QUESTION BANK

B.Tech –II Year –II Semester

DEPARTMENT OF MECHANICAL ENGINEERING

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution – UGC, Govt.of India)

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(Affiliated to JNTUH, Hyderabad, Approved by AICTE –Accredited by NBA & NAAC-"A" Grade-ISO 9001:2015 Certified)

DATA BASE SYSTEMS

UNIT-I

1. Explain about Database architecture with a neat diagram?

2. a) What are the advantages of DBMS over file management system?
   b) Explain levels of abstraction in DBMS

3. Write short notes on database languages with examples?

4. **a)** Define DBMS? List Database system applications.
   b).What are Different types Database users and explain the roles of DBA.

5. a) What are functional components of data base?
   b) What are different characteristics of database?

UNIT-II

1. What is a view? Explain about views in detail?

2. Explain the E-R diagram components and notations with their extended features?

3. Explain the keys
   a) Primary key b)foreign key c) super key d) candidate key

4. a) Write short notes on i) participation constraints ii) week entity?

   b) What are the design issues of ER diagram explain with suitable example?
5. Explain the concept of Triggers?

UNIT-III

1. Explain the following
   a) Joins b) Aggregate functions

2. Explain the following
   a) UNION b) INTERSECT c) EXCEPT

3. What is nested query explain with suitable example?
4. Explain the following
   a) NULL values b) HAVING clause c) GROUP BY

5. What are the differences between Correlated and uncorrelated sub queries with example?

UNIT-IV

1. What is Normalization? Explain 1NF, 2NF?

2. a) What is MVD explain in brief?
   b) What is functional dependency? Explain about dependency preserving?

3. Explain the following
   a) 4NF b) 5NF

4. Define BCNF? How does BCNF differ from 3NF? Explain with an example.

5. What is Redundancy? What are the different problems encountered by redundancy?

UNIT-V

1. a) What is Transaction state? And explain ACID properties?
   b) Explain the concept of serilizability?

2. What are the transaction isolation levels in SQL?

3. Write short notes on recoverability?
4. Explain the concept of testing on serializability?

5. Explain the concept of Concurrent execution

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DYNAMICS OF MACHINERY
R17A0307

UNIT-I

1] a. What is the gyroscopic effect on a ship when it turns towards left and the propeller rotates Counter clockwise when viewed from stern.

b.The mass of turbine rotor of a ship is 8 tonnes and has a radius of gyration of 0.6 meters. It rotates at 1800 rpm clockwise when looking from the front. Determine the gyroscopic effect if

i) The ship is travelling at 100 km/h and steers to the right in a curve of 70 meters radius.

ii) The ship is pitching and the bow descends with maximum velocity. The pitching is simple harmonic and the total angular movement between the extreme positions is 10 degrees.

iii) The ship is rolling and at a certain instant has an angular velocity of 0.03 radians/ second clockwise when looking from bow.

2] a.What is the effect of gyroscopic couple on the stability of a two wheeler taking a turn?

b.The mass of the motor cycle along with the rider is 180 kg. The height of the centre of gravity of total mass is 600mm above the ground when it moves straight. Each wheel has a diameter of 700mm and mass moment of inertia of 2 kgm^2.The engine rotates at a speed of 5 times the road wheel and engine rotating parts have mass moment of inertia of 0.2kgm^2. Determine the angle of heel required if the motor cycle negotiates a curve of radius 100 meters at a speed of 108 km/hr.

3] a.Explain the gyroscopic effect on an aero plane.

b.A racing car weighs 20kN.It has a wheel base of 2m, track width of 1m and height of C.G 300mm above ground level and lies midway between the front and rear axles. The engine flywheel rotates at 3000 rpm clockwise when viewed from the front. The moment of inertia of the flywheel is 4kgm^2 and the moment of inertia of each wheel is 3kgm^2 Find the reactions between the wheels and the ground when the car takes a curve of 15m towards right at 30 km/hr,taking into consideration the gyroscopic and centrifugal effects. Each wheel radius is 400mm.

4] a.An aero-plane makes a complete half circle of 50 m radius towards left in a time of 20 seconds when flying at 200kmph. The rotary engine and the propeller of the plane has a mass of 400kg and a radius of gyration of 0.3 m. The engine rotor rotates at 2400 rpm clockwise when seen from the rear. Find the gyroscopic couple on the air craft and state its effect on the aero-plane.

b. Define precession axis and spin axis by neat sketches

5] a. Derive the equation for Gyroscopic couple for a rotating disc.

b. A uniform disc having a mass of 8 kg and radius of gyration 150 mm is mounted on one end of a horizontal arm of length 200 mm. The other end rotates freely in a bearing. The disc is given a clockwise spin of 240 rpm. Determine the motion of the disc if its arm remains horizontal.

6] Explain the effect of gyroscopic couple on novel –ship during steering, pitching and rolling. Explain with neat sketch.

UNIT-III

1].a.Distinguish between brakes and dynamometers.

b.Derive an expression for total braking torque about fulcrum in a differential band brake when the brake drum rotates in counter clockwise direction.What is a clutch? Describe a single plate clutch with a neat diagram.

2]. Determine the axial force required to engage a cone clutch transmitting 20kW of power at 750 rpm. Average friction diameter of the cone is 400mm and average pressure intensity60 kN/m^2. Semi cone angle is 10^0 and coefficient of friction is 0.25.Also find the width of the friction cone.

3]a. What is meant by self locking and a self energized brake?

b. A band brake acts on 3/4 th of a circumference of a brake drum of 450 mm diameter which is keyed to a shaft. The band brake provides a braking torque of 225 Nm. One end of the lever is attached to a fulcrum pin of the lever and the other end is attached to a pin 100 mm from the fulcrum. If the operating force is applied at 500 mm from the fulcrum and coefficient of friction is 0.25, find the operating force when the drum rotates in(i)Clock-wise direction,(ii)anti- clockwise direction.

4] a.Name different types of dynamometers and explain any one of them.

b. In a vertical belt transmission dynamometer, the diameter of the driving pulley rotating at 1500 rpm is 80 mm. The centre distance of the intermediate pulley from the fulcrum is also 80 mm each. The weighing pan on the lever is at a distance of 250 mm. find the power transmitted when a mass of 20kg is required on the pan including its own mass.

5] a. Explain a torsion dynamometer with a neat sketch.

b. The following data refer to a rope brake dynamometer in a laboratory experiment.Diameter of the flywheel=1m Diameter of the rope=10 mm. Dead weight on the brake=50 kg Speed of the engine =180 rpm Spring balance reading=120 N.Find the power of the engine?

6] a.Explain the function of absorption type dynamometer.

b.Describe with a neat sketch the torsion dynamometer.

7] a.Explain in detail the calculations involved in finding the power transmitted in a transmission type dynamometer.

b.Explain the function of transmission type dynamometer.

8] a. Derive from first principles, the expression for the frictional moment (or torque due to friction) of a conical pivot assuming uniform pressure.

b.A flat foot step bearing 300mm in diameter supports a load of 8kN. If the coefficient of friction is 0.1, and the speed of the shaft is 80 rpm, find the power lost in friction, assuming uniform wear.

9] a. Show that the torque transmitted by a cone clutch when the intensity of pressure is uniform is given by: $[2\mu W/3\sin\alpha] \cdot [(r_o^3 - r_i^3)/(r_o^2 - r_i^2)]$ Where W = axial load μ = coefficient of friction of contact surfaces α = semi-cone angle r_o = outer radius of contact surface r_i = inner radius of contact surface

b) Describe with a neat sketch the working of a single plate friction clutch.

10]a) Define the terms: 'coefficient of fluctuation energy' and 'coefficient of fluctuation of speed'.

b) Find a relation for the coefficient of fluctuation of speed in terns of the maximum fluctuation of energy and the kinetic energy of the flywheel at mean speed.

11] A car engine has its rated output of 10kW. Maximum torque developed is 100Nm.The clutch used is of single plate type having two active surfaces. Axial pressure is not to exceed 0.85 bar. External diameter of the friction plate is 1.25 times the internal diameter. Determine the dimensions of the friction plate and the axial force exerted by the springs. Assume uniform wear and coefficient of friction as O.3

12. (a) Explain the working of a multi-plate clutch with the help of a neat sketch.
(b) A single plate clutch is required to transmit 150 kW at 6000 rpm. The clutch facings available provide a coe_cient of friction of 0.25, and the average pressure is to be limited to 75 kN/m2. Determine the dimensions of the working surface of the clutch plate if its maximum dimension is not to exceed 160 mm due to space restrictions.

13]The turning moment diagram for a multi cylinder engine has been drawn to a scale of 1cm= 5000Nm torque and 1cm= 60^0 respectively. The intercepted areas between output torque curve and mean resistance taken in order from one end are -0.3, +4.1, -2.8, +3.2, -3.3, +2.5, -3.6, +2.8, -2.6 square cm when the engine is running at 800rpm. The engine has a stroke of 300 mm and the fluctuation of speed is not to exceed 2% of mean speed. Determine a suitable diameter of cross section of the flywheel rim for limiting value of the shaft centrifugal stress of 280 X 10^3 N/ m^2. The material density may be assumed as 7.2 g/cm^3. Assume the thickness of the rim to be ¼ th of the width.

UNIT-IV

(1). A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 3cm, 3.8cm, 4cm and 3.5cm respectively from the axis of rotation. The masses 1, 3 and 4 are 7.5kg, 8kg and 5kg respectively. The axial distances between 2 and 3 is 40cm and between 1 and 3 is 15cm. The masses 1 and 3 are at right angles to each other. Find for complete balance.
(a) The angles between the masses 1, 2 and 4.
(b) Axial distance between the planes of rotation of 3 and 4.
(c) The magnitude of mass 2.

(2). A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 3cm, 3.8cm, 4cm and 3.5cm respectively from the axis of rotation. The masses 1, 3

and 4 are 7.5kg, 8kg and 5kg respectively. The axial distances between 2 and 3 is 40cm and between 1 and 3 is 15cm. The masses 1 and 3 are at right angles to each other. Find for complete balance. (a) The angles between the masses 1, 2 and 4.
(b) Axial distance between the planes of rotation of 3 and 4.
(c) The magnitude of mass 2.

(3)A rotating shaft carries four radial masses A = 8 kg, B = C = 6 kg, and D = 5 kg. The mass centers are 30 mm, 40 mm, 40 mm, and 50 mm respectively from the axis of the shaft. The axial distance between the planes of rotation of A and B is 400mm, and that between B and C is 500 mm. The masses A and C are at right angles to each other. Find for a complete balance, (a) the angle between the masses B and D from mass A, (b) the axial distance between the planes of rotation of C and D, and (c) the magnitude of mass B.

(4)a.What is the necessity of balancing for rotors of high speed engines?

b.A rigid rotor has all its unbalance in one plane and can be considered to consist of three masses m_1 = 5 kg, m_2 = 3 kg at an angle of 165^0 counter clockwise from m_1 and m_3 = 8 kg at angle 85^0 clockwise from m_1. The radii r_1 = 200mm, r_2 = 80mm and r_3 = 140 mm. Determine the balancing mass required at a radius of 100 mm. Specify the location of this mass with respect to m_1.

(5)a. What is meant by static and dynamic unbalance in machinery?

b. A rotor has the following properties:

Mass	Magnitude	Radius	Angle	Axial distance from first mass
1	9Kg	100mm	0^0	-
2	7 Kg	120mm	60^0	160mm
3	8 Kg	140mm	135^0	325mm
4	6 Kg	120mm	270^0	560mm

If the shaft is balanced by two counter masses located at 100 mm radius and revolving in planes midway of planes I and 2, and midway of planes3 and 4, determine the magnitude of the masses and their corresponding angular positions.

(6)**a.**What is primary and secondary balancing in reciprocating engines?

b.The cranks of a three cylinder locomotive are set at 120^0. The stroke is 120 mm, the length of the connecting rod is 240 mm, the mass of the reciprocating parts per cylinder is 1kg and the speed of the crank shaft is2400 rpm. Determine the magnitude of primary and secondary balancing.

(7)**a**.Explain the balancing of multi cylinder in line engines?

b.An air compressor has four vertical cylinders 1,2,3 and 4 inline and the driving cranks at 90^0 intervals reach their uppermost positions in this order. The cranks are of 150 mm radius, the connecting rods 500 mm long and the cylinder centre lines 400 mm apart. The mass of the reciprocating parts of each cylinder is 22.5 kg and the speed of rotation is400 rpm. Show that there are no out of balance primary and secondary forces. Determine the corresponding couples indicating their positions for maximum values. The centralplane of the machine may be taken as reference plane.

(8) **a.**Obtain the expressions for primary and secondary forces for a V-Engine having two identical cylinders lying in a plane. The included angle between the two cylinders may be taken as 45^0.

b.The pistons of 60^0 twin V-Engine have strokes of 120 mm. The connecting rods driving a common crank are of length 200 mm. The mass of the reciprocating parts per cylinder is1.5 kg and the speed of the crank shaft is 2500 rpm. Determine the magnitude of primary and secondary unbalanced forces.

(9)(a) Explain the method of balancing of different masses revolving in the same plane.

(b)A single cylinder horizontal engine runs at 120 rpm. The length of stroke is 400mm. The mass of the revolving parts assumed concentrated at the crank pin, is 100kg and mass of reciprocating parts is 150kg. Determine the magnitude of the balancing mass required to be placed opposite to the crank at a radius of 150mm which is equivalent to all the revolving and 2/3 of the reciprocating masses. If the crank turns 30^0 from the inner dead center, find the magnitude of the unbalanced force due to the balancing mass.

(10) (a)How is the effect of hammer blow reduced in coupled locomotives?

(b)An inside cylinder locomotive has its cylinder center lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150kg at the crank pin and the reciprocating masses per cylinder are 180kg. The wheel center lines are 1.5m apart. The cranks are at right angles. The whole of rotating parts and 2/3 of reciprocating masses are to be balanced by masses placed at a radius of 0.6m. Find the magnitude and direction of the balancing masses.

(11)(a)How are different masses rotating in different planes balanced?

(b)Four masses P, Q, R and S are completely balanced. Masses R and S make angles of 90^0 and 210^0 respectively with Q in the same sense. The planes containing Q and R are 300 mm apart. Masses P, Q, R and S are supposed to be concentrated at radii of 360mm, 480mm, 240mm and 300mm respectively. The masses Q,R and S are 15kg, 25kg and 20kg respectively.

Determine

i)The mass P and its angular position.

ii)The planes in which the masses P and S are placed.

(12)a.Describe Dunkerley's method to find the natural frequency of a shaft carrying several loads.

b.A shaft 50 mm diameter and 3 m long is simply supported at its ends and carries three loads of 1000 N, 1500N and 750N at 1m, 2m and 2.5m from the left support. Modulus of elasticity is 200 GN/m^2. Find the frequency of transverse vibrations.

(13)a.Distinguish between longitudinal, transverse and torsional vibrations.

b.A cantilever shaft of 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus of the shaft material is 200 GN / m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft.

(14)a.What is meant by Magnification factor in case of forced vibrations? On what factors does it depend?

b.A vibrating system consists of a mass of 50 kg, a spring of stiffness 30kN/m and a damper. The damping provided is only 20% of the critical value. Determine the damping factor, critical damping coefficient and logarithmic decrement.

(15)a.What is critical or whirling speed of shaft?

b.Calculate the whirling speed of a shaft 20 mm diameter and 0.6 m long, carrying a mass of 1 kg at

its mid point. Density of the shaft material is 40 Mg/m^3 and E = 200 GN/m^2. Assume freely supported shaft.

(16)a.Discuss a three rotor vibratory system and find the ratio of their amplitudes.

b.A 1.5 m long shaft AB has flywheels at its ends A and B. The mass of the flywheel at the end A is 600kg and its radius of gyration is 400mm. The corresponding values for the flywheel at the end B are 300kg and 300 mm. The diameter of the shaft for the first 400mm starting from the end A is 50mm, 60 mm diameter for the next portion of 500 mm length and the remaining portion of 600mm length is unknown. Determine the diameter of the shaft for the portion B so that the node of the torsional vibration of the system will be at the center of 500 mm long segment. Also determine the frequency of vibration.

(17)a.Derive the equation for determining the frequency of torsional vibration in a two rotor system.

b.A stepped shaft of 0.05 m in diameter for the first 0.6 m length, 0.08 m diameter for the next 1.8 m and 0.03 m diameter for the remaining 0.25 m length. While the 0.05 m diameter end is fixed, the 0.03 m diameter end of the shaft carries a rotor of mass moment of inertia 14.7 kg-m2. If the modulus of elasticity of the shaft material is 0.83 x 1011 N/m2, find the natural frequency of torsional oscillations, neglecting the inertia effect of the shaft.

(18)a.Discuss the effect of inertia of the shaft in free torsional vibration.

b.A shaft 100 mm diameter and 1000 mm long is fixed at one end and the other end carries a flywheel of mass 90 kg. The radius of gyration of the flywheel is 500mm. Find the frequency of torsional vibration, if the modulus of rigidity for the shaft material is $80GN/m^2$.

(19)a.Define vibration isolation and transmissibility.

b.A single cylinder engine of total mass 200kg is to be mounted on an elastic support which permits vibratory movement in vertical direction only. The mass of the piston is 3.5 kg and has a vertical simple harmonic motion with a stroke of 150mm. It is desired that the maximum vibratory force transmitted through the elastic support to the foundation shall be 600N when the engine speed is 800 rpm. Find the necessary stiffness of the elastic support and the amplitude of vibration at 800 rpm.

(20)a.Explain the terms under damping, critical damping and over damping.

b.An instrument vibrates with na frequency of 1 Hz. When there is no damping. When the damping is provided, the frequency of damped vibration was observed to be 0.9 Hz. Find the damping factor and logarithmic decrement.

UNIT-V

(1)a.What is the function of a governor? How does it differ from that of a flywheel?

b.Each arm of a porter governor is 300 mm long and is pivoted on the axis of rotation. Each ball has a mass of 6 kg and the sleeve weighs 18kg. The radius of rotation of the ball is 200 mm when the governor begins to lift and 250 mm when the speed is maximum. Determine the maximum and minimum speeds and the range of speed of the governor.

(2)a.Derive an expression for the determination of equilibrium speed of a Proell governor.

b.The weight of each ball of a Proell governor is 90N. The central load is 1500N and the arms are 250mm long. The arms are open and pivoted at a distance of 50 mm from the axis of rotation. The extension of the lower arms to which each ball is attached is 125 mm long and the radius of rotation of the balls is 250mm. When the arms are inclined at 40^0 to the axis of rotation, find i) the equilibrium speed for the above configuration and the coefficient of insensitiveness if friction is equivalent to a force of 20N at the sleeve.

(3)a.Explain the terms sensitiveness, hunting and stability relating to governors.

b.A Hartnell governor having a central sleeve spring and two right angle bell crank levers moves between 290 rpm and 310 rpm for a sleeve lift of 15 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis and the mass of each ball is 2.5 kg. Determine the loads on the spring at the lowest and highest equilibrium speeds and the stiffness
of the spring.

(4)Derive an expression for the determination of equilibrium speed of a Porter governor.

b.Calculate the minimum speed of a Porter governor , which has equal arms each 200mm long and are pivoted on the axis of rotation. The mass of each ball is 5 kg and the minimum radius of rotation for the ball is 100mm.

(5)a.Derive an expression for determination of equilibrium speed of Hartung governor.

b.In a spring controlled governor of the Hartung type, the length of the ball and sleeve arms are 80mm and 120mm respectively. The total travel of the sleeve is 25 mm. In the mid position, each spring is compressed by 50mm and the radius of rotation of the mass center is 140mm. Each ball has a mass of 4 kg and the spring has a stiffness of 10kN/m. The equivalent mass at the sleeve is 16kg. Neglecting the moment due to the revolving masses, when the arms are inclined, determine the ratio of range of speed to the mean speed of the governor. Also find the speed in mid position.

FLUID MECHANICS & HYDRAULIC MACHINERY

UNIT 1

1. a) Differentiate between simple and differential type of manometers.
   b) A rectangular plate of size 25cm x 50cm and weighing 25kg (f) slides down 30^0inclined surfaces at a uniform velocity of 2m/sec. If the uniform 2mm gap between the plate and inclined surface is filled with oil. Determine the viscosity of oil?

2. a) What is the pressure within a droplet of water 0.5mm in diameter at 200C, if the pressure outside the droplet is standard atmospheric pressure of 1.03Kg (f)/cm^2. Given σ = 0.0075 Kg(f)/m for water at 200^0C.

   b) Derive the equation of continuity for 3-D Fluid flows.

3. a) Differentiate between i) Absolute and gauge pressure, ii) simple manometers and differential manometers, and iii) Piezometer and pressure gauge.
   b) Two large vertical plane parallel surfaces are 5 mm apart and the space between them is filled with a fluid. A thin plate of 12.5 cm square falls freely between the planes along the central plane and reaches a steady velocity of 2 m/s. Determine the weight of the plate if the viscosity of the fluid filling the space is 0.02 Ns/m .

4. a) Two large planes are parallel to each other and are inclined at 30° to the horizontal with the space between them filled with a fluid of viscosity 20 cp. A small thin plate of 0.125 m square slides parallel and midway between the planes and reaches a constant velocity of 2 m/s. The weight of the plate is 1 N. Determine the distance between the plates.
   b) Derive expressions from basics for the pressure inside a droplet and a free jet.

5. a) What is meant by one-dimensional, two-dimensional and three- dimensional flows?
   b) Distinguish between: i) Steady flow and un-steady flow ii) Uniform and non-uniform flow
   iii) Compressible and Incompressible flow iv) Laminar and turbulent flow.

6. a) Explain different types of differential manometers with the help of neat diagram.
   b) A single column vertical manometer is connected to a pipe containing oil of specific gravity
   0.9. The area of the reservoir is 80 times the area of the manometer tube. The reservoir contains mercury of sp. gr. 13.6. The level of mercury in the reservoir is at a height of 30 cm below the center of the pipe and difference of mercury levels in the reservoir in the right limb is 50 cm. find the pressure in the pipe.

7. a) A U- tube mercury manometer is used to measure the pressure of oil flowing through a pipe whose specific gravity is 0.85. The center of the pipe is 15 cm below the level of mercury. The mercury level difference in the manometer is 25 cm, determine the absolute pressure of the oil flowing through the pipe. Atmospheric pressure is 750 mm of Hg.

b) State and prove Pascal's law. Explain the consequences of the law.

UNIT 2

1. a) Derive Bernoullis equation from the fundamentals of Eulers. What are the assumptions of these Equations?

b) A bend in pipe line conveying water gradually reduces from 0.6 to 0.3mts diameter and deflects the through angle of 600. At the large end the gauge pressure is 171.675KN/m2.Determine the magnitude and direction of force exerted on bend when there is no flow.

2. a) Explain the measurement of flow using an pitot tube

b) A venturimeter has its axis vertical, the inlet and throat diameters being 150mm and 75mm respectively. The throat is 225 mm above inlet and cd=0.96. Petrol of specific gravity 0.78. Flows up through the water meter at a rate 0f 0.029mt3 /sec. find the pressure difference between inlet and throat.

3. a) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of

water. The pressure at inlet is 17.658 N/cm2 and the vacuum pressure at the throat is 30 cm of mercury. Find the Discharge of water through venturimeter. Take Cd=0.98.

b) Explain various minor losses in pipes.

4. a) Derive Darcy Weisbach equation?

b) The water is flowing through a taper pipe of length 50m having diameters 40cm at the upper end and 20cm at lower end, at the rate of 60 litres/sec. The pipe has a slope of 1in 40. Find the pressure at the lower end if the pressure at the higher level is 24.525 N/cm^2 .

5. a) Define major and minor losses in pipes.

b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of the differential manometer connected to inlet and throat is 10cm of mercury. Determine the rate of flow. Take C_d= 0.98.

6. a) Define and explain the terms: i) Hydraulic gradient line and ii) Total energy line

b) Determine the difference in the elevations between the water surfaces in the two tanks which are connected by a horizontal pipe of diameter 400 mm and length 500m. the rate of flow of water through the pipe is 200 litres/s. consider all the losses and take the value of f=0.009

UNIT 3

1. a) Derive an expression for the force exerted by fluid on moving flat plate.
   b) A jet of water having a velocity of 45mt/sec impinges without should a series of vanes moving at 15mt/sec. The direction of motion of vanes being inclined at 200 to that of the jet. The relative velocity at out let is 0.9 of that at inlet, and the absolute velocity of water at exit is to be normal to motion of vanes. Find i) Vane angle at entrance and exit. ii) Work done on vanes per unit weight of water supplied by soil.
2. a) Derive the expression for the force exerted by a water jet on a plate moving in the same direction of the jet with a velocity less than that of the jet.
   b) A blade turns the jet of diameter 3 cm at a velocity of 20 m/s by 60°. Determine the force exerted by the blade on the fluid.
3. a) Explain briefly the principles on which pelton wheel works?
   b) Design a pelton wheel which is required to develop 1500Kw, when working under a head of 160mts at a speed of 420rpm.the overall efficiency may taken as 85% and assume other data required.

4. a) Explain how hydraulic turbines are classified.
   b) A Pelton wheel is to be designed for the following specifications. Power= 735.75 kW S.P head= 200m, Speed=800rpm, overall efficiency=0.86 and jet diameter is not to exceed one-tenth the wheel diameter. Determine: (i) Wheel diameter, (ii) the no of jets required and (iii) diameter of the jet. Take Cv=0.98 and speed ratio=0.45

5. a) Explain briefly the principles on which a Kaplan turbine works.
   b) A francis turbine with an overall efficiency of 70% is required to produce 147.15 kW. It is working under a head of 8m. The peripheral velocity=$0.30\sqrt{2gh}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gh}$. The wheel runs at 200 rpm and the hydraulic losses in the turbine are 20% of the available energy. Assume radial discharge, determine: (i) the guide blade angle,
   (ii) the wheel vane angle at inlet
   (iii) the diameter of wheel at inlet and
   (iv) width of wheel at inlet.

UNIT 4:

1. a) What do you understand by the characteristics curves of turbine? Name and explain the important characteristics curves of a turbine.
   b) What is meant by 'cavitation'? What is Thoma's cavitation factor, and what is its significance for water turbines?
2. Explain the terms 'specific speed', 'unit speed' and 'unit power' as applied to hydraulic turbines. Deduce expressions to indicate their values.

3. a) What is cavitation? How can it be avoided in reaction turbine?
   b) What is the basis of selection of a turbine at a particular place?
4. a) A turbine develops 1000 kW under a head of 16 m at 200 rpm, while discharging 9 cubic meters of water/sec. find the unit power and unit discharge of the wheel.
   b) Explain in detail the draft tube theory for turbine.
5. a) Explain briefly governing of hydraulic turbines.
   b) Explain in detail surge tank.

UNIT 5

1. a) Define a centrifugal pump. Explain the working of a single stage centrifugal pump with neat sketches.
   b) Define slip, percentage slip and negative slip of reciprocating pump.

2. A Centrifugal pump delivers water against a net head of 10 m at a design speed of 800 rpm. The vanes are curved backwards and make an angle of 30^0 with the tangent at the outer periphery. The impeller diameter is 30cm and has a width of 5 cm at the outlet. Determine the discharge of the pump if the manometric efficiency is 85%.

3. a) Define cavitation. What are the effects of cavitation?
b) A single acting Reciprocating pump running at 30rpm delivers 0.012 m^3/s of water. The diameter of the piston is 25cm and stroke length is 50 cm. Determine: i) The theoretical discharge of the pump, ii) Co-efficient of discharge, and iii) slip and percentage slip of the pump.

4. A fluid is to be lifted against a head of 120m. The pumps that run at a speed of 1200 rpm with rated capacity of 300 litres/sec are available. How many pumps are required to pump the water if specific speed is 700.

5. a) Explain the performance of an centrifugal pump using performance characteristic curves.
   b) A single acting reciprocating pump having cylinder diameter of 150 mm and stroke 300 mm is used to raise water through a total height of 30m. Find the power required to drive the pump, if the crank rotates at 60 rpm.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Code No: (R17A0061)

Unit-I

1. Define Managerial Economics? Discuss the nature and scope.
2. Explain the concepts of macroeconomic in detailed.
3. What is demand? Explain determinants of demand.
4. What is elasticity of demand? Discuss measurements of elasticity of demand.
5. How do you describe demand forecasting? Explain different methods of demand forecasting.
6. What are those factors governing demand forecasting?
7. Explain different types of elasticity of demand with suitable examples.
8. What is law of demand? Explain exceptions of law of demand.

Unit-II

1. What is production? Discuss the process of production in detailed.
2. Describe production function with a suitable example.
3. What is the difference between isocost and isoquats? Explain with tabular format.
4. Discuss Cobb-Douglas production function.
5. Briefly discuss internal and external economies of scale in an organization.
6. How do you describe cost? Explain different cost concepts.
7. What is BEP? Explain in a graphical presentation.
8. From the following data you are required to calculate:
   i. Margin of safety
   ii. Total Sales
   iii. Variable Cost from the following figures:

Fixed Costs Rs. 48,000 Profit Rs. 12,000 Break-Even Sales Rs. 72,000

Unit-III

1. What is competition? Explain the features of perfect competition.
2. What is the difference between monopoly and monopolistic competition?
3. Define pricing. What are the main objectives of setting a price?
4. Discuss different methods used in pricing.
5. What is partnership firm? Explain the features of it.
6. How business organizations changing its activities in post-liberalization scenario?
7. Discuss the characteristics of sole proprietorship firms?
8. What is the difference between public and private company?

Unit-IV

1. What is capital? Explain types of capital in order to estimate the capital?
2. Discuss various methods and sources of raising finance.
3. What is the significance of capital?
4. How do you estimate fixed and working capital requirements?
5. What is accounting cycle? Explain conventions of accounting.
6. Discuss capital and cash budget in detailed.
7. What is accounting? Explain concepts of accounting.
8. Prepare the formats of Profit and Loss account and Balance Sheet.

Unit-V

1. What is ARR (Accounting Rate of Return)? How it is used capital budget?
2. A company has an investment opportunity costing Rs. 3, 00,000 with the following expected net cash flows:

Year	1	2	3	4	5
CFAT	48,000	66,000	82,000	98,000	1,15,000

Using 10% as the rate of discount determine the following:

a) Net Present Value b) Pay Back Period

3. Explain the methods of capital budgeting with their merits and demerits.
4. Discuss the different between NPV and Payback Period.
5. Explain various types of ratios.
6. The following is the balance sheet of XYZ Ltd., as on 31st March, 2018.

Liabilities	Amount (Rs)	Assets	Amount (Rs)
Equity Share Capital	20,00,000	Land and Buildings	30,00,000
8% Preference Share Capital	30,00,000	Furniture and Fixtures	20,00,000
General Reserves	5,00,000	Machinery	40,00,000
Profit and Loss	3,00,000	Goodwill	6,00,000
Bank Loan	15,00,000	Cash in Hand	1,00,000
5% Debentures	25,00,000	Cash at Bank	80,000
Creditors	7,00,000	Debtors	8,50,000
Bills Payables	3,00,000	Closing Stock	3,00,000
Outstanding Expenses	2,00,000	Bills Receivables	45,000
		Pre-paid Expenses	25,000
Total	1,10,00,000	Total	1,10,00,000

Calculate:

a) Current Ratio b) Quick Ratio c) Debt-Equity Ratio

d) Proprietary Ratio e) Inventory to Working Capital f) Current Assets to Fixed Assets

PRODUCTION TECHNOLOGY

UNIT-I

1. Explain the principle of gating system. Explain the function of chaplets in foundry?

   OR

   Name and describe the casting process that is widely used for making cast iron pipes?

2. What is flux generally used in gas welding? What characteristics are required for a flux?

   OR

   Differentiate between “leftward” and “rightward” technique used in horizontal welding. How they affect the speed and quality of weld?

3. Compare among cold, warm and hot working of metals?

   OR

   Explain the terms strain hardening, recovery and recrystallization in detail?

4. Compare among cold, warm and hot working of metals?

   OR

   Explain the possible defects in rolling and suggest suitable remedies?

5. Compare hot spinning and cold spinning?

   OR

   Sketch and explain wire drawing process?

UNIT-II

1 With the help of suitable diagrams discuss the following casting methods.
(a)True-Centrifugal casting
(b)Semi Centrifugal casting
(c) Centrifugal Casting

(OR)

What is permeability and why is it important in molding sands?

2. List and explain the destructive tests applied in welding?

(OR)

Explain the process of thermit welding. Where would you recommend it? State and explain clearly the controlling parameters that influence the thermit welding?

3. Explain the function of planetary hot rolling process?

(OR)

(b) How does metal act above its re-crystallizationin temperature? State the advantages of hot working over cold working?

(c)

4. Explain the coining operation with a neat sketch?

(OR)

Describe briefly the deep drawing operation with a neat sketch? And discuss its advantages and applications?

5. What are the similarities and differences between piercing and blanking?

(OR)

Explain the process of tube drawing with a neat sketch

UNIT-III

1. What are split and multi piece patterns? What are the advantages of making them in two or more pieces? Give examples

(OR)

Discuss the importance of feeding distance, location, neck size and directional solidication in riser design.

2. Explain various resistance welding processes?

(OR)

Write about gas welding equipment.

3. What is the main advantage of Injection moulding for thermoplastics parts as compare to hot compression moulding?

(OR)

Explain the method used for processing of Bottle, oatable objects of thermoplastics? With neat sketch? State its advantages

4. Why are heat-treatments given to forged components ? Explain Annealing, Hardening, tampering in relation to forging?

(OR)

List the di erent stages in the drop forging processes in production of a component such as a spanner?

5. List the advantages of forging of metals? Why is press forging preferred over hammer forging processes

(OR)

Explain a closed-die-forging operation in comparison to open-die-forging? Dis-cuss the main advantages of forging over casting (or) welded parts?

UNIT-IV

1) . Explain the elements of gating system?

(OR)

Explain the advantages, limitations and applications of casting process

2) Explain the working principle, advantages and limitations of TIG welding?

(OR)

Differentiate between soldering and brazing

3) Explain about types of extrusion process?

(OR)

Types of forging process

4) Explain about different types of forging hammers?

(OR)

Explain about different types of forging defects

5) Explain About Different Types Of Rolling Mills?

(OR)

What is meant by hot working and cold working?

UNIT-V

1) explain about permanent mould casting

(OR)

Explain the working principle of Blast furnace?

2) What are some of the commonly used shielding gases in gas tungsten arc process? Explain their characteristics.

(OR)

Explain about Laser beam welding?

3) Differentiate thermosetting plastic and thermo plastic?

(OR)

Differentiate between hot worked and cold worked parts?

4) What are the important considerations to be taken while designing plastic parts? Discuss?

(OR)

Explain various types of drawing operations?

5) Explain different sheet metal operations?

(OR)

What is the basic difference between extrusion and drawing?

THERMAL ENGINEERING

UNIT-I

1. Differentiate between air standard cycles and actual cycles.
2. List out the various losses and explain.
3. What are the assumptions made on air standard efficiency?
4. Write notes on loss due to gas exchange process and pumping losses.
5. Write the differences between fuel-air cycle and actual cycles.
6. What are the factors which influence the volumetric efficiency?
7. a) With a neat diagram explain the working principle of a four stroke CI engine.
   b) Draw the Valve timing diagram and explain.
8. a) With a line diagram explain fuel injection system used in a CI engine.

   b) With a neat sketch explain the working principle of a modern carburetor.
9. a) With a neat diagram explain the working of a Battery coil ignition system.

   b) Describe the working of pressurized lubrication system.
10. a) With a neat diagram explain the working of fuel atomizer.

    b) Explain the working of a two stroke SI engine.

UNIT-II

1. Explain the combustion phenomenon of SI engine. Describe briefly about the turbulence in SI engines.
2. What is normal combustion and abnormal combustion? Explain the phenomenon of knocking in SI engine.
3. Explain the combustion phenomenon of CI engine. Describe briefly about the fuel requirement and fuel rating.
4. Discuss the factors which affect the combustion in SI engine. Explain briefly about the combustion chambers used in SI engines.
5. Describe the phenomenon of knocking in SI engine. How it can be controlled?
6. What is delay period in CI engines? Explain the factors which influence the delay period.

UNIT-III

1. a) Define the following terms i) Brake Power ii) Indicated Power iii) Friction power iv) Brake thermal efficiency v) Mechanical efficiency.
   b) Describe the method of determination of air consumption in IC engine.
2. a) Explain briefly about rope brake dynamometer.
   b) What are the different methods used in CI engine to create turbulence in the mixture? Explain its effect on power output and thermal efficiency of the engine.
3. a) Describe briefly about heat balance sheet.
   b) Describe the method commonly used in laboratory for measuring the air supplied in an IC
   engine.

4. The power output of an I.C. engine is measured by a rope brake dynamometer. The diameter of brake pulley is 700N-m and the rope diameter is 25mm. The load on the light side of the rope is 50kg and spring balance reads 50N. The engine running at 900rpm consumes fuel of calorific value of 44,000kJ/kg at a rate of 4kg/h. Calculate i) Brake specific fuel consumption and ii) Brake thermal efficiency
5. The following details were recorded in a 4 cylinder, 4 stroke engine bore=100mm, stroke =120mm, speed=1600rpm, fuel consumption = 0.2kg/min, calorific value of fuel=44Mj/kg, difference in either side of the pulley is 40kg, brake circumference is 300cm. If the mechanical efficiency is 80% calculate i) Brake thermal efficiency ii) Indicated thermal efficiency iii) Indicated mean effective pressure iv) Brake specific fuel consumption.
6. From the data given below calculate indicated power, brake power and draw a heat balance sheet for a two stroke diesel engine run for 20 minutes at full load R.p.m =350,m.e.p=3.1 bar,NET brake load=640 N,Fuel consumption=1.52 kg,Cooling Water =162 kg,Water inlet Temperature=30^{o}C, Water outlet Temperature=55^{o}C,Air used/Kg of fuel=32Kg, Room temperature=20^{o}C, Exhaust temperature=305^{o}C,Cylinder Bore=200mm, cylinder stroke =280mm, Brake diameter=1m, CV of fuel = 43900kJ/kg. steam formed per kg of fuel in exhaust = 1.4kg, specific heat of steam in exhaust2.09kJ/kg-k, specific heat of exhaust gases=1kJ/kg-k.

7. During the trial on a single cylinder, four stroke, diesel engine the following are noted: Load on hydraulic dynamometer=950N; Dynamometer constant=7500; Fuel used per hour=10.5kg/hr; calorific values of fuel=50000kJ/Kg, Engine speed=400rpm; calculate brake thermal efficiency of the engine?

UNIT-IV

1. State how the air compressors are classified? Explain the working of roots blower. Write the applications of compressed air.
2. Draw the velocity diagram of an axial flow compressor? What do you mean by multistage compression? And state its advantages.
3. Compare between reciprocating and rotary compressors? Define the terms i) Volumetric efficiency ii) mechanical efficiency iii)clearance ratio
4. An air compressor takes in air at 1 bar and 20 ^{0} C and compresses it according to law $pv^{1.2}$ = constant .It is then delivered to a receiver at a constant pressure of 10 bar. R=0.287 KJ/Kg K. Determine: (i) Temperature at the end of compression (ii) Work done and heat transferred during compression per kg of air.
5. A two cylinder single acting air compressor is to deliver 16kg of air per min at 7 bar from suction conditions 1bar and 15^{o}C. Clearance may be taken as 4% of stroke volume and index for both compression and expansion as1.3. Compressor is directly coupled to a 4 cylinder 4 stroke petrol engine which runs at 2000rpm with a brake mean effective pressure of 5.5bar. Assuming a stroke bore ratio of 1.2 for both engine and compressor and a mechanical efficiency of 82% for compressor, calculate the required cylinder dimensions.

UNIT-V

1. Explain with a neat diagram about the working of centrifugal air compressor with velocity diagram.
2. Define the terms i) slip factor ii) Power input factor iii) Pressure coefficient iv) Diffuser efficiency. Explain the working of an axial flow compressor with a neat sketch?
3. Compare between axial flow and centrifugal compressors. List out the losses in a centrifugal compressor.
4. Describe briefly about surging and choking of compressors.
5. A centrifugal compressor used as a supercharger for aero-engine handles 150kg/min of air. The suction pressure and temperature are 1 bar and 290K. The suction velocity is 80m/s. After compression in the impeller the conditions are 1.5 bar and 345Kand 220m/s. Calculate i) Isentropic efficiency ii) power required to drive the compressor. iii) the overall efficiency of the unit. It may assume that KE of air gained in the impeller is entirely converted into pressure in the diffuser.
6. An axial flow compressor with an overall isentropic efficiency of 85% draws air at 20^oC and compresses it in the pressure ratio of 4:1. The mean blade speed and flow velocity are constant throughout the compressor. Assuming 50% reaction and taking blade velocity as 180m/s and work input factor as 0.82, calculate i) Flow velocity ii) Number of stages take $\alpha_1=12^o$ and $\beta_1=42^o$