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Course Code: SOE-B-MA304

O P JINDAL UNIVERSITY

B. Tech. III Semester Regular Examinations

Advanced Engineering Mathematics-I

(Offered to B. Tech.(MECH))

Time: 3 Hrs. **Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

			M	CO	KL
Section-A					
1	a.	Define Analytic function with example.	2	CO1	KL1
	b.	Define Isolated singularity with example.	2	CO2	KL1
	c.	What is the inverse Laplace transform of $L^{-1}\left\{\frac{1}{(s-a)^n}\right\}$?	2	CO4	KL1
	d.	Write condition for the existence of Laplace Transform.	2	CO3	KL1
	e.	The real root of the equation $f(x)=x^3-4x-9$, using bisection method(one stage).	2	CO5	KL1
	f.	Apply Euler's method to solve $y' = x + y, y(0) = 0$, choosing the step length= 0.2(find y_1).	2	CO6	KL1
	g.	Write a short note on measure of central tendency.	2	CO7	KL1
	h.	Define interquartile range.	2	CO8	KL1
	i.	Define discrete probability distribution and continuous probability distribution.	2	CO9	KL1
	j.	What is Binomial distribution?	2	CO10	KL1
Section-B: Unit-I					
2	a.	If $w=\phi+i\psi$ represents the complex potential for an electric field and $\psi=x^2-y^2+\frac{x}{x^2+y^2}$, determine the function φ.	8	CO1	KL3
	b.	If $f(z)$ is a holomorphic function of z, show that $(i)\left\{\frac{\partial}{\partial x}\lvert f(z)\rvert\right\}^2+\left\{\frac{\partial}{\partial y}\lvert f(z)\rvert\right\}^2=\lvert f'(z)\rvert^2$	8	CO1	KL2

		OR			
3	a.	Evaluate $\int_C \frac{z+1}{z^4-4z^3+4z^2}dz$, where C is $\|z-2-i\|=2$.	8	CO2	KL2
	b.	Find the Laurent's series expansion of $\frac{z}{(z^2-1)(z^2+4)}$ for (a) $\|z\|<1$ (b) $1<\|z\|<2$.	8	CO2	KL2
		Unit-II			
4	a.	Evaluate (i) $\int_0^\infty te^{-2t}\cos tdt$ (ii) $\int_0^\infty \frac{e^{-at}-e^{-bt}}{t}dt$.	8	CO3	KL2
	b.	Use the convolution theorem to find $L^{-1}\frac{s^2}{(s^2+a^2)(s^2+b^2)}$.	8	CO3	KL2
		OR			
5	a.	Solve by the method of transforms, the equation $y'''+2y''-y'-2y=0$ given $y(0)=y'(0)=0$ and $y''(0)=6$.	8	CO4	KL3
	b.	Find the inverse Laplace transform of $\frac{s^2}{s^4+4a^4}$.	8	CO3	KL2
		Unit-III			
6	a.	Find a root of the equation $x^3+x^2+x+7=0$ by Secant method correct to three decimal places	8	CO5	KL2
	b.	Find a real root of equation $x\log_{10}x=1.2$ by Regula-Falsi method correct to four decimal places.	8	CO5	KL2
		OR			
7	a.	Evaluate $y(0.1)$ correct to six places of decimals by Taylor's series method if $y(x)$ satisfies $y'=xy+1, y(0)=1$.	8	CO6	KL2
	b.	Given $\frac{dy}{dx}=x^2(1+y)$ and $y(1)=1, y(1.1)=1.233, y(1.2)=1.548, y(1.3)=1.979$. Evaluate $y(1.4)$ by Adams-Bashforth method.	8	CO6	KL2

Unit-IV

8	a.	Write the importance of Central Tendency and below are Amaya's subjects and the corresponding number of units and grades she got for the previous 8grading period. Compute her average grade point Subject | Unit | Grade Hindi | .9 | 86 English | 1.5 | 85 Mathematics | 1.5 | 88 Science | 1.8 | 87 Social Science | .9 | 86 TLE | 1.2 | 83 MAPEH | 1.2 | 87	8	C07	KL2
	b.	Define Mode and find the modal class and the actual mode of the data set below: Number | Frequency 1-3 | 7 4-6 | 6 7-9 | 4 10-12 | 9 13-15 | 2 16-18 | 8 19-21 | 1 22-24 | 2 25-27 | 3 28-30 | 2	8	CO7	KL1
		OR			
9	a.	Write a short note on Variance and Standard Deviation. Calculate the Standard Deviation for the following data: x: 0 1 2 3 4 5 6 7 8 9 10 f: 2 1 2 0 2 4 9 11 13 8 8	8	CO8	KL2
	b.	What is the coefficient of variation and calculate the coefficient of variation for the following data set: The price, in cents, of a stock over five trading days was 52, 58, 55, 57, 59.	8	CO8	KL2
		Unit-V			
9	a.	Define Random Variables and Expectation. X is a continuous random variable with probability function given by	8	CO9	KL2

		$f(x) = kx(0 \le x < 2)$ $= 2k(2 \le x < 4)$ $= -kx + 6k(4 \le x < 6)$ Find k and mean value of X.			
	b.	Define Moment Generating Function and find the moment generating function of the exponential distribution $f(x) = \frac{1}{c} e^{-\frac{x}{c}}$, $0 \le x \le \infty$, $c > 0$ Hence find it's mean and Standard Deviation.	8	CO9	KL2
		OR			
9	a.	Define Binomial Distribution. In 256 sets of 12 tosses of a coin, in how many cases, one can expect 8 heads and 4 tails.		CO10	KL3
	b.	Define Poisson Distribution. If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction.		CO10	KL3

Course Code: SOE-B-ME301

O P JINDAL UNIVERSITY

B. Tech. III Semester Regular Examinations

THERMO FLUIDS - I

(Offered to Mechanical Engineering)

Time: 3 Hrs. **Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

			M	CO	KL
Section-A					
1	a.	A heat engine produces work equivalent to 80 kW with an efficiency of 40%. Determine the heat transfer rate with the source and sink.	2	CO1	2
	b.	What do you understand by intensive and extensive properties?	2	CO1	1
	c.	Define isothermal compressibility?	2	CO2	1
	d.	What is an equation of state?	2	CO2	1
	e.	You may have noticed that dams are built much thicker at the bottom. Tell why dams are built that way?	2	CO3	1
	f.	What do you understand by buoyant force and centre of buoyancy?	2	CO3	1
	g.	What is the Eulerian description of fluid motion? How does it differ from the Lagrangian description?	2	CO4	1
	h.	What do you understand by convective and local acceleration?	2	CO4	1
	i.	What are the assumptions made for deriving the Bernoulli's equation?	2	CO5	1
	j.	Define the term boundary layer? What causes boundary layer to develop?	2	CO5	1
Section-B: Unit-I					
2	a.	0.2 m^3 of an ideal gas at a pressure of 20 bar and 600 K is expanded isothermally to 5 times the initial volume. It is then cooled to 300 K at constant volume and then compressed back polytropically to its initial state. Determine the net work done and heat transfer during the cycle.	8	CO1	3
	b.	Calculate the available and unavailable energy of a system that absorbs 1500 kJ of heat from a source at 500 K temperature. The environment is at 290 K temperature. Also, explain in short how the expression of available work changes for the condition when heat is withdrawn from varying temperature.	8	CO1	3
OR					
3	a.	A heat engine working on the Carnot cycle absorbs heat from three thermal reservoirs at 1000 K, 800 K, and 600 K. The engine does 10 kW of net work and rejects 400 kJ/min of heat to a heat sink at 300 K. If the heat supplied by the reservoir at 1000 K is 60% of the heat supplied by the reservoir at 600 K, make calculations for the quantity of heat absorbed by each reservoir.	8	CO1	3
	b.	One kg of air initially at 7 bar pressure and 360 K temperature expands	8	CO1	3

		polytropically (n=1.2) until the pressure is reduced to 1.4 bar. Determine i) Final specific volume and temperature ii) Change in entropy Take R= 287 J/kgK and $\gamma = 1.4$			
Unit-II					
4	a.	Derive the following expression $c_p - c_v = \frac{Tv\beta^2}{K_T}$, where the notations have their usual meanings	8	CO2	2
	b.	Obtain Maxwell's relation from Helmholtz's function (f) and Gibbs's free energy (g).	8	CO2	2
OR					
5	a.	Derive the First and second Tds equation.	8	CO2	2
	b.	List down the factors which are taken into account by Vander Waal' equation in modifying the ideal gas equation. Further, write the equation in reduced parameters.	8	CO2	2
Unit-III					
6	a.	The viscosity of a fluid is to measured, by a viscometer constructed of two 1.5 m long concentric cylinders. The inner diameter of the outer cylinder is 16 cm, and the gap between the two cylinders is 0.09 cm. The outer cylinder is rotated at 250 rpm, and the torque is measured to be 1.4 Nm. Determine the viscosity of the fluid.	8	CO3	3
	b.	A simple U-Tube manometer containing mercury is connected to a pipe in which an oil of specific gravity 0.8 is flowing. The pressure in the pipe is vaccum. The other end of the manometer is open to the atmosphere. Determine the vaccum, pressure in pipe, if the difference of mercury level in the two limbs is 20 cm and height of oil in the limb from the centre of the pipe is 15 cm below.	8	CO3	3
OR					
7	a.	Discuss the stability of a (a) submerged body and (b) floating body.	8	CO3	2
	b.	A circular plate 3.0 m diameter is immersed in water in such a way that the plane of the plate makes an angle of 60^0 with the free surface of water. Determine the total pressure and centre of pressure when the upper edge of the plate is 2m below the free surface of water	8	CO3	3
Unit-IV					
8	a.	Develop an expression for the continuity equation for a three-dimensional flow field in a cartesian coordinate system.	8	CO4	2
	b.	The stream function for a two-dimensional flow field is given by $\psi = 2xy$, calculate the velocity at the point P (2,3). Find the velocity potential function	8	CO4	3

		ϕ.			
OR					
9	a.	Discuss in detail about: stream lines, path lines and streak lines.	8	CO4	2
	b.	A flow field is given by $\vec{V} = x^2y\hat{\imath} + y^2z\hat{\jmath} - (2xyz + yz^2)\hat{k}$ Prove that it is a case of possible steady incompressible fluid flow. Determine the velocity and acceleration at the point (2, 1, 3).	8	CO4	3
UNIT-V					
10	a.	Develop an expression for the Euler's equation of motion along the streamline for an ideal fluid and from it also obtain the Bernoulli's equation.	8	CO5	2
	b.	An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil of sp. Gravity 0.9, when the coefficient of discharge of the meter is 0.64.	8	CO5	3
OR					
11	a.	Determine the displacement thickness, momentum thickness, and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$ where, u is the velocity at a distance y from the plate and u = U at y = δ, δ is the boundary layer thickness	8	CO5	3
	b.	An oil of specific gravity 0.8 is flowing through a venturi meter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturi meter. Take C_d = 0.98.	8	CO5	3

Course Code: SOE-B-ME302

O P JINDAL UNIVERSITY

I B. Tech. III Semester Regular/Backlog Examinations — **R 20**

Computer Aided Machine Drawing

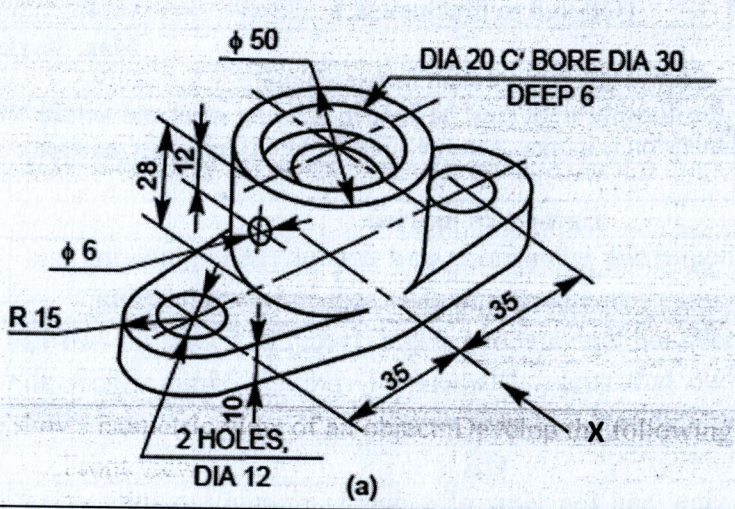
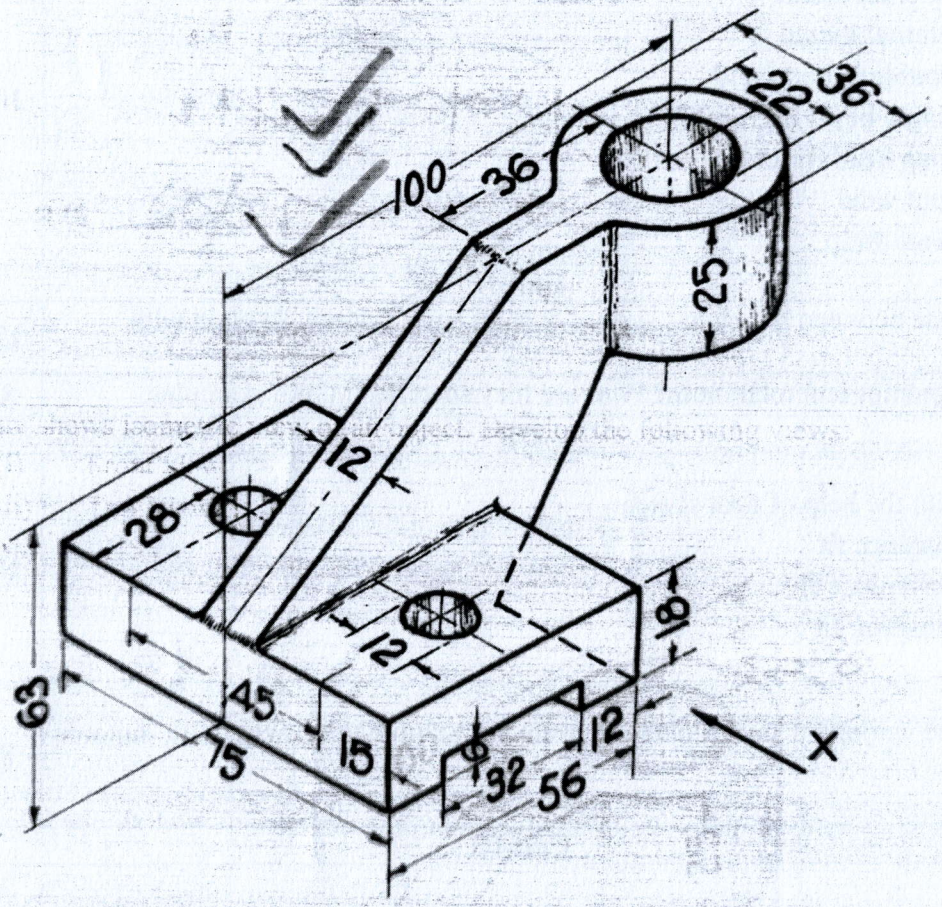
(Offered to Mechanical)

Time: 4 Hrs. **Max. Marks: 100**

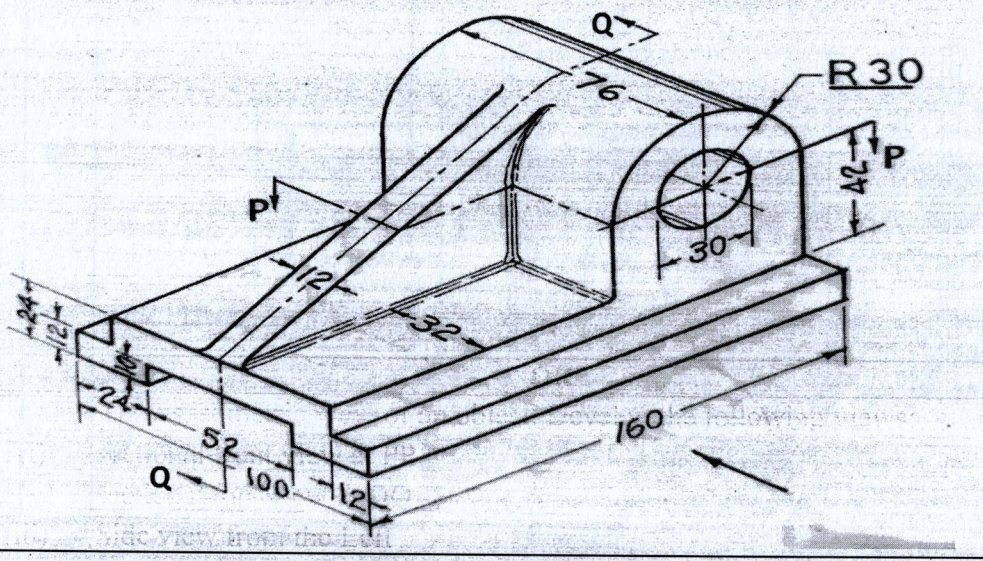
Answer any one question from each unit

All questions carry equal marks. All the drawing work must be done in drawing sheet and written work should be in answer sheet. All dimension is in mm. Assume suitable data if missing (required).

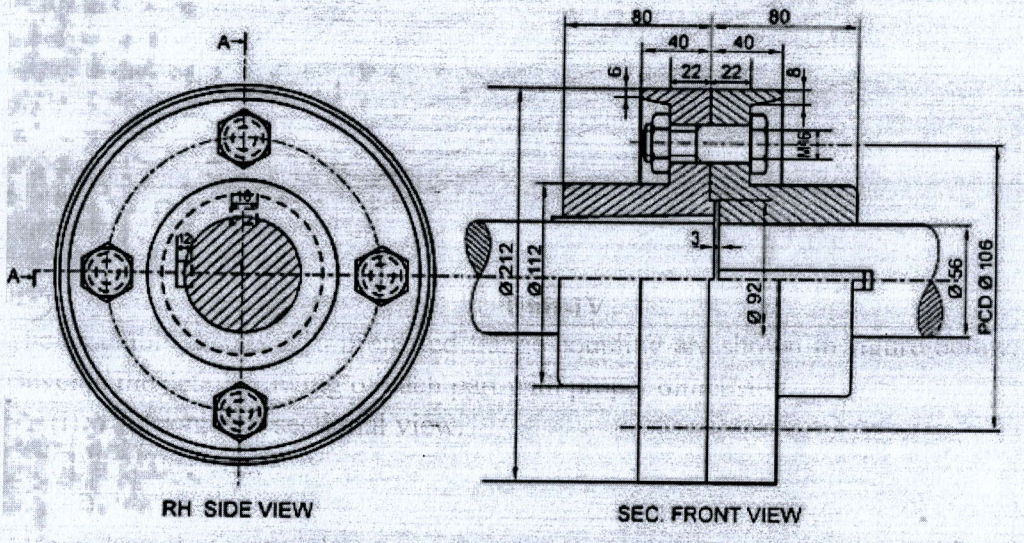
			M	CO	KL
Unit-I (20 marks)					
1	a.	Write a short note on Sequential engineering and concurrent engineering and what are the benefits of concurrent engineering over sequential engineering.	10	1	2
	b.	Draw a sectional front view and top view of a single riveted butt joint for two 12 mm thick plate, using two butt straps. Diameter of rivets = 24mm. Show all dimension (pitch, margin, width etc.) on your sketch.	10	2	3
OR					
2	a.	Draw a sectional front view and top view of a double riveted lap joint using rivets in zig-zag arrangement. Thickness of plate = 10 mm, diameter of rivets = 20 mm. Gives all other dimension (like pitch, margin, width etc.).	10	2	3
	b.	Draw the actual projection/section and convention of the following (any five) (i) External thread (ii) Internal thread (iii) Double V butt weld (iv) Single bevel butt weld (v) Snap head Rivet (vi) Spot weld (vii) Seam welp	10	1	2
Unit-II					
3	a.	Differentiate between hole basis system & shaft basis system. Explain with sketch.	12	2	2
	b.	What are geometrical tolerances? How are they specified? Give examples.	8	2	2
OR					
4	a.	Explain with the help of neat sketch: (i) Clearance fit (ii) Interference fit (iii) Transition fit	12	2	2
	b.	Explain the unilateral and bilateral system of writing tolerances with suitable examples.	8	2	2
Unit-III					

5	a.	Figure shows isometric view of an object. Develop the following views: (i) Front view (ii) Top View (iii) Side view from the Left  (a)	8	3	3
	b.	Figure shows isometric view of an object. Develop the following views: (i) Front view (ii) Top View (iii) LHSV  	12	3	3

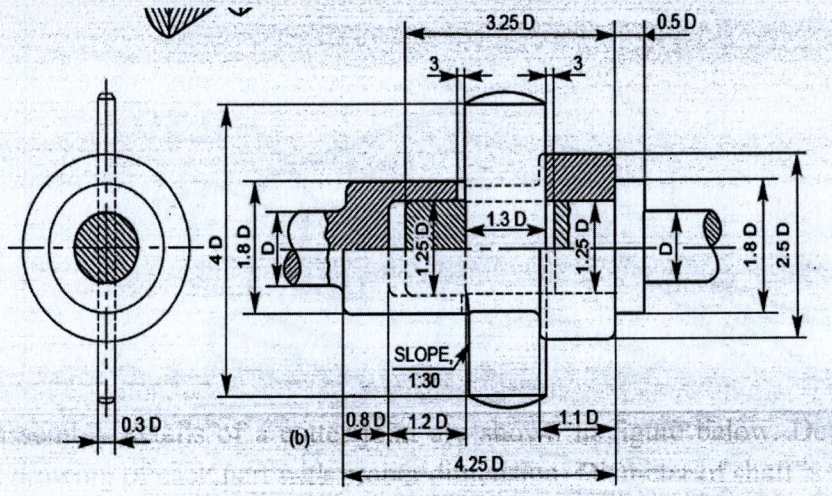
OR

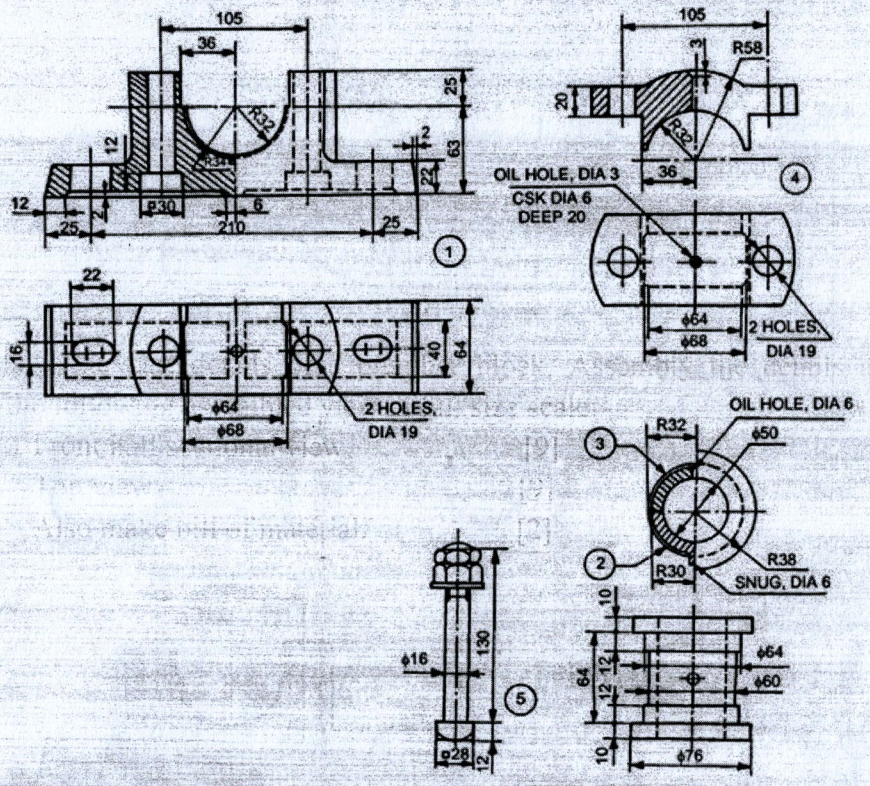
6	a.	Figure shows isometric view of an object. Develop the following views: (i) sectional front view at PP (ii) sectional top View at QQ (iii) Side view from the Left 	20	3	3

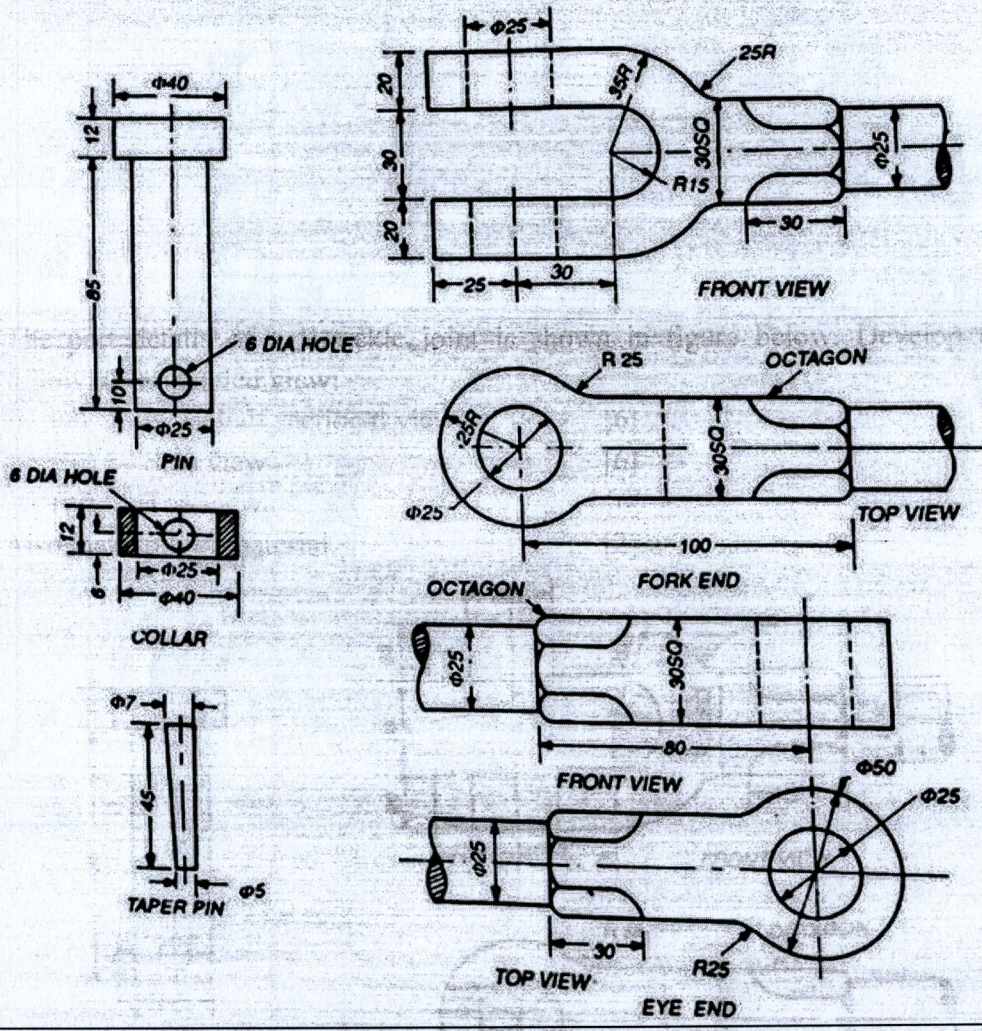
Unit-IV

7	a.	The assembly details of a protected flange coupling are shown in figure below. Develop the detail drawing of each part with proper dimension. (i) Front half sectional view. (ii) Side view (iii) Top view Also make bill of material.  A PROTECTED FLANGE COUPLING	20	4	3

OR

8	a.	The assembly details of a cotter joint are shown in figure below. Develop the detail drawing of each part with proper dimension. Diameter of shaft is 30mm. (i) Front half sectional view. (ii) Side view (iii) Top view Also make bill of material.  	20	4	3
		UNIT-V			

9	a.	Figure show the part details of a plumber block. Assembly the details and Develop the following assembled view in full size scale: (i) Front half sectional view [9] (ii) Top view [9] (iii) Also make bill of material. [2] 	20	5	3
		OR			

10	a.	The part details of a Knuckle joint is shown in figure below. Develop the following assembled view: (ii) Front half sectional view. [6] (iii) Side view [6] (iv) Top view [6] Also make bill of material. [2] 	20	5	3