COURSE COVERAGE SUMMARY A.Y:2019-20

III YEAR B. TECH II SEMESTER (A-SECTION)	MACHINE DESIGN - II (R17A0319)

UNIT-1

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Types of Journal Bearings	A Text Book of MACHINE DESIGN by S. Md. Jalaludeen	17.1-17.2
2	Lubrication		17.6-17.10
3	Bearing Modulus		17.12-17.16
4	Full and partial bearings, Clearance ratio		17.3-17.4
5	Heat dissipation of bearings		17.14-17.16
6	Bearing Materials		17.4-17.5
7	Journal bearing design		17.18-17.20
8	Ball and roller bearings		18.1-18.10
9	Static loading of ball and roller bearings		18.11-18.17
10	Bearing life		18.18-18.20
11	Problems on Journal Bearings		17.27-17.37
12	Problems on ball and roller bearings		18.31-18.44

ASSIGNMENT QUESTIONS:

- The load on the journal bearing is 150 kN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following :
  1. Length of the bearing if the allowable bearing pressure is 1.6 N/mm2, and
  2. Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60°C and viscosity of the oil at 60°C is 0.02 kg/m-s and the bearing clearance is 0.25 mm.

- A ball bearing subjected to a radial load of 5 kN is expected to have a life of 8000 hours at 1450 r.p.m. with a reliability of 99%. Calculate the dynamic load capacity of the bearing so that it can be selected from the manufacturer's catalogue based on a reliability of 90%.

- A 100 mm long and 60 mm diameter journal bearing supports a load of 2500 N at 600 r.p.m. If the room temperature is 20°C, what should be the viscosity of oil to limit the bearing surface temperature to 60°C? The diametral clearance is 0.06 mm and the energy dissipation coefficient based on projected area of bearing is 210 W/m^2/°C.

- Select single row deep groove ball bearing for an application in which the radial load is 2000 N and axial is 1000N during 90 per cent of the time and radial of 8000 N with axial load of 5000N during the remaining 10 per cent. The shaft is to rotate at 150 r.p.m. Life of the bearing is 5000 hours. Also find the life of the selected bearing with 95% reliability.

- Select a ball bearing to carry satisfactorily a 65 kN radial load together with 10 kN of thrust load. The journal supported by the bearing rotates at 1400 rpm for an estimated 0.1 million hours of life. The journal diameter is 100 mm. 5 M b) A 80 mm long journal bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of the oil is 0.021 kg / m-s at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed.

- Following data is given for a 3600 hydrodynamic bearing. Journal diameter=100mm, bearing length=100mm, radial load=50kN, journal speed=1440 rpm, radial clearance=0.12 mm, viscosity

of lubricant =16 Cp. Calculate: i) Minimum oil film thickness, ii) Coefficient of friction and iii) Power lost in friction.

- A single row deep groove ball bearing No.6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. Find the expected life that 50 % of the bearings will complete under this condition.
- A Ball bearing works on the following work cycle

Element No.	Radial Load (N)	Speed (r.p.m)	Element time (%)
1	3000	720	30
2	7000	1440	40
3	5000	900	30

The dynamic load capacity of the bearing is 16600N. Calculate
(a) The average speed of rotation
(b) The equivalent radial load
(c) The bearing life.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:
  https://www.youtube.com/watch?v=ALPKXoclcaw
  https://www.youtube.com/watch?v=64EfZpMuOho
  https://www.youtube.com/watch?v=RLo6hHfOb3c
  https://www.youtube.com/watch?v=gcHM8iiZ2Ws
  https://www.youtube.com/watch?v=ePVReO5pRvU
  https://www.youtube.com/watch?v=vGl7nQUbWGM
  https://www.youtube.com/watch?v=GevX7x_PxWE
  https://www.youtube.com/watch?v=L1riecGFhaQ

- STUDY MATERIAL: Refer Digital Notes
  https://mrcet.com/downloads/digital_notes/ME/III%20year/MACHINE%20DESIGN%20II.pdf

- PPTs: Refer Digital Notes & also refer
  https://www.slideshare.net/chetanvadodariya/11-bearing-types-and-appl-guidelines

UNIT-2

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Connecting Rod & Thrust in connecting rod		14.1-14.3
2	Stress due to whipping action on connecting rods		14.4-14.6
3	Pistons	A Text Book of MACHINE DESIGN by S. Md. Jalaludeen	14.7-14.8
4	Forces acting on pistons		14.8
5	Construction, Design and proportions of piston		14.9-14.18
6	Problems on Connecting rod and piston		14.18-14.27

DEPARTMENT OF MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS:

- Design a cast iron trunk type piston for a single acting four stroke engine developing 75 kW per cylinder when running at 600 r.p.m. The other available data is as follows: Maximum gas pressure = 4.8 N/mm2 ; Indicated mean effective pressure = 0.65 N/mm^2; Mechanical efficiency = 95%; Radius of crank = 110 mm; Fuel consumption = 0.3 kg/BP/hr; Calorific value of fuel (higher) = 44 x 103 kJ/kg; Difference of temperatures at the centre and edges of the piston head = 200℃; Allowable stress for the material of the piston = 33.5 MPa; Allowable stress for the material of the piston rings and gudgeon pin = 80 MPa; Allowable bearing pressure on the piston barrel = 0.4 N/mm2 and allowable bearing pressure on the gudgeon pin = 17 N/mm^2.

- The following data is given for the piston of a four-stroke diesel engine: Cylinder head = 250 mm Material of piston rings = Grey cast iron Allowable tensile stress = 100 N/mm^2 Allowable radial pressure on cylinder wall = 0.03 MPa Thickness of piston head = 42 mm Number of piston rings = 4. Calculate all the dimensions related to piston and piston rings.

- A connecting rod is required to be designed for a high speed, four stroke I.C. engine. The following data are available. Diameter of piston = 88 mm; Mass of reciprocating parts = 1.6 kg; Length of connecting rod (centre to centre) = 300 mm; Stroke = 125 mm; R.P.M. = 2200 (when developing 50 kW); Possible over speed = 3000 r.p.m.; Compression ratio = 6.8 : 1 (approximately); Probable maximum explosion pressure (assumed shortly after dead centre, say at about 3°) = 3.5 N/mm^2

- Design a CI piston for a single acting four stroke petrol engine of the following specifications :
Cylinder bore = 100mm
Stroke Length =120mm
Maximum gas pressure = 5MPa
Break mean effective Pressure =0.65MPa
Fuel Consumption = 0.17kg/bhp/min Speed =220rpm

- Design a connecting rod of I-cross section for an automobile diesel engine of the following specifications. Diameter of cylinder=100mm Stroke length =125mm Maximum combustion pressure =2.8MPa Maximum engine speed=2000rpm Weight of the reciprocating parts =1.1kg Length of connecting rod between centers=31.5cm Assume an allowable crushing stress =3000kg/cm^2.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:
https://www.youtube.com/watch?v=FkA7rmZdNZw
https://www.youtube.com/watch?v=Wcqwi-2TKr4
https://www.youtube.com/watch?v=r45xO3SGLoY

- STUDY MATERIAL: Refer Digital Notes
https://mrcet.com/downloads/digital_notes/ME/III%20year/MACHINE%20DESIGN%20II.pdf

- PPTs: Refer Digital Notes & also refer
https://www.slideshare.net/karuppusamypitchai/u2-design-of-piston?qid=efb2eb6a-f9c9-4da5-9826-2b798b307f2b&v=&b=&from_search=7

UNIT-3

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Transmission of power by Belt Drives,		21.1-21.33
2	Transmission efficiencies, Flat and V type		22.1-22.27
3	Transmission of power by Rope Drives		24.1-24.23
4	Stresses and deflections of Helical springs	A Text Book of	12.1-12.8
5	Extension and compression rings	MACHINE DESIGN by	12.9-12.15
6	Design of springs for fatigue loading	S. Md. Jalaludeen	12.21-12.24
7	Natural frequency of helical springs		12.15-12.18
8	Energy storage capacity		12.19-12.20
9	Helical torsion Springs		12.25-12.27
10	Problems on Flat belt Drives	A Text Book of	694-710
11	Problems on V-Belt Drives and Ropes	MACHINE DESIGN by R S Khurmi & J K Gupta	731-743

ASSIGNMENT QUESTIONS:

- A V-belt drive system transmits 100 kW at 475 r.p.m. The belt has a mass of 0.6 kg/m. The maximum permissible tension in the belt is 900 N. The groove angle is 38° and the angle of contact is 160°. Find minimum number of belts and pulley diameter. The coefficient of friction between belt and pulley is 0.2.

- An open belt 100 mm wide connects two pulleys mounted on parallel shafts with their centres 2.4 m apart. The diameter of the larger pulley is 450 mm and that of the smaller pulley 300 mm. The coefficient of friction between the belt and the pulley is 0.3 and the maximum stress in the belt is limited to 14 N/mm width. If the larger pulley rotates at 120 r.p.m, find the maximum power that can be transmitted.

- A V- belt drive is used to connect two shafts 1 m apart for transmitting 90 KW at 1200 rpm of a driver pulley. Take effective diameter of driver pulley = 250 mm, effective diameter of drive pulley = 900 mm, coefficient of friction = 0.25, density of the belt material = 1100 kg/m^3, the angle of groove = 400, area of the belt section is 400 mm2 and permissible stress is 2.46 MPa. Calculate the number of belts required and the length of belt.

- Select a suitable wire rope for a vertical mine hoist to lift a load of 10 kN from 60 m deep. The rope should have a factor of safety equal to 6. The weight of the bucket is 5 kN. The load is lifted up with a maximum speed of 150 metres/min which is attained in 1 second.

- Find the width of a Flat belt required to transmit 12 kW at 1600 rpm of motor. The diameter of smaller pulley is 120 mm and that of driven pulley is 300 mm. The angle of contact on smaller pulley is 2.9 radians and larger pulley is 3.38 radians. The coefficient of friction on smaller pulley is 0.4 and for larger pulley is 0.3. The belt used is 8 mm thick and weighs 10 KN/m^2. Allowable tension in belt is 1.75 MPa.

- Two close coiled helical springs are compressed between two parallel plates by a load of 1 kN. The springs have a wire diameter of 10 mm and the radii of coils are 50 and 75 mm. Each spring has 10 coils and is of the same initial length. If the spring is placed inside the larger one such that both the springs are compressed by same amount, calculate (a) the total deflection, and (b) the maximum stress in each spring. Take G = 40 GPa for both the springs.

- A helical spring, in which the slope of the helix may be assumed small, is required to transmit a maximum pull of 1 KN and to extend 10 mm for 200 N load. If the mean diameter of the coil is to be the 80 mm, find the suitable diameter for the wire and number of coils required. Take G = 80 GPa and allowable shear stress as 100 MPa.

DEPARTMENT OF MECHANICAL ENGINEERING

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS: Belts
  https://www.youtube.com/watch?v=nMsB6Soz4Hc&list=PLA5C56D8447F78725&index=9
  https://www.youtube.com/watch?v=Fb4weO0HLxk&list=PLA5C56D8447F78725&index=10
  https://www.youtube.com/watch?v=FfVtpHTeu-8&list=PLA5C56D8447F78725&index=11
  https://www.youtube.com/watch?v=cfAK1bbdtp8
  https://www.youtube.com/watch?v=SI_RoeNEVwg

  Springs:
  https://www.youtube.com/watch?v=QfhIea6KzZA&list=PLA5C56D8447F78725&index=6
  https://www.youtube.com/watch?v=46quOD7V-cQ&list=PLA5C56D8447F78725&index=7
  https://www.youtube.com/watch?v=T4IgtIkBnOo&list=PLA5C56D8447F78725&index=8

- STUDY MATERIAL: Refer Digital Notes
  https://mrcet.com/downloads/digital_notes/ME/III%20year/MACHINE%20DESIGN%20II.pdf

- PPTs: Refer Digital Notes & also refer
  https://www.slideshare.net/sammydude10/springs-10310410?qid=f572ceeb-cc1a-4f4b-8052-411e277fd515&v=&b=&from_search=3
  https://www.slideshare.net/vijay431/belt-drives-126571575?qid=bcc65e59-daf0-4efe-8ceb-30bcf0a9cd26&v=&b=&from_search=5

UNIT-4

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Spur gears		1021-1023
2	Important Design Parameters	Machine Design & R.S. Khurmi & J.K. Gupta	1024-1027
3	Design of gears using AGMA procedure involving Lewis		1036-1039
4	Buckingham equations & Helical gears		1067-1071
5	Check for wear		1042-1044

ASSIGNMENT QUESTIONS:

- What should be the module, face width and number of teeth on each gear of a pair of spur gears, a C45 steel pinion driving a cast iron gear, if they are to transmit 18.75 kW at 700 rev/min of the 0.18m pinion in continuous service? The velocity ratio is 3, the teeth are 200 full depth and the load is smooth. Determine the outside and root diameters.
- Two parallel shafts are connected by a pair of steel helical gears. The power transmitted is 15kW at 4000rpm of the pinion. The safe static strength for the material is 100MPa. Gear ratio is 4:1 Stub teeth with 20^0 pressure angle in diameter plane have helix angle of 45^0. Also calculate the necessary BHN with the standard point of wear. Check the design for dynamic load and suggest modification if necessary. Use 30 teeth on the pinion.
- A pair of 20° full-depth involute tooth spur gears is to transmit 30 kW at a speed of 250 r.p.m. of the pinion. The velocity ratio is 1:4. The pinion is made of cast steel having an allowable static stress, σ_o = 100 MPa, while the gear is made of cast iron having allowable static stress, σ_o = 55 MPa. The pinion has 20 teeth and its face width is 12.5 times the module. Determine the module, face width and pitch diameters of both the pinion and gear from the standpoint of strength only taking velocity factor into consideration.
- A pair of helical gears with 30° helix angle is used to transmit 15 kW at 10 000 r.p.m. of the pinion.

DEPARTMENT OF MECHANICAL ENGINEERING

The velocity ratio is 4 : 1. Both the gears are to be made of hardened steel of static strength 100 N/mm2. The gears are 20° stub and the pinion is to have 24 teeth. The face width may be taken as 14 times the module. Find the module and face width from the standpoint of strength and check the gears for

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:
  https://www.youtube.com/watch?v=CCpFji0RBw0&list=PLSGws_74K01_e499POG3gczxcnlJEHMWE&index=3
  https://www.youtube.com/watch?v=aIWB_E-qOWg
  https://www.youtube.com/watch?v=ULuO1LxTnuI
  https://www.youtube.com/watch?v=4yW5__bAqMU
  https://www.youtube.com/watch?v=sUMZvDv_ADg
  https://www.youtube.com/watch?v=bAh1yRzrYJs&list=PLm_MSClsnwm-QwOu8EkbM7C-DOUB4DxLD&index=45

- STUDY MATERIAL: Refer Digital Notes
  https://mrcet.com/downloads/digital_notes/ME/III%20year/MACHINE%20DESIGN%20II.pdf

- PPTs: Refer Digital Notes & also refer
  https://www.slideshare.net/YashShah328/spur-gear-and-design-of-spur-gear
  https://www.slideshare.net/AMIR92671/design-of-helical-gear-box
  https://slideplayer.com/slide/12099846/

UNIT-5

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Design of screw		624-625
2	Important Terminology		632-635
3	Square, ACME, Buttress thread	Machine Design & R.S. Khurmi & J.K. Gupta	642-643
4	Compound screw		669-673
5	Differential screw		667-673

ASSIGNMENT QUESTIONS:

- A vertical two start square threaded screw of a 100 mm mean diameter and 20 mm pitch supports a vertical load of 18 kN. The axial thrust on the screw is taken by a collar bearing of 250 mm outside diameter and 100 mm inside diameter. Find the force required at the end of a lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20.
- The lead screw of a lathe has Acme threads of 60 mm outside diameter and 8 mm pitch. It supplies drive to a tool carriage which needs an axial force of 2000 N. A collar bearing with inner and outer radius as 30 mm and 60 mm respectively is provided. The coefficient of friction for the screw threads is 0.12 and for the collar it is 0.10. Find the torque required to drive the screw and the efficiency of the screw.
- A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters [10M] Page 3 of 3 of screw

collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm², find: 1. the torque required to rotate the screw; 2. the stress in the screw; and 3. the number of threads of nut in engagement with screw.

- A nut and screw combination having double start square threads nominal diameter 25 mm and pitch 5 mm subjected to axial load of 1000 N. The outer and inner diameter of the screw collar is 50 and 20 mm respectively. The coefficient of friction for collar thread and screw thread are 0.15 & 0.2 respectively. The screw rotates at 12 rpm. Assume uniform wear condition, and allowable bearing pressure is 5.77 N/mm². Determine, i) Power required to rotate the screw ii) Stresses in screw Body & threads iii) No. of threads of nut in engage with screw.

- A machine slide weighing 3000 N is elevated by a double start acme threaded screw at the rate of 840 mm/min. If the coefficient of friction be 0.12, calculate the power to drive the slide. The end of the screw is carried on a thrust collar of 32 mm inside diameter and 58 mm outside diameter. The pitch of the screw thread is 6 mm and outside diameter of the screw is 40 mm. If the screw is of steel, is it strong enough to sustain the load?

- The screw of a press has square threads and is 60 mm nominal diameter. The maximum unsupported length is 40 mm. The screw is made of 25C4 steel and the nut is of phosphor bronze. Determine the capacity of the press and length of the nut. If the coefficient of friction for the threads is 0.15 and 0.14 for the thrust collar, determine the necessary torque, taking outside and inside diameter of thrust collar to be 100 mm and 30 mm respectively.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:
  https://www.youtube.com/watch?v=TiAuAf6cZUM&list=PL3D4EECEFAA99D9BE&index=18
  https://www.youtube.com/watch?v=GfbcxJmjn9s
  https://www.youtube.com/watch?v=HZJv_MoJhdk

- STUDY MATERIAL: Refer Digital Notes
  https://mrcet.com/downloads/digital_notes/ME/III%20year/MACHINE%20DESIGN%20II.pdf

- PPTs: Refer Digital Notes & also refer
  htqetps://www.slideshare.net/rajjyotiroy/power-screw-69459821
  https://www.slideshare.net/vishalmuttagi/design-of-power-screw

COURSE COVERAGE SUMMARY A.Y:2019-20

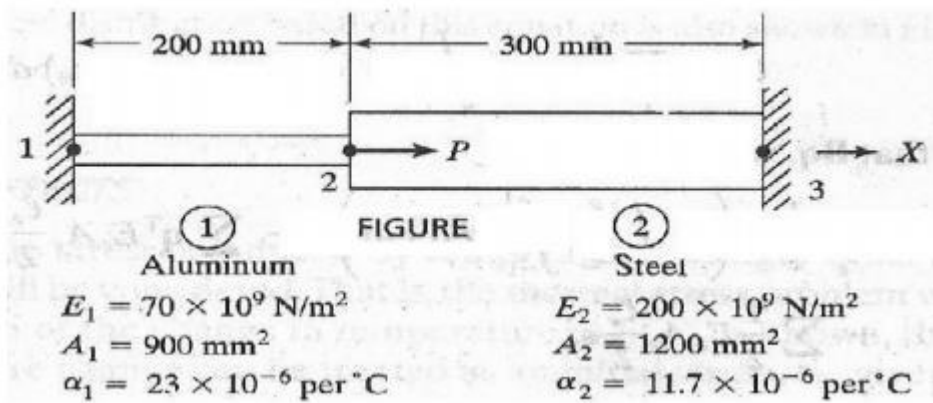| III YEAR B. TECH II SEMESTER (B-SECTION)	FINITE ELEMENT METHOD (R17A0320)

UNIT-1

| S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain – Displacement relations. Stress – strain relations.	Finite Element analysis & S.S.Bhavikatti	9-18
2	Advantages, Disadvantages and applications of FEM	Finite Element Analysis **in Engineering &** S.Md.Jalaludeen	
3	Finite element modeling coordinates and shape functions. Potential Energy approach : Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.		

ASSIGNMENT QUESTIONS:

1. For the three-stepped bar shown in Figure, determine the nodal displacements, nodal forces and stresses in the elements.
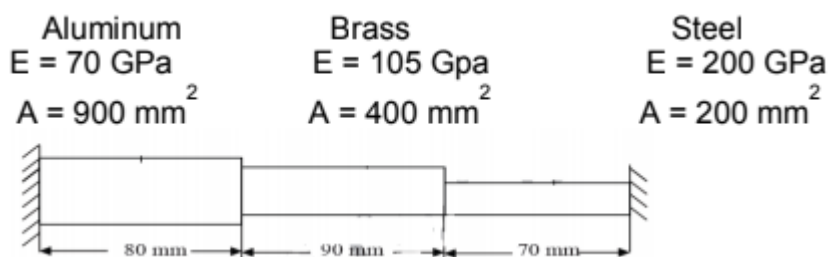

2. Derive the equations of equilibrium for 3-D Body
3. What is FEM? What are applications of FEM? What are Advantages and Disadvantages of FEM
4. Explain Rayleigh's Ritz Method?
5. Explain Weighted residual method
6. An axial load P=300X103N is applied at 20^0 C to the rod as shown in Figure below. The temperature is the raised to 60^0 C .a) Assemble the K and F matrices.

   b) Determine the nodal displacements and stresses.

Aluminum
$E_1 = 70 \times 10^9 \text{ N/m}^2$
$A_1 = 900 \text{ mm}^2$
$\alpha_1 = 23 \times 10^{-6} \text{ per } ^\circ C$

Steel
$E_2 = 200 \times 10^9 \text{ N/m}^2$
$A_2 = 1200 \text{ mm}^2$
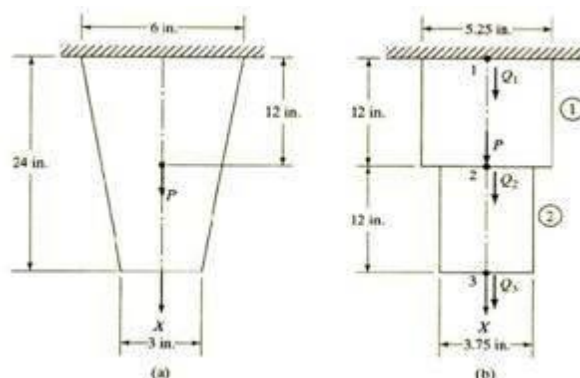$\alpha_2 = 11.7 \times 10^{-6} \text{ per } ^\circ C$

7. Explain the Steps involved (Discretization) in FEM

8. Explain the Concept of Minimum Potential Energy approach

9. Determine the nodal displacement and Element stresses for axially loaded bar as shown in the Fig. Consider axial load P = 2KN
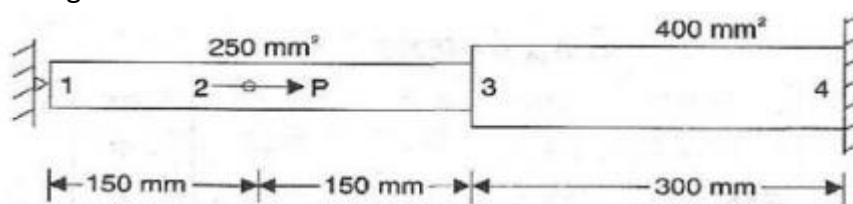
10. Determine the nodal displacements, element stresses and support reactions for the bar as shown in Figure. Take $E = 200 \times 10^9 \text{ N/m}^2$
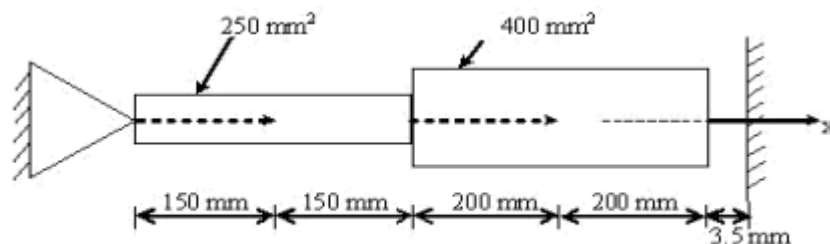
11. If a displacement field is described by u = (- 9x³ y²+ 25 x² y³) v = (10 x³ + 20 y³ − 8 x² y²) Determine the e_x, e_y, and γ_{xy} at the point x = 2, y = 4 also find the stresses ×µµµf_x ,f_y for plane stress condition if E = 2.1 x 10⁵N/mm², µ = 0.30.

12. Evaluate the stresses in each element Determine the reaction force at the support. Consider 1in=1cm for SI UNITS

ADDITIONAL RESOURSES:

- NPTEL VIDEO LINKS:

https://nptel.ac.in/courses/112/106/112106135/
https://www.youtube.com/watch?v=UOp6JEiJctA
https://www.youtube.com/watch?v=A3eVp1_SEXY
https://www.youtube.com/watch?v=57cmCLaQ8Ks
https://www.youtube.com/watch?v=MDUzkxK99Ec
https://www.youtube.com/watch?v=T6qMGdGuJvY

- STUDY MATERIAL: Contents available in digital Notes.
- PPTs: PPT available in digital Notes

UNIT-2

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Analysis of Trusses: Stiffness matrix for plane truss element, Stress calculations and problems.	Finite Element Analysis **in Engineering &** S.Md.Jalaludeen	
2	Truss problems with Temperature effects		
3	Analysis of Beams: Stiffness matrix for plane truss element, Stress calculations and problems.		

ASSIGNMENT QUESTIONS:

1. Determine the shape functions for 4 – nodded quadrilateral element.
2. For a beam and loading shown in fig., determine the slopes at 2 and 3 and the vertical deflection at the midpoint of the distributed load.
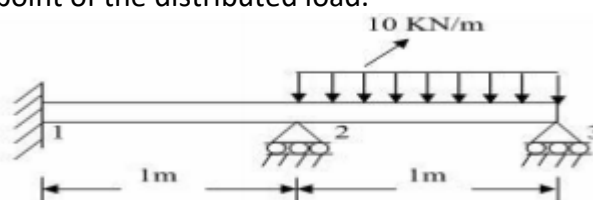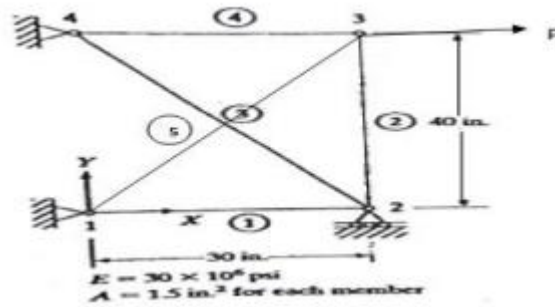

3. Calculate the stiffness matrix, stresses and reactions in the truss structure shown in Figure
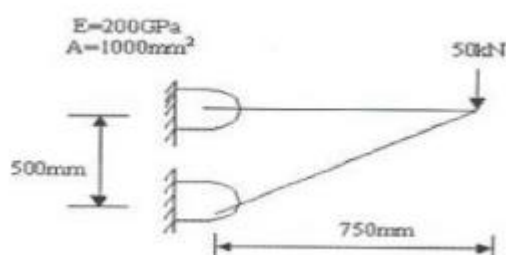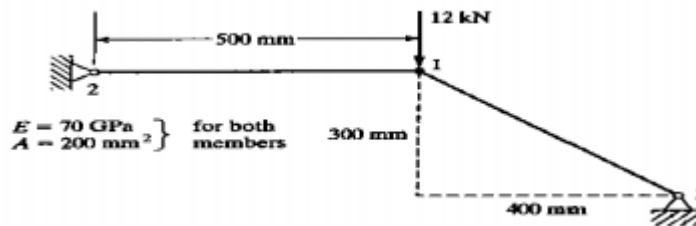

4. Derive the stiffness matrix for truss and beam as shown in figure and P= 30KN
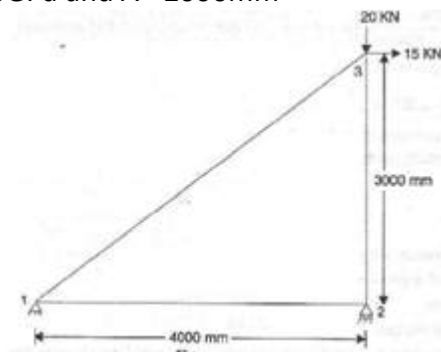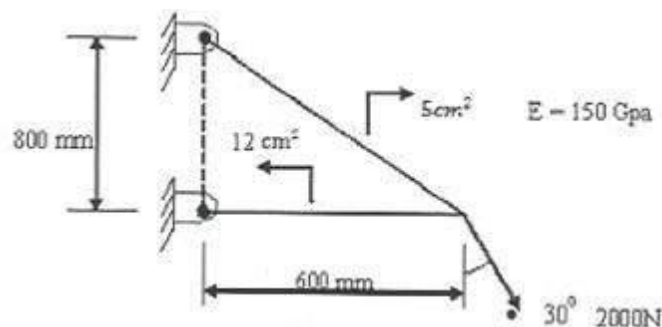
5. Consider the truss shown in Fig.. Determine the displacement and stress in each truss member. Find element Stresses also.

6. Obtain the forces in the plane Truss shown in Figure below and determine the support reactions also. Take E=200GPa and A= 2000mm^2

7. Calculate the nodal displacement, stresses and support reactions for the truss shown in figure

8.

ADDITIONAL RESOURSES:

- NPTEL VIDEO LINKS:

https://www.youtube.com/watch?v=yfyElneBW98
https://www.youtube.com/watch?v=z3bgQdRShO0
https://www.youtube.com/watch?v=JphRVN9Eezc
https://www.youtube.com/watch?v=m5Ng0C5ZFJ8

DEPARTMENT OF MECHANICAL ENGINEERING

https://www.youtube.com/watch?v=TUHIzqELwmg

https://www.youtube.com/watch?v=m5Ng0C5ZFJ8

- STUDY MATERIAL: Contents available in digital Notes.
- PPTs: Available in digital Notes

UNIT-3

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Finite element modeling and CST	1.Finite Element Methods Belugondu & Chandraputla 2. Finite Element Analysis **in Engineering &** S.Md.Jalaludeen	
2	Two dimensional stress analyses with CST		
3	CST element and treatment of boundary conditions. Convergence requirements	Finite Element Analysis **in Engineering &** S.Md.Jalaludeen	
4	Axi-symmetric loading with triangular elements derivation		
5	Axi-symmetric loading with triangular elements problems		

ASSIGNMENT QUESTIONS:

1. a.) Write the difference between CST and LST elements

   b) For point P located inside the triangle shown in the figure below the shape functions N1 and N2 are 0.15 and 0.25, respectively. Determine the x and y coordinates of point P.
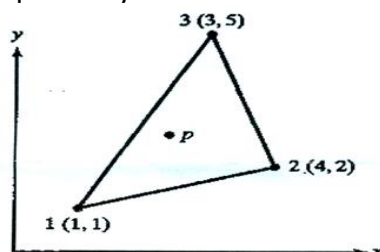
2. For the plane stress element shown in Fig, the nodal displacements are u_1 = 2.0 mm, v_1 = 1.0 mm, u_2 = 0.5 mm, v_2 = 0.0 mm, u_3 = 3.0 mm, v_3 = 1.0 mm and consider Young's Modulus E = 210 GPa, Poisson's ratio v = 0.25 and uniform plate thickness t = 10 mm. Determine the element stresses σ_x, σ_y, τ_{xy}, σ_1 and σ_2 and the principal axis angle θ_p.


(50,100)
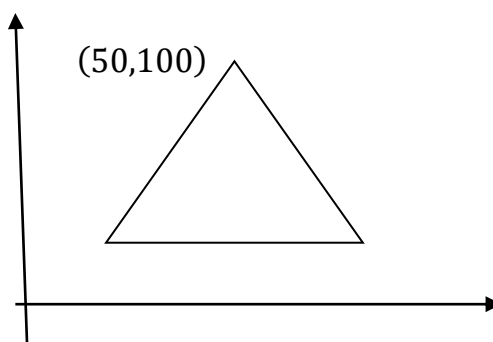
(30, 20)   (80, 20)

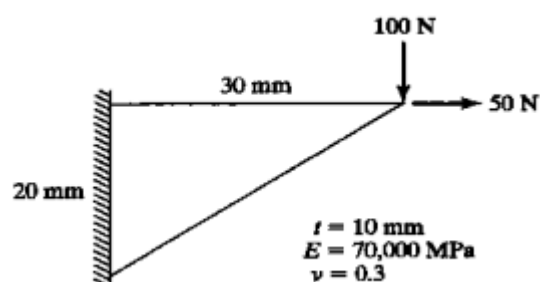**3.** Differentiate between Axi- symmetric elements and symmetric elements with suitable examples.

4. a.) Derive the Shape Functions N_1, N_2 and N_3 for a plane triangular element.

b.) Compute the strain displacement matrix and also the strains of a axi-symmetric triangular element with the coordinates r_1 = 30 mm, z_1 = 40 mm, r_2 = 60 mm, z_2 = 50 mm, r_3= 50 mm, z_3 = 80 mm. The nodal displacement values are u_1 = 0.01 mm, w_1 = 0.01 mm, u_2 = 0.01 mm, w_2 = -0.04 mm, u_3 = -0.03 mm, w_3 = 0.07 mm

5. Explain the methodology to estimate the stiffness matrix of four nodded Quadrilateral element.

b) Evaluate $\int [e^{2x} + x^3 + 1 / (x^2 + 2)] dx$ over the limits -1 and +1 using one point

6.   An axi-symmetric triangular element is subjected to the loading as shown in fig. the load is distributed throughout the circumference and normal to the boundary. Derive all the necessary equations and derive the nodal point loads.
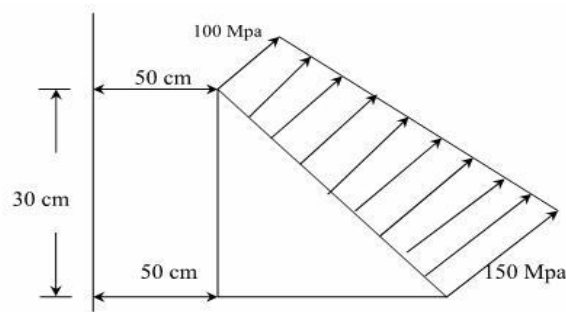
7. Evaluate the element stiffness matrix for the triangular element shown under plane strain condition. Assume the following values E=200 GPa, µ=0.25, t=1 mm
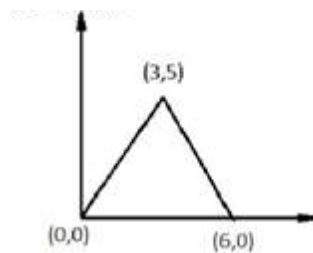
8. For the triangular plane structure given in Fig, determine the deflection at the point of load application using a one-element model. If a mesh of several triangular elements is used, comment on the stress values in the elements close to the tip.

ADDITIONAL RESOURSES:

- NPTEL VIDEO LINKS:
  https://www.youtube.com/watch?v=m6u4lOK6RyY
  https://www.youtube.com/watch?v=DCGm0qgIXcs
  https://www.youtube.com/watch?v=Bf1ZiBwAFQw

  - STUDY MATERIAL: Contents available in digital Notes.
  - PPTs: Available in digital Notes

UNIT-4

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Two dimensional four node and iso-parametric elements derivation & problems	Finite Element Analysis **in Engineering &** S.Md.Jalaludeen	
2	Numerical integration		
3	Heat transfer analysis introduction		
4	One dimensional steady state analysis composite wall.		
5	One dimensional fin analysis		
6	Two dimensional analysis of thin plate.		
7	Problems		

ASSIGNMENT QUESTIONS:

1. Derive the shape functions of two dimensional four nodded iso-parametric element. Plot the shape functions
2. Explain the formulation of 4-noded Iso-parametric axi-symmetric element and derive the stiffness matrix.
3. Explain plane stress and plane strain conditions with suitable examples.
4. For the element shown in the figure, assemble Jacobian matrix and strain displacement matrix
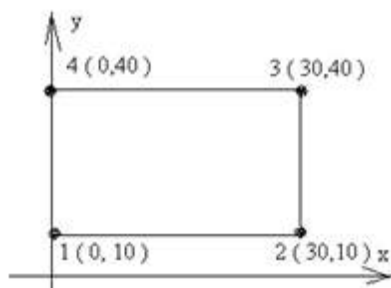
5. For the Iso-parametric quadrilateral element shown in fig , determine the local co-ordinates of the point P whose Cartesian co=ordinates as(6,4)

node	x	y
1	2	1
2	5	2
3	7	6
4	1	5
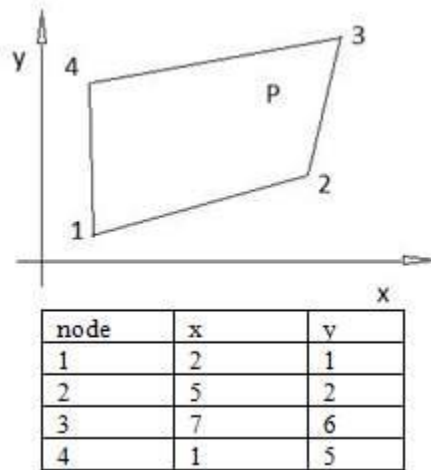
6. The composite wall consists of three materials shown in figure. The inside wall temperature is at 200^0C and the outside air temperature is 50^0C with a convection coefficient of 10 W/m2 ^0C.Determine the temperature along the composite wall
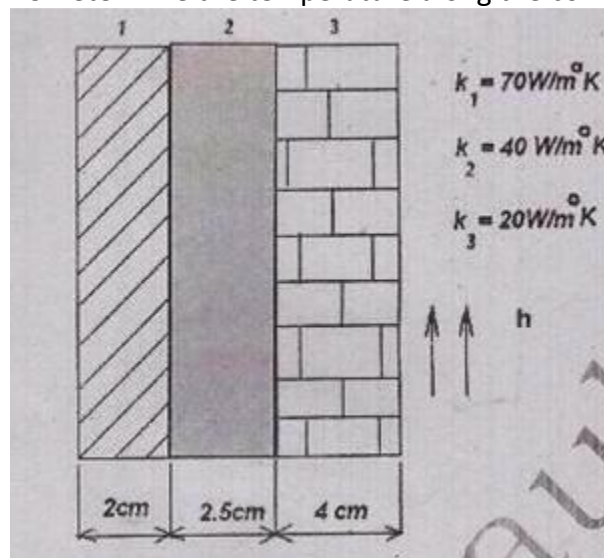
7. Derive one dimensional steady state heat conduction equation

ADDITIONAL RESOURSES:

- NPTEL VIDEO LINKS:
  https://www.youtube.com/watch?v=mf-eSiS9oWg
  https://www.youtube.com/watch?v=3WtCixoFHIY
https://www.youtube.com/watch?v=PhedVyx_G8o

- STUDY MATERIAL: STUDY MATERIAL: Contents available in digital Notes.
- PPTs: Available in digital Notes

DEPARTMENT OF MECHANICAL ENGINEERING

UNIT-5

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Dynamic Analysis introduction	Finite Element Analysis **in** **Engineering &** S.Md.Jalaludeen	
2	Formulation of finite element model		
3	Elemental Stiffness matrices,		

ASSIGNMENT QUESTIONS:

1. Determine the Eigen values and Eigen Vectors for the stepped bar as shown in Figure, take density as 7850 kg/m^3 and E= 30X10^{6}N/m^2?

2. Define a.) Eigen value and Eigenvector b.) Dynamic analysis

3. Determine natural frequencies and corresponding mode shapes for the figure
4. Take L$_1$=1m, L$_2$=2m, A$_1$=2m^2, A$_2$=1m^2, ρ = 7850 kg/m^3, E = 200Gpa
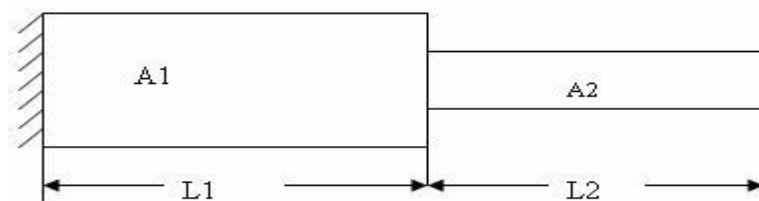
4. Consider axial vibration of the steel bar shown in Figure.6,
    i)   Develop the global stiffness and mass matrices
    ii) Determine the natural frequencies and mode shapes using the characteristic
   Polynomial technique.
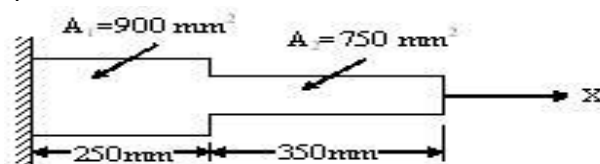
5. Write short note on a.) Eigen vectors for a stepped beam   b.) Evaluation of Eigen values

6. Determine natural frequencies for a Steel bar as shown in figure.
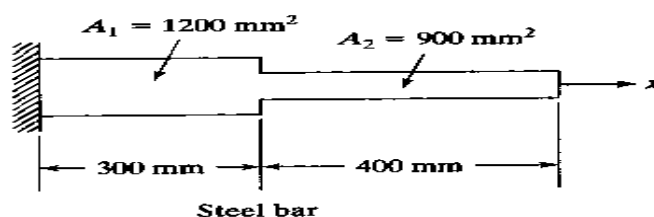
7. a.) Write a short note on damping.

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b.) Consider axial vibration of the steel bar shown in Figure., Develop the global stiffness and mass matrices Determine the natural frequencies and mode shapes using the characteristic polynomial technique
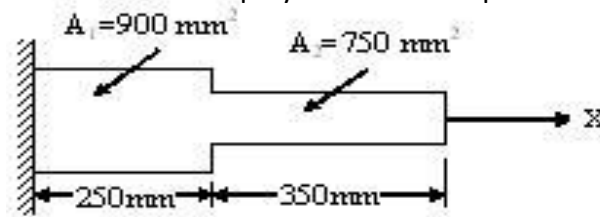
8.) Consider axial vibration of the steel bar shown in Fig. a) Develop the global stiffness and mass matrices b) By hand calculations, determine the lowest natural frequency and mode shape 1and 2

E=70,000 MPa
v =0.3
ρ =7840 Kg/m³
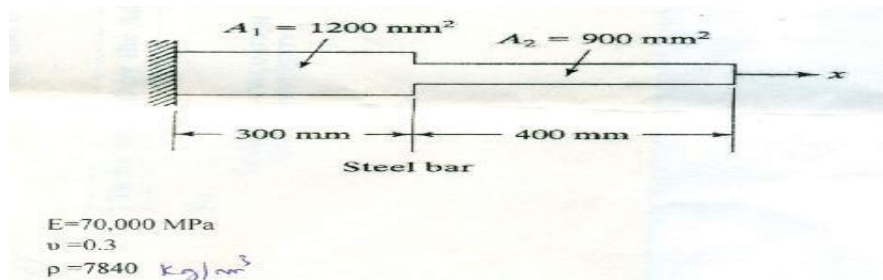
9.) Write the step by step procedure to determine the frequencies and nodal displacements of the steel cantilever beam shown in Figure.
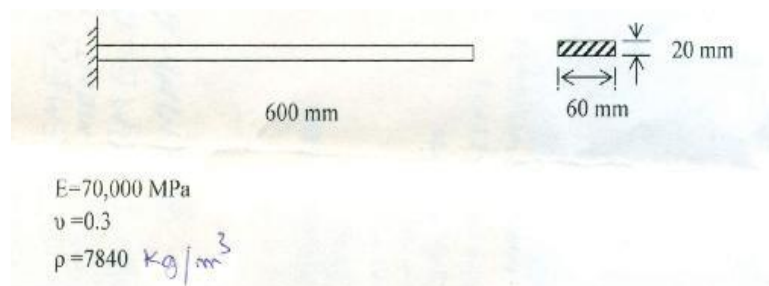
E=70,000 MPa
v =0.3
ρ =7840 Kg/m³

ADDITIONAL RESOURSES:

- NPTEL VIDEO LINKS:
https://www.youtube.com/watch?v=w-TDsOqJ5gw
https://www.youtube.com/watch?v=NuX7SUElOXU
- STUDY MATERIAL: STUDY MATERIAL: Contents available in digital Notes.
- PPTs: Available in digital Notes

COURSE COVERAGE SUMMARY A.Y:2019-20	
III YEAR B. TECH II SEMESTER (A-SECTION)	HEAT TRANSFER (R17A0321)

UNIT-1

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Basic modes of heat transfer	Heat Transfer – RC Sachdeva	2,3
2	Heat conduction equations	Heat Transfer – RC Sachdeva	25 to 34
3	Steady state one dimensional heat conduction solutions for plain and composite slabs	Heat Transfer – YVC Rao	23 to 51
4	Critical thickness of insulation	Heat Transfer – YVC Rao	54
5	Heat conduction through fins	Heat Transfer – RC Sachdeva	96 to104
6	Fin effectiveness and efficiency	Heat Transfer – RC Sachdeva	110 to 113

ASSIGNMENT QUESTIONS:

- Describe briefly about the modes of heat transfer.
- Derive conduction equations in Cartesian, cylindrical and spherical coordinates.
- A hollow cylinder 5cm ID and 10cm OD has an inner surface temp. of 200C and an outer surface temperature of 100C. Determine the temperature of the point halfway between the inner and outer surfaces. If the thermal conductivity of cylinder material is 70W/m-K determine the heat flow through the cylinder per linear meter.
- The door of a cold storage plant is made from two 6mm thick glass sheets separated by a uniform air gap of 2mm. The temperature of air inside the room is -20C and the ambient air temperature is 30C. Assuming the value of h between air and glass is 23.26W/m2K. Determine the rate of heat leakage into the room per unit area of the door. Neglect convection coefficients in the air gap
- Hot air at a temperature of 65^0C is flowing through a steel pipe of 120mm diameter. The pipe is covered with two layers of different insulting materials of thickness 60 mm and 40 mm, and their corresponding thermal conductivities are 0.24 and 0.4 W/m^0 C. The inside and outside heat transfer coefficients are 60&12 W/m^0 C respectively. The atmosphere is at 20^0C. Find the rate of heat loss from 60 m length of pipe.
- A Circumferential aluminum Fin of 1mm thick and 1.5cm long are soldered to 2.5 cm OD of pipe. The fin base temperature is 170^0C and ambient fluid temperature 25^0C. Estimate the heat loss per fin. The heat transfer coefficient h taken as 130 W/m^{2}K
- Compare the efficiency of a plate fin of length L=1.5cm and thickness 2mm for the following two cases. (i) Fin material is aluminum, k=210W/m-K and h=285W/m2-K.   (ii) Fin material is steel k=40W/m-K and h=510W/m-K.
- A composite slab is made of three layers 15cm, 10cm and 12cm thickness,. The first layer is of material with thermal conductivity 1.45 for 60% of the area and the rest is of material with conductivity of 2.5 W/mK. The second layer is made of material with conductivity of 12.5 W/mK for 50% area and of material with conductivity 18.5 W/mK is used for the other 50%.

The third layer is of signal material of thermal conductivity 0.76 W/mK. The slab is exposed on one side to warm air at 26^0C and to cold air at -20^0C on the other side. The convection coefficient are 15 and 20 W/m^{2}K on the inside and outside respectively. Determine the heat flow and interface temperatures.

(Q=127.35W/m^2 , 17.51,7.3, 6.48, -13.63^{0}C)

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:

  https://www.youtube.com/watch?v=HidbLOlsHkw
  https://www.youtube.com/watch?v=J_zqQcncAu4
  https://www.youtube.com/watch?v=sCa9wkaZ_yE
  https://www.youtube.com/watch?v=SNnd0f3xXlg
  https://www.youtube.com/watch?v=in2YpMWFnA4

- STUDY MATERIAL:

  http://www.cdeep.iitb.ac.in/webpage_data/nptel/Mechanical/Heat%20and%20Mass%20Transfer/Conduction/Module%201/main/1.3.2.html
  http://sharif.ir/~moosavi/Ozisik%20Heat%20Conduction%20(ISBN%200471532568).pdf
  http://www.eng.auburn.edu/~dmckwski/mech7210/condbook.pdf
  http://www.cdeep.iitb.ac.in/webpage_data/nptel/Mechanical/Heat%20and%20Mass%20Transfer/Conduction/Module%202/main/2.6.4.html

- PPTs:

  https://www.slideshare.net/RIFFAT_ZAHID/modes-of-heat-transfer
  https://www.slideshare.net/YashawanthaKM/heat-conduction-equation

https://www.vttresearch.com/sites/default/files/pdf/publications/2009/P162.pdf
https://www.slideshare.net/tmuliya/heat-transfer-from-extended-surfaces-or-fins
https://www.slideshare.net/satyamsinghh/heat-transfer-39827651

UNIT-2

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Unsteady state Heat Transfer conduction	Heat Transfer − RC Sachdeva	159 -160
2	I-D Transient heat conduction	Heat Transfer − RC Sachdeva	161 - 163
3	Lumped system analysis	Heat Transfer − RC Sachdeva	164 - 166
4	Use of Heisler charts	Heat Transfer − RC Sachdeva	182 - 191

ASSIGNMENT QUESTIONS:

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- A 40X40 cm copper slab 5 mm thick at a uniform temperature of 250°C, suddenly has its temperature lowered at 30°C. Find the time at which the slab temperature becomes 90°C.Take ρ=9000Kg/m^3, c=0.38Kj/KgK, K=370 W/mK and h=90 W/m^{2}K
- A Slab of aluminum 10 cm thick is originally in a temperature of 500°C. It is suddenly immersed in a liquid at 100°C resulting in a heat transfer coefficient of 1200 W/m^{2}K. Determine the temperature at the centerline and surface 1 minute after immersion. Also calculate the total thermal energy removed per unit area of the slab during this period. The properties of aluminum are ρ=2700Kg/m^3, c=0.90 Kj/KgK ,K=215 W/mK and $\propto = 8.4X10^{-5}$ m^2/s.
- An aluminum sphere weighing 5.5kg and initially at a temperature of 290C is suddenly immersed in a fluid at 15C, h=58W/m2-k. Determine the time required to cool the aluminum to 95C, using the lumped heat analysis method.
- A long cylinder of radius 15 cm initially at 30°C is exposed over the surface to gases at 600°C with a convective heat transfer coefficient of 65 W/m2K. Using the following property values determine the temperatures at the centre, mid radius and outside surface after 20 minutes. Density = 3550 kg/m3, sp. heat = 586J/kg K, conductivity = 19.5 W/mK. Also calculate the heat flow.
- The average heat transfer coefficient for flow of 100C air over a flat plate is measured by observing the temperature time history of a 3cm thick copper slab exposed to 100C air. In one test run the initial temperature of plate was 210C, and in 5 minutes the temperature decreased by 40C. Calculate the heat transfer coefficient for this case.

ADDITIONAL RESOURSES:
- NPTL VIDEO LINKS:
    https://www.youtube.com/watch?v=G8oW5KQHcvQ
    https://www.youtube.com/watch?v=W1m036J7qXU
    https://www.youtube.com/watch?v=Di8G5iPDPEQ
    https://www.youtube.com/watch?v=M0tkQjzH3MQ

- STUDY MATERIAL:
    http://www.cdeep.iitb.ac.in/webpage_data/nptel/Mechanical/Heat%20and%20Mass%20Transfer/Conduction/Module%204/main/4.4.html
    http://thegateacademy.com/files/wppdf/Transient-heat-conduction-or-Unsteady-state-heat-conduction.pdf
    http://www.cdeep.iitb.ac.in/webpage_data/nptel/Mechanical/Heat%20and%20Mass%20Transfer/Conduction/Module%204/main/4.2.html
    https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/103105140/lec13.pdf

- PPTs:

https://www.slideshare.net/erlaurito/unsteady-state-basics-presentation
https://www.slideshare.net/ahmadreza_aminian/transient-heat-conduction
https://www.slideshare.net/HarshPathak28/heat-transfer-lumped-parameter-analysis
https://www.slideserve.com/brit/heisler-charts

UNIT-3

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Dimensional analysis	Heat Transfer – RC Sachdeva	261
2	Boundary layer theory concept	Heat Transfer – RC Sachdeva	238
3	Free, and Forced convection	Heat Transfer – YVC Rao	349-359
4	Laminar and turbulent heat transfer correlation	Heat Transfer – RC Sachdeva	269
5	Application of dimensional analysis	Heat Transfer – RC Sachdeva	263 - 264
6	Dimensionless numbers and Empirical correlations	Heat Transfer – YVC Rao	355-359

ASSIGNMENT QUESTIONS:

- Explain with neat sketch the Concept of Boundary layer theory also define Hydrodynamic and Thermal Boundary layer thickness.

- Air at 20° C is flowing along a heated flat plate at 134° C at a velocity of 3m/s. The plate is 2 m long and 1.5 m wide. Calculate the thickness of the hydrodynamic boundary layer and the skin friction coefficient at 40cm from the leading edge of the plate. Kinematic viscosity of air at 20° C may be taken as 15.06×10^{-6} m^2/s, also calculate the local heat transfer coefficient at x=0.4m and the heat transferred from the first 40cm of the plate.

- Assuming that a man can be represented by a cylinder 30cm in diameter and 1.7m high with a surface temperature of 30° C, calculate the heat he would lose while standing in a 36km/h wind at 10° C.

- A vertical pipe of 20cm outer diameter, at a surface temperature of 100° C is in a room where the air is at 20° C. The pipe is 3m long. What is the rate of heat loss per meter length of the pipe?

- State the Buckingham's Pi theorem. Explain the various parameters used in forced convection using dimensional analysis obtain an expression for Nusselt number in terms of Reynolds and Prandtl number

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:

    https://www.youtube.com/watch?v=MWCKHQhxj_w
    https://www.youtube.com/watch?v=lnFjt30goiY
    https://www.youtube.com/watch?v=VEsEoq52_r0
    https://www.youtube.com/watch?v=Cm_Ggi9_FtY

DEPARTMENT OF MECHANICAL ENGINEERING

- STUDY MATERIAL:

  https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/103108098/lec2.pdf

  https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/112105192/lec28.pdf

  http://mech.sut.ac.ir/People/Courses/18/Chapter3-%20Part1.pdf

- PPTs:

  http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2349

  web.iitd.ac.in › ~pmvs › courses › mel242 › mel242-24

  https://www.slideshare.net/msg15/forced-convection

  www.math.utah.edu › ~gustafso › slides › heat-transfer

  www.bakker.org › dartmouth06 › engs150 › 13-heat

UNIT-4

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Types of heat exchangers	Heat Transfer – RC Sachdeva	499- 501
2	Overall heat transfer coefficient	Heat Transfer – RC Sachdeva	502
3	LMTD and NTU methods	Heat Transfer – RC Sachdeva	506 -509
4	Heat exchangers with phase change	Heat Transfer – RC Sachdeva	512
5	Different regimes of boiling	Heat Transfer – RC Sachdeva	475-477
6	Laminar film condensation	Heat Transfer – RC Sachdeva	486
7	Drop wise condensation	Heat Transfer – YVC Rao	384

ASSIGNMENT QUESTIONS:

- List out the different types of heat exchangers and explain briefly with neat sketches about a) shell and tube heat exchanger and b) Cross flow heat exchanger.

- In a double pipe counter flow heat exchanger, 10000kg/h of an oil having a specific heat of 2095 J/kg-K is cooled from 80° C to 50° C by 8000 kg/h of water entering at 25° C. Determine the heat exchanger area for an overall heat transfer coefficient of 300 W/m^2 K. Take Cp for water as 4180 J/Kg-K.

- Hot oil with a capacity rate of 2500 W/K flows through a double pipe heat exchanger. It enters at 360° C and leaves at 300° C. Cold fluid enters at 30° C and leaves at 200° C. If the overall heat transfer coefficient is 800 W/m^2-K, determine the heat exchanger area required for a) Parallel flow and b) Counter flow.

- Saturated steam at 120° C is condensing on the outer tube surface of a single pass heat exchanger. the heat transfer coefficient is U = 1800 W/m^{2}K. Determine the surface area of a heat exchanger capable of heating 1000 kg/h of water from 20° C to 90° C. Also compute the rate of condensation of steam h_{fg}=2200 kJ/kg.

DEPARTMENT OF MECHANICAL ENGINEERING

- Saturated steam at 100º C is condensing on the shell side of a Shell and tube heat exchanger. The cooling water enters the tubes at 30º C and leaves 70º C . Calculate the effective log mean temperature difference if the arrangement is i) Counter flow, ii) Parallel flow and iii) Cross flow.
- Describe briefly the various regimes in boiling heat transfer.
- Explain briefly about film-wise and drop-wise condensation.
- Explain pool boiling. What is critical heat flux?
- Distinguish between nucleate boiling and film boiling.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:

  https://www.youtube.com/watch?v=jc_hL_tSFzo&pbjreload=10
  https://www.youtube.com/watch?v=Kj0ebo-vVAg
  https://www.youtube.com/watch?v=GrCbRHTeNBw
  https://www.youtube.com/watch?v=y5MX_gawtVQ
  https://www.youtube.com/watch?v=GgFSBuf3AIE

- STUDY MATERIAL:

  https://www.nuclear-power.net/nuclear-engineering/heat-transfer/heat-exchangers/types-of-heat-exchangers/
  http://etrl.mechanical.illinois.edu/pdf/ME420/Lecture%2014%20-%20Convection%20-%20Heat%20Exchangers,%20LMTD%20Method,%20NTU%20Method.pdf
  http://www.engineeringnotes.com/thermal-engineering/boiling/definite-regimes-of-boiling-heat-transfer-thermal-engineering/30456
  https://www.slideshare.net/mghadamyari/condensation-on-vertical-surface-34292381

  PPTs:
  https://www.slideshare.net/gchilveri/heat-exchangers-and-types
  web.iitd.ac.in › ~pmvs › courses › mel709 › selfstudy-3
  https://www.slideshare.net/gauravdave549/phase-change-heat-transfer
  https://www.slideshare.net/ZOTTY/boiling-condensation
  https://www.slideshare.net/7874mayur/condensation-66628529
  https://www.slideshare.net/KrishnaKhandelwal8/presentation-on-filmwise-and-dropwise-condensation

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UNIT-5

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Black body radiation	Heat Transfer – RC Sachdeva	374
2	radiation field, Kirchhoff's laws	Heat Transfer – RC Sachdeva	390
3	Stefan Boltzman equation	Heat Transfer – RC Sachdeva	382 - 383
4	Heat radiation through absorbing media	Heat Transfer – YVC Rao	254 -256
5	Radiant heat exchange	Heat Transfer – RC Sachdeva	426- 427
6	Radiation shields	Heat Transfer – RC Sachdeva	441 - 444

ASSIGNMENT QUESTIONS:

- Derive Wien's displacement law from Planck's law.
- Explain the following terms i) reflectivity ii) transmissivity iii) Black body and iv) Absorptivity
- What are radiation shape factors why are they used?
- Explain the phenomenon of radiation between two black bodies.
- Explain the phenomenon of radiation between non black (gray) bodies.
- Explain the functions of radiation shield.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:

    https://www.youtube.com/watch?v=mht2DN7p4MQ
    https://www.youtube.com/watch?v=D_MXeMSQ4Dc
    https://www.youtube.com/watch?v=-wMhiqvTfxc
    https://www.youtube.com/watch?v=SOyJiu9XfSY
    https://www.youtube.com/watch?v=67PfCRGGY8c

- STUDY MATERIAL:

    http://hyperphysics.phy-astr.gsu.edu/hbase/mod6.html
    https://books.google.co.in/books?id=gLK8DwAAQBAJ&pg=PA547&dq=Kirchhoff%E2%80%99s+law+heat+transfer&hl=en&sa=X&ved=0ahUKEwjGyoTvm7DoAhXQzDgGHVf2DLYQ6AEIVTAF#v=onepage&q=Kirchhoff%E2%80%99s%20law%20heat%20transfer&f=false
    https://books.google.co.in/books?id=g1oiDQAAQBAJ&printsec=frontcover&dq=Heat+radiation+through+absorbing+media&hl=en&sa=X&ved=0ahUKEwjzvbWTnLDoAhXrwTgGHYAWBWgQ6AEIOTAC#v=onepage&q=Heat%20radiation%20through%20absorbing%20media&f=false

https://books.google.co.in/books?id=ERtpN94lCOsC&pg=PA934&dq=Radiation+shiel
d+heat+transfer&hl=en&sa=X&ved=0ahUKEwiB3rzDnLDoAhX6wjgGHSMVCo8Q6AEI
QTAD#v=onepage&q=Radiation%20shield%20heat%20transfer&f=false

- PPTs:
  https://www.slideshare.net/sunipm/black-body-radiation-73296531
  https://www.slideshare.net/abhijitcool18/pht-47739321
  https://www.slideshare.net/fianilham1/stefanboltzmann
  https://www.slideshare.net/aravind00728/radiative-heat-transfer
  https://www.slideshare.net/RakeshCa2/radiation-protection-39841251

COURSE COVERAGE SUMMARY A.Y:2019-20	
III YEAR B. TECH II SEMESTER (A-SECTION)	CAD/CAM (R17A0322)

UNIT-1

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Computers in Industrial Manufacturing	CAD/CAM – ChennaKesava R.Alavala	2 - 4
2	Product cycle	CAD/CAM – P N Rao	5 – 12
3	Cad/cam hardware,	CAD/CAM – ChennaKesava R.Alavala	15 – 37
4	Basic structure		
5	Raster scan graphics		32 – 35
6	Coordinate system		59 – 61
7	Database structure for graphics modeling	CAD/CAM – P N Rao	61 - 63
8	Transformation of geometry		70 – 77
9	3D transformations,		77 – 78
10	Clipping		80 - 81

ASSIGNMENT QUESTIONS:

1. With neat sketch, explain the product life cycle in a computerized manufacturing environment
2. List and explain any three types of input, Storage and display devices.
3. Explain the basic principle of CRT? Explain about Raster Scan Display System?
4. A line is defined by its end points (0, 0) and (2, 3) in a 2-D graphics system. Perform the following transformations on this line:
   A. Scale the line by a factor of 2.0.
   B. Translate the line by 2 units in X – direction and 2 units in Y – direction
   C. Rotate the original line by 450 about the origin
5. What do you understand by the CPU and ALU? List the advantages of computer aided design?
6. Explain about the types of production? And Elaborate on the basic requirements that a CAD software as to satisfy?
7. The two end points of a line segment have co-ordinates (1, 3) and (3, 6). If this is to be scaled to twice its present size, write the transformation matrix and the coordinates of the new end points.

ADDITIONAL RESOURSES:

- VIDEO LINKS:

Computers in Industrial Manufacturing - https://www.youtube.com/watch?v=vO1lc75jtiM

Product cycle - https://www.youtube.com/watch?v=U0QbBY4JPvw

CAD / CAM Hardware - https://www.youtube.com/watch?v=GNMt5hEy3bQ

Computer Graphics –
   https://www.youtube.com/watch?v=NmMky9Pg8Yc&list=PLrjkTql3jnm9cY0ijEyr2fPdwnH-0t8EY

Transformations - https://www.youtube.com/watch?v=gNBPW_9D23w

- STUDY MATERIAL:
   https://mrcet.com/downloads/digital_notes/ME/III%20year/COMPUTER%20AIDED%20DESIGN%20COM
   PUTER%20AIDED%20MANUFACTURING.pdf

- PPTs:

https://drive.google.com/open?id=1zPNZ_0J9QD31zpXmVp1Oeb1q5-yIVJ-q

UNIT-2

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1.	Requirements of geometric modeling	CAD/CAM - P N Rao	97 - 99
2.	Geometric models		99 – 102
3.	Geometric construction Methods,	CAD/CAM - P N Rao	102 – 105
		CAM/CAM – Chennakesava R.Alavala	126 - 129
4.	Curve representation methods	CAD/CAM - P N Rao	122 – 124, 131 - 137
5.	Surface representation methods		140 - 149
6.	Solid representation		155 – 156 160 - 162

ASSIGNMENT QUESTIONS:

1. Define geometric modeling? Illustrate the requirements of geometric models and explain the need of geometric modeling.
2. Explain about order of continuity equation? derive the expression for hermit cubic spline
3. Explain Bezier curve with neat sketch. Also write its characteristics and obtain the parametric equation for the same
4. A cubic Bezier curve is defined by the control points as (0, 0), (1, 2), (3, 2) and (2, 0). Find the equation of the curve and calculate the point at U = 0.4 and U = 0.6.
5. Explain about C-rep & B-rep approaches in solid modeling
6. Enumerate the difference between wireframe, surface and solid modeling
7. Explain the following terms in detail with respect to surface modelling?
   a. Cylindrical surface
   b. Ruled Surface and
   c. Composite surface.

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ADDITIONAL RESOURSES:

- VIDEO LINKS:

  Geometric Modelling - https://www.youtube.com/watch?v=sF7SNDd5aX0&list=PLLvBXFAVDeLYJkmexmAEo-qb2miY97C_&index=3
  Surface Modelling - https://youtu.be/ONj8HDP4PYw
  Solid Modelling [Section-A] https://youtu.be/ldqvKzc3NRU
  Solid Modelling [Section-B] https://youtu.be/ZqPjhdTFEMM
  Solid Modelling [Section-C] https://youtu.be/RSJARgxthf0

- STUDY MATERIAL:

  https://mrcet.com/downloads/digital_notes/ME/III%20year/COMPUTER%20AIDED%20DESIGN%20COMPUTER%20AIDED%20MANUFACTURING.pdf

- PPTs: https://slideplayer.com/slide/12059331/

UNIT-3

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1.	Numerical Control		
2.	NC modes		
3.	NC elements		
4.	NC machine tools		
5.	Structure of CNC machine tools	CAM/CAM – PN Rao	
6.	Machining Center		
7.	Turning Center,		
8.	CNC Part Programming fundamentals		
9.	Manual Part Programming methods		
10.	Computer Aided Part Programming		

ASSIGNMENT QUESTIONS:

1. Briefly discuss the following NC motion control modes.
   - A. Point -to-point
   - B. Straight cut
   - C. Contouring
2. Briefly discuss about the elements of Numerical Control.
3. List out and explain 10 G-Codes and 10 M-Codes in detail and also their groups
4. With neat sketch, explain the basic components of an NC system
5. Distinguish between NC and CNC machines
6. Discuss the advantages and limitations of open loop and closed loop systems
7. Write the fundamentals of manual part programming and the procedure for writing computer assisted part programming?
8. The Component to be machined is shown in the figure. Write a program with and without using canned cycles to drill all the holes.

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All dimensions in mm

9. Write a complete part program using the ISO codes for the following component shown in the figure for the external contour using cutter radius compensation.

ADDITIONAL RESOURSES:

- VIDEO LINKS:

  Numerical Control - https://www.youtube.com/watch?v=5b8P3flb26I

  Computer Numerical Control - https://www.youtube.com/watch?v=S3cOTf4YdJQ

  APT - https://www.youtube.com/watch?v=4Bsy9NnekI0

- STUDY MATERIAL:

https://mrcet.com/downloads/digital_notes/ME/III%20year/COMPUTER%20AIDED%20DESIGN%20COMPUTER%20AIDED%20MANUFACTURING.pdf

- PPTs:

Numerical control - https://drive.google.com/open?id=1F2nKNfi1b-zJpr9H9hRakFRIWzB_UCJv

APT - https://drive.google.com/open?id=1a7hTpzIbcka9rE9iasKdAAk2fJpNzrOe

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UNIT-4

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1.	Group Technology, Part family	CAD/CAM: Computer-Aided Design and Manufacturing - Groover	524
2.	Coding and Classification	CAM/CAM – PN Rao	528--535
3.	Production flow analysis		536-542
4.	Computer aided processes planning	CAM/CAM – Chennakesava R.Alavala	428-430
5.	Retrieval type and Generative type	CAD/CAM: Computer-Aided Design and Manufacturing - Groover	549-554

ASSIGNMENT QUESTIONS:

1. Define group technology and discuss about production flow analysis with an example. Also mention the advantages and limitations of PFA\

2. i. Explain the various difficulties in traditional process planning in detail.
   ii. What is meant by CAPP? List out types of process planning
   iii. Explain need of process planning?

3. Explain about variant and generative type process planning systems.

4. What factors must be considered while selecting a classification and coding system?

5. Define part family? List about various types of pats classification and coding systems.

6. Develop the OPITZ form code (first 5 digits) with justification for the component shown in figures.
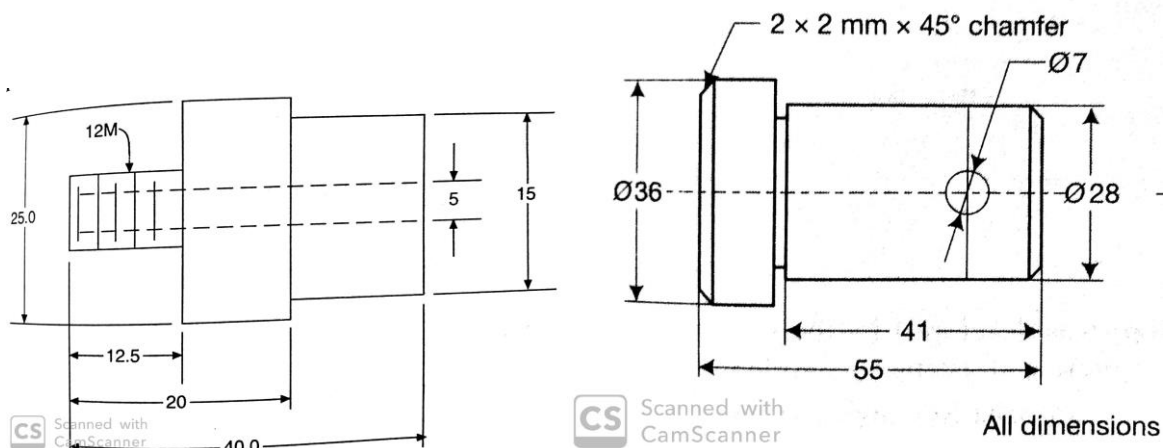
ADDITIONAL RESOURSES:

- VIDEO LINKS:

  Group Technology - https://youtu.be/WZ2U6W7FWx0
  Computer Aided Processes Planning - https://youtu.be/nt_gK-jWF6w

- STUDY MATERIAL:

  https://mrcet.com/downloads/digital_notes/ME/III%20year/COMPUTER%20AIDED%20DESIGN%20COMPUTER%20AIDED%20MANUFACTURING.pdf

- PPTs:

https://drive.google.com/open?id=17mMhHZaSahwY9vVQUEFURebgHxX4sdTH

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UNIT-5

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1.	Computer Aided Quality Control		440
2.	Terminology in quality control		442
3.	Computer in QC		445
4.	Contact inspection methods		447
5.	Non contact inspection methods – optical, non optical	CAD/CAM: Computer-Aided Design and Manufacturing - Groover	449
6.	Computer aided testing, integration of CAQC		455
7.	Types of Manufacturing systems,		460
8.	Machine tools and related equipment		463
9.	Material handling systems, ,		465
10.	Computer control systems, human labor in the manufacturing systems		475
11.	CIMS benefits		480

ASSIGNMENT QUESTIONS:

1. Define computer aided quality control and Discuss various types of contact inspection methods with neat diagram
2. Explain the different types of Non-Contact inspection techniques used in computer- aided quality control systems.
3. With the help of schematic diagram explain the measurement system based on scanning laser beam system explain its applications in CAQC systems?
4. State the advantages of CIM in manufacturing industry in detail? Explain the role of human labor in CIM
5. Sketch and explain the elements of machine vision?

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS:

    Computer Intergrated Manufacturing (CIM): https://youtu.be/VzibGwba3Qs

    Computer Aided Quality Control (CAQC) : https://youtu.be/5wSzRE4K4PI

- STUDY MATERIAL:

    https://mrcet.com/downloads/digital_notes/ME/III%20year/COMPUTER%20AIDED%20DESIGN%20COMPUTER%20AIDED%20MANUFACTURING.pdf

    CIM - https://drive.google.com/open?id=17zW8pf-c52-V9TwvPTXw0NBXiIqmjduH

- PPTs:

CAQC - https://drive.google.com/open?id=1wU038H5Ck4lyfLyO6RcGgypIIAw7pWGQ

CIM - https://www.slideshare.net/viswa375/ch9-computer-integratedmanufacturing?next_slideshow=1

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COURSE COVERAGE SUMMARY A.Y:2019-20

III YEAR B. TECH II SEMESTER (A-SECTION)	AUTOMOBILE ENGINEERING (R17A0323)

UNIT-1

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Introduction to Automobile or Vehicle	Automobile Engg.by P.S.Gill Vol.II	14
2	Types of Automobile	Automobile Engg.by P.S.Gill Vol.II	14
3	Vehicle construction and Components	Automobile Engg.by P.S.Gill Vol.II	14, 314 -320
4	Resistances to vehicle motion	Automobile Engg.by P.S.Gill Vol.II	15
5	Components and Nomenclature	Automobile Engg.by P.S.Gill Vol.I	41,43 and 90
6	Engine support systems	Automobile Engg.by P.S.Gill Vol.I	132 to 227
7	Cooling system.	Automobile Engg.by P.S.Gill Vol.I	299-348
8	Lubrication System.	Automobile Engg.by P.S.Gill Vol.I	230-285

ASSIGNMENT QUESTIONS:

• Explain the construction of various frames used in automobiles with neat sketch.

• Discuss the Construction and working principles of 3-way Catalytic controller

• Explain the following terms:

i) Load distribution in frames ii) Frame types with neat sketch

iii) Frame materials iv) Frame testing.

• Explain the operation of the typical turbocharger with sketch.

• Discuss the principle of operation of a four stroke cycle S.I. Engine with a neat Sketch.

• With the help of neat sketch explain in detail about the construction and working of different engine components?

• What are the functions of a cooling system?

• Sketch and explain different types of lubrication systems used in automotive

• engines.

• What do you know about emission norms? Discuss.

• With a block diagram discuss the operational features of electronics engine

management system.

- What are the desirable properties of a good lubricant?
- Draw the layout of an automobile and indicate the various components.
- Explain with neat sketch the various types of chassis and discuss their advantages & disadvantages.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS: Refer YouTube appropriate videos that shown in video class

- STUDY MATERIAL:

- PPTs: use "slideshare" online ppts

UNIT-2

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Introduction of Ignition System	Automobile Engg.by P.S.Gill Vol.I	432-444
2	Fuel Injection system for SI engines.	Automobile Engg.by P.S.Gill Vol.I	448-505
3	Fuel Injection system for C I engines	Automobile Engg.by P.S.Gill Vol.I	567
4	Electronic Diesel Control	Automobile Engg.by P.S.Gill Vol.I	581
5	Components in Diesel Supply System	Automobile Engg.by P.S.Gill Vol.I	581-590
6	Fuel Injector	Automobile Engg.by P.S.Gill Vol.I	592
7	Introduction of Ignition System	Automobile Engg.by P.S.Gill Vol.I	507
8	CRDI - Common rail fuel injection system	Automobile Engg.by P.S.Gill Vol.I	565
9	Turbocharger-Super charger	Automobile Engg.by P.S.Gill Vol.I	660-675
10	Catalytic converter	Automobile Engg.by P.S.Gill Vol.I	841-842

ASSIGNMENT QUESTIONS:

- What are the functions of carburetor?
- Sketch and explain the construction and operation of a simple carburetor.
- Explain with a sketch the working of an electronic fuel injection system (any one type).
- Describe the working of a lead acid battery with its neat sketch.
- Draw a typical ignition coil and name the parts.
- Draw the layout of a battery ignition system and mention the function of each component.
- What is supercharger? What is turbo charger? Distinguish them in terms of working.

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- Explain the following of an injector of a common rail diesel injection system.
- What are the types of electronic ignition systems? Describe any one of them clearly.
- Discuss various methods to reduce the level of pollutants in the exhaust gases

ADDITIONAL RESOURSES:
- NPTL VIDEO LINKS: Refer YouTube appropriate videos that shown in video class

- STUDY MATERIAL:

- PPTs: use "slideshare" online ppts

UNIT-3

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Transmission Systems in Automobile-Types of clutches	Automobile Engg.by P.S.Gill Vol.II	27-73
2	Gear Boxes-types	Automobile Engg.by P.S.Gill Vol.II	74-117
3	Propeller Shaft	Automobile Engg.by P.S.Gill Vol.II	251
4	Differential-Automatic-Semi automatic	Automobile Engg.by P.S.Gill Vol.II	136-178
5	Hotchkiss drive- Torque tube Drive	Automobile Engg.by P.S.Gill Vol.II	267-269

ASSIGNMENT QUESTIONS:
- What is meant by clutch? List out the requirements.
-
ADDITIONAL RESOURSES:
- NPTL VIDEO LINKS: Refer YouTube appropriate videos that shown in video class
- STUDY MATERIAL:

- PPTs: use "slideshare" online ppts

UNIT-4

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Introduction of steering system	Automobile Engg.by P.S.Gill Vol.II	431
2	Ackermann steering geometry	Automobile Engg.by P.S.Gill Vol.II	433
3	Steering Gear Boxes	Automobile Engg.by P.S.Gill Vol.II	439-454
4	Power steering	Automobile Engg.by P.S.Gill Vol.II	455-461
5	Suspension system-types	Automobile Engg.by P.S.Gill Vol.II	375

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6	Braking System-Types-ABS-Hrdraulic-Air Braking	Automobile Engg.by P.S.Gill Vol.II	544-640

ASSIGNMENT QUESTIONS:

- What is castor, camber and King pin inclination with respect to wheel geometry?
- List down the various components of a steering system.
- What are the different types of steering gears used in an automobile?
- Explain the operation of a sliding mesh gearbox and deduce the gear ratios.
- With a neat diagram explain the construction and operation of a shock absorber.
- Explain the operation of a telescopic type shock absorber with a sketch.
- What is the advantage of independent suspension system?
- Explain the construction and operation hydraulic braking system with a sketch.
- What is the difference between dead front axle and live front axle?
- Describe the working of Anti Lock Braking System? Write the advantages.
- Draw the layout of Hydraulic braking system and explain the master cylinder working with necessary diagram.
- Describe Air brake systems in automobiles. Write its applications.

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS: Refer YouTube appropriate videos that shown in video class

- STUDY MATERIAL:

- PPTs: use "slideshare" online ppts

UNIT-5

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Natural Gas as a Fuel in Automobile.	Refer our MRCET digital Notes	
2	Liquefied petroleum gas as a Fuel in Automobile		
3	Bio diesel as a Fuel in Automobile		
4	Hybrid electric vehicle		
5	Fuel Cell		

ASSIGNMENT QUESTIONS:

- Describe various alternate fuels available in detail.
- Explain the various properties of alternative fuels.
- Explain the production of nature gas with a neat sketch in details.
- Explain the various significance of CNG conversion kit used in S.I. engines.
- Explain the fuel character tics Alcohols, CNG, LPG and hydrogen.
- Describe the salient feature of using LG as an alternate fuel.
- What is bio diesel? What are the advantages over other fuels as bio diesel as fuels?
- Explain with neat sketches the working of fuel cell.

ADDITIONAL RESOURSES:

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- NPTL VIDEO LINKS:

- STUDY MATERIAL:

- PPTs: use "slideshare" online ppts

COURSE COVERAGE SUMMARY A.Y:2019-20

III B. TECH II SEMESTER (A-SECTION)	DATA STRUCTURES USING PYTHON (R17A0553)

UNIT-1

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Introduction to Python, Installation and Working with Python	Through Internet	https://www.geeksforgeeks.org/
2	Understanding Python variables Python basic Operators,		https://www.studytonight.com/
3	understanding python blocks,		
4	Python Data Types: Declaring and using Numeric data types: int, float,complex,Using string data type and string operations.		

ASSIGNMENT QUESTIONS:

1) Write the Features of Python Programming.
2) Write about Installation and Working with Python.
3) Describe about String Operations with Examples

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS: https://onlinecourses.nptel.ac.in/noc20_cs26/unit?unit=1&lesson=2
- STUDY MATERIAL: Soft-Copy provided Unit-Wise
- PPTs: Nill

Status: Completed

UNIT-2

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Control Flow- if, if-elif-else,loops,for loop using ranges, string	Through Internet	https://www.geeksforgeeks.org/
2	Use of while loops in python,Loop manipulation using pass, continue, break and else		https://www.studytonight.com/
3	Programming using Python conditional and loops block		
4	Python arrays.		

ASSIGNMENT QUESTIONS:

1.Explain the Conditional statements in python.

2.Describe Loop statements in python with example.

3.Explain Arrays implementation in python with examples.

5.Write the Python Program to display Prime numbers for given integer value.

6.Write the Python program to find Biggest of 3 numbers using Conditional

statements.

ADDITIONAL RESOURSES:
- NPTL VIDEO LINKS: https://onlinecourses.nptel.ac.in/noc20_cs26/unit?unit=1&lesson=2
- STUDY MATERIAL: Soft-Copy provided Unit-Wise
- PPTs: NILL

Status: Completed

UNIT-3

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Functions -Calling Functions, Passing Arguments, Keyword Arguments,Default Arguments, Variable-length arguments	Through Internet	https://www.geeksforgeeks.org/
2	Anonymous Functions, Fruitful Functions(Function Returning Values)		https://www.studytonight.com/
3	Scope of the Variables in a Function - Global and Local Variables.		
4	Powerful Lamda function in python.		

ASSIGNMENT QUESTIONS:

1. Define Function.and explain types of arguments passed to the Function with

Examples.

2. Define Anonymous function.and write about usage of lambda functions with examples.
3. Define Scope. Describe about scope of variables with examples.

ADDITIONAL RESOURSES:
- NPTL VIDEO LINKS: https://onlinecourses.nptel.ac.in/noc20_cs26/unit?unit=1&lesson=2
- STUDY MATERIAL: Soft-Copy provided Unit-Wise
- PPTs: Nill

Status: Completed

UNIT-4

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Data Structures-List Operations, Slicing, Methods	Through Internet	https://www.geeksforgeeks.org/
2	Tuples, Sets, Dictionaries		https://www.studytonight.com/
3	Sequences,Comprehensions		

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4	Dictionary manipulation,		
5	list and dictionary in build functions		

ASSIGNMENT QUESTIONS:

1. Give a Comparision between List,Tuple and Dictionary.
2. Discuss about List and Dictionary Comprehension with Examples.
3. Define Data Structure and discuss Datastructures in Python Programming

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS: https://onlinecourses.nptel.ac.in/noc20_cs26/unit?unit=1&lesson=2
- STUDY MATERIAL: Provided Unit-Wise
- PPTs: Nill

Status: 50%Completed(Some topics discussed in Unit-I)

UNIT-5

S.N.	Topic as per the syllabus	Textbook & Author	Pages
1	Sorting:Bubble Sort,Selection Sort,Insertion Sort,Mergesort,Quick sort.	Through Internet	https://www.geeksforgeeks.org/
2	Linked Lists,Stacks,Queues		https://www.studytonight.com/ http://btechsmartclass.com/

ASSIGNMENT QUESTIONS:

1. Explain LinkedList with example.
2. Explain the following sorting techniques

   (a)Insertion Sort   (b)Selection Sort
3. (a) Describe about Merge Sort with example.

   (b) Write the Quick Sort algorithm to sort the list of elements

ADDITIONAL RESOURSES:

- NPTL VIDEO LINKS: https://onlinecourses.nptel.ac.in/noc20_cs26/unit?unit=1&lesson=2
- STUDY MATERIAL: Provided Unit-Wise
- PPTs: Nill

Status: 80% Completed

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