The line sketch of a small residence is shown in Fig.(2). Draw to a suitable scale. All dimensions are in cm. **Specifications** are same as in Question No. 1

i) Plan at sill level

ii) Section on XX

iii) Front elevation. (30 marks)

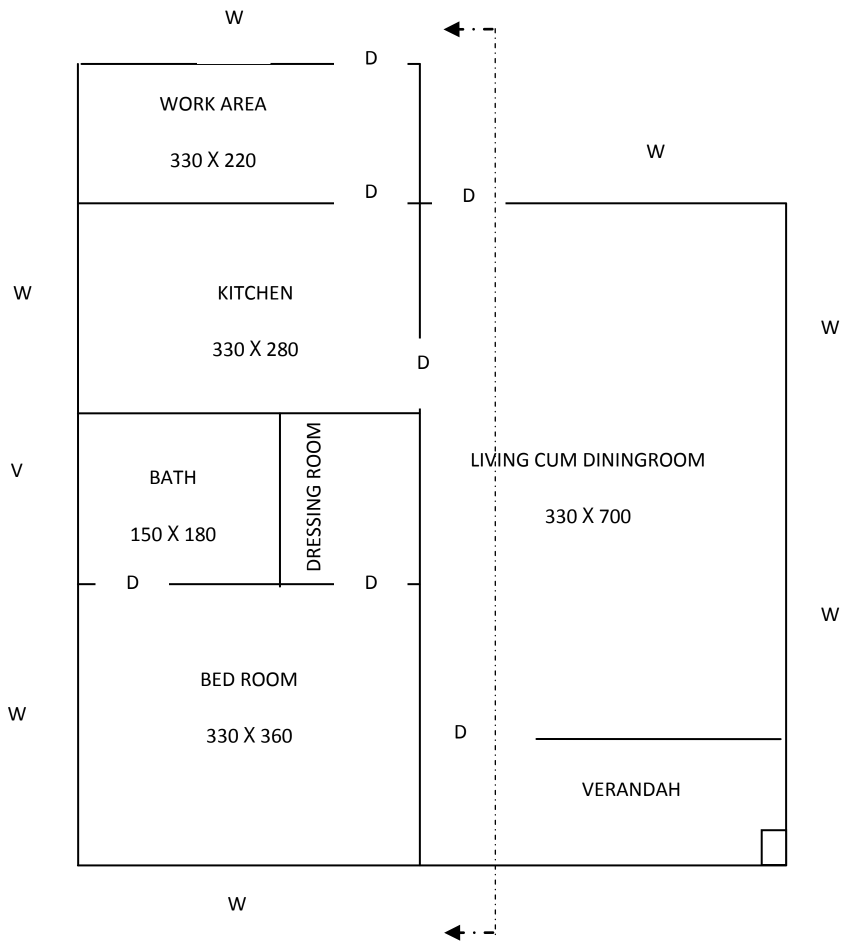


Fig. 2

MODULE - IV

7. Estimate the quantities of the following items of work for the building shown in Fig.(1):

a) Plastering in CM 1:3

b) RCC work for roof slab (20 marks)

OR

8. Estimate the quantities of the following items of work for the building shown in Fig (2):

a) Earthwork excavation

b) RR masonry in CM 1:6 (20 marks)
