13/05/19

Lab

1:30

BHARATIYA VIDYA BHAVAN'S

SARDAR PATEL COLLEGE OF ENGINEERING

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Examination

May 2019

Class: M. Tech. (Mechanical)

Program: M. Tech. (Mechanical Engineering)/M/C Design **Duration: 3 Hrs**

Course Code: MTMD201Maximum Marks:100

Name of the Course: FRACTURE MECHANICS Semester: II

Instructions

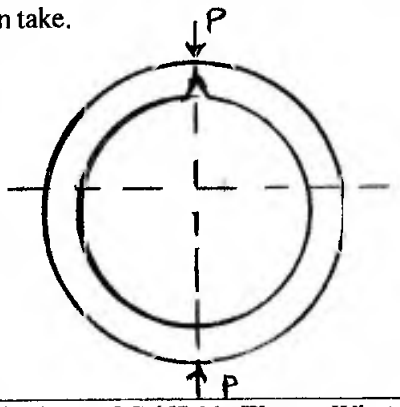
1Question No 1 is compulsory

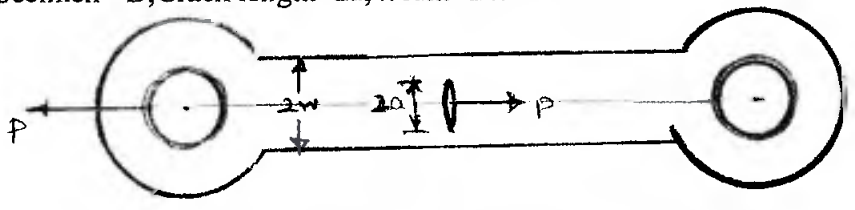
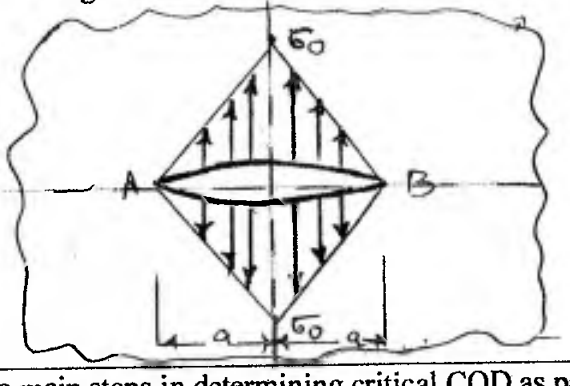
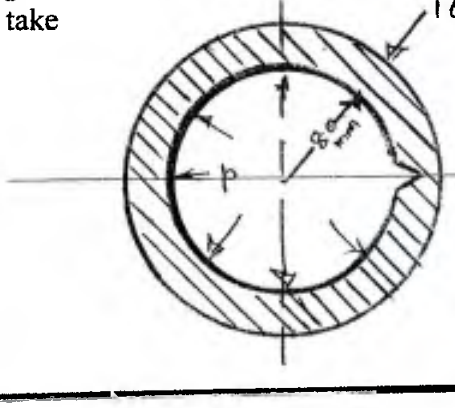
2.Attempt any four questions out of remaining six.

3.Draw neat diagrams wherever necessary.

4.Assume suitable data if necessary.

5.Answers to the sub questions should be grouped together.

Q. No.		Max. Marks	CO No.	Module No
1 a)	A 25 mm thick steel plate in plane strain with width = 250 mm has an initial edge crack of size 10 mm.It is subjected to const. amplitude fatigue cycling with stress range =80 Mpa for 750,000 cycles.Determine the final crack size using Paris Law.Use C = 6.31×10^{-12} (Mpa,m units) and m = 2.98.Consider crack closure effect by taking effective stress range as 84 % of the actual stress range.	07	2,4	6,7
b)	List and explain the various steps for conducting a JIC test.	07	3	5
c)	List and explain the various factors that contribute to Environment Assisted Fracture?	06	4	6
2a)	Explain with sketches the 3 modes of fracture failure.	03	1	1
b)	Derivethe relationship between G and K for a uniaxially loaded infinite plate with a central crack.	10	1	2,
c)	A steel ring has σ_{ys} = 1213 Mpa and KIC = 75 Mpa$\sqrt{m}$ .A load P= 5 KN is exerted on the ring.The ring thickness in the perpendicular direction is 25 mm.There is a vertical crack of 15 mm depth.Determinei)FOS ii)Maximum load that the ring can take.  OD of ring=270 mm ID of ring =230 mm	07	2,4	3,7
3 a)	Explain the limitations of Griffith's Theory.What is the Irwin Orowan modification?	05	1	2,3

3 b)	Determine the stress field ahead of the crack tip for an infinite plate with a central crack of length 2a loaded in Mode II using Westergaard's approach.	15	1	3
4 a)	Determine the SIF for the given specimen loaded as shown.Thickness of specimen =B;Crack length=2a;Width=2W 	05	2,4	3,7
b)	Determine the depth 'h' of a DCB specimen beyond the crack tip in terms of the crack length 'a' if the SERR or G is to remain constant with growth of crack.The specimen is under constant load.Thickness B= 30 mm constant;Initial crack length = 50 mm;E= 207 GPa;Depth of each cantilever = 12 mm over initial crack length.	10	2	2
c)	.A large plate of 36 mm thickness is tested under displacement control.It has an edge crack a =32 mm.At displacement of 7.2 mm the load is 2750 N and the crack starts growing.At a=41.7 mm the crack stops and the load is 1560 N. Determine GIC .	05	2	2
5 a)	Write a short note on overloads and their effect on crack growth.	05	2,4	6,7
b)	Determine KIA and KIB at either end by the Green's Function approach for the given configuration. 	08	2	3
c)	What are the main steps in determining critical COD as per BS 5762.	07	3	5
6a)	Estimate the size of the plastic zone in plane strain condition only using both Von Mises & Tresca criteria.Sketch the same.	07	1	3
b)	What is the R curve?What is the condition for catastrophic failure?	06	2	4
c)	A large plate of 5 mm thickness made of steel with σ_{ys} =350 Mpa has a through thickness centre crack of length 2a =40 mm.It is subjected to a stress of 150 Mpa.Determine effective crack length using Irwin's correction.	07	1	3
7 a)	Prove that the J integral is equivalent to G for linear elastic materials	12	2	4
b)	A pressurised steel cylinder has an axial crack of 3 mm depth on its inner surface.The material yield stress σ_0 =700Mpa;Strain hardening exponent n=7;E=207 Gpa;α(Ramberg Osgood) =6.2;J_p =280 J/m^2;other constants as given in figure.Determine the maximum pressure that the cylinder can take  R_i = 80 mm W = 16 mm R_c = 83 mm g_1 = a/W h_1 = 11.4 $p_0 = \frac{2b\sigma_0}{\sqrt{3}R_c}$ b = unCracked ligament length	08	4	4

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Sem- May 2019 Examinations

Program: M.Tech F. Y. Machine Design | **Duration: 3 Hour**

Course Code: PC-MTMD202 | **Maximum Points: 100**

Course Name: Advanced Finite Element Methods | **Semester: II**

Notes:

- **Question No. 1 is compulsory, Attempt any four questions out of remaining six.**
- **Use of Scientific calculator is allowed.**
- **Answers to all sub questions should be grouped together.**
- **Assume suitable data if necessary justify the same and state the assumptions clearly.**
- **Draw Diagrams Wherever Necessary.**

Q. No.	Questions	Point	CO	BL	PI
1.	(a) **Develop** a set of governing equations for Finite element formulation for plane stress condition (Matrix form).	12	01	L4	1.3.2
	(b) What are shape functions describe with sketches? What are their properties?	8	02	L3	2.2.2
2.	(a) **Derive** the shape functions for a 2-dimensional linear triangular element	15	03	L3	2.2.2
	(b) Differentiate between global and local co-ordinates.	05	02	L1	1.2.1
3.	**(a) Solve** the differential equation $\frac{d^2y}{dx^2}+y+x=0$; $0\le x\le 1$, subject to boundary conditions y(0) = y(1) = 0 and x=1,using Galerkin method. Assume trial solution as $y = a_1+a_2x+a_3x^2$ Also show the solution, is the acceptable approximate solution.	14	03	L4	1.3.2
	b) Write a note on Slave-Master condition for modeling contact.	06	04	L2	1.1.1.
4.	**(a) Find** the deflection at center of simply supported beam of span length l subjected to UDL, throughout its length as shown in **Fig.1** Use Rayleigh-Ritz method. Differential equation is given by, $EI\frac{d^4y}{dx^2}-w=0$, $0\le x\le l$, boundary conditions are $y=0$ at $x=0$ and $y=0$ at $x=l$,assume trial solution as, $y=a_1+a_2x+a_3x^2$.	12	01	L4	1.3.2
	(b) **Discuss** Guass quadrature rule, and evaluate the following integral. $\int_{-1}^{1}(2+x+x^2)\,dx$	8	02	L2	1.3.1
5.	(a) The nodal co-ordinates of the triangular element are shown in **Fig.2**	10	04	L3	2.2.2

	At the interior point 'P', the x-coordinate is 3.3 and N_1= 0.3, Determine the N_2, N_3 & y-coordinate of P. **(b)** Discuss flow rule, hardening rules and Drucker's stability postulates.	10	02	L2	1.3.1
6.	**(a)** For a four noded tetrahedral solid element shown in **Fig.3**.determine the temperature at point P(2,1,3) given that the temperatures at nodes 1, 2, 3 & 4 are 70°C, 90°C, 60°C & 80°C respectively. **(b) Derive** the iso-parametric (mapping) formulation for a simple linear bar element.	12 08	02 01	L3 L4	2.2.2 1.3.2
7.	(a) The nodes of a quadratic one dimensional line element are located at $x = 0, x = l/2 \& x = l$, as shown in **Fig.4**. Express the shape functions using Lagrange interpolation polynomial. (b) **Explain** (a) GTN (Gurson) model (b) Neo-Hookean model	10 10	04 04	L5 L1	2.1.2 1.2.1

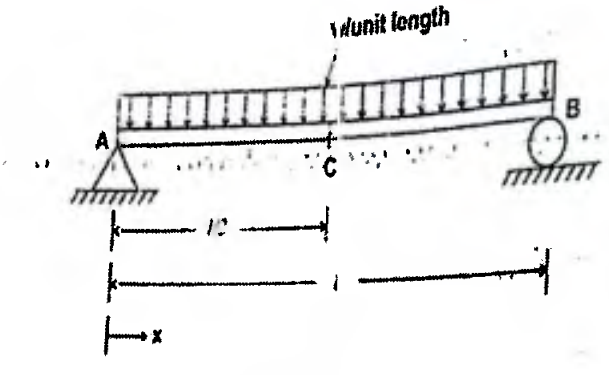

Fig.1

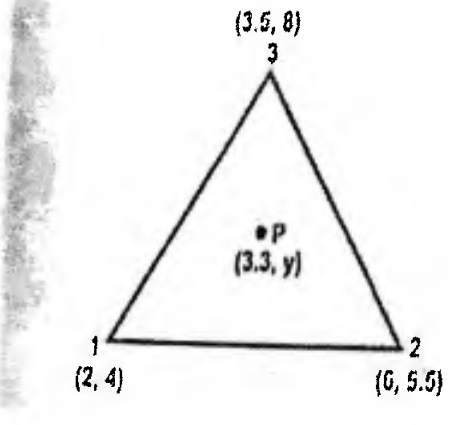

Fig.2

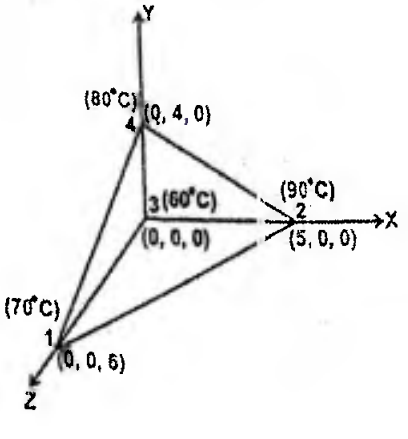

Fig.3

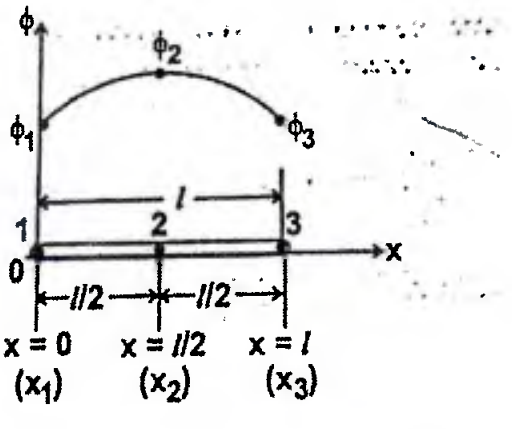

Fig.4

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Munshi Nagar, Andheri (W) Mumbai – 400058

EVEN SEM JULY 2019 RE-EXAMINATIONS

(OLD COURSE)

Program: M.Tech M/C Design **Duration: 3Hrs**

Course Code: MTMD202 **Maximum Points: 100**

Course Name: Advanced Finite Element Methods **Semester: II**

Notes: 1.Answer any five questions.

2. Assume suitable additional data if necessary and state the same.

Q.No.	Questions	Points
Q.1	A) The governing differential equation is EI (d^2y/dx^2) $-M(x)=0$ with the boundary conditions $y(0)=0$ and $y(H)=0$. A simply supported beam with concentrated end moments, M_0 is to be considered. Beam span length is H and the coefficient EI represents the resistance of the beam to deflection. Find an approximate solution to the physical problem using Galerkin's method. Refer Fig.1. An approximate equation for the beam deflection is $y(x) = A \sin\{\pi x/H\}$.	10
	B) The differential equation $D^{(e)} d^2\Phi/dx^2 = 0$ is applicable to each section of the composite wall shown in the Fig.2. $D^{(e)}$ is the thermal conductivity. Calculate the nodal temperature values with in the wall.	10
Q.2	A)The nodal values for a triangular element is as follows:- $X_i = 0.13$, $Y_i = 0.13$, $X_j = 0.25$, $Y_j = 0.13$, $X_k = 0.19$, $Y_k = 0.19$, $\Phi_i = 185$, $\Phi_j = 151$, $\Phi_k = 160$. Calculate the value of Φ at Point A(x= 0.18, y= 0.13).Also find the x, y coordinates where the contour line for 170 intersects the element boundaries.	10
	B) Evaluate $[K^{(e)}]$ and $\{f^{(e)}\}$ for triangular element shown in Fig.3. The conductivities are $K_{xx} = K_{YY} = 2$ w/ ^{0}C. cm and h=0.2 W / cm^2.^{0}C.The heat source Q^* is a line source.	10
Q.3	A) Determine the temperature distribution in the circular fin using the three element grid as shown in Fig.4. Include convection heat loss from the end of the fin.	10
	B) Calculate the axial force in each member of the structural system shown in Fig.5. Assume E =20 (10^6) N/cm^2 and $\alpha = 11(10^{-6})$ /^{0}C.	10
Q.4	A) For the plane truss shown in Fig.6, determine the horizontal and vertical displacements of node 1and the stress in each element. All the elements have E= 210GPA and A=4.0(10^{-4}) m^2.	10
	B) Calculate the nodal displacements and the internal member forces for the beam shown in Fig.7.Construct the shear force and bending moment diagram for each member. Use E = 20 (10^6) N/cm^2 and I =8000 cm^4.	10

Q.5	A) With suitable own example explain the steps involved in details for conducting finite element analysis for the case **"Steady state structural analysis "**	10
	B) Derive from integral equation associated with two dimensional field equations for the element matrices to show that $[K^{(e)}] = [K_D^{(e)}] + [K_G^{(e)}]$.	10
Q.6	Explain the following:- A) Weighted residual method for obtaining numerical solutions to differential equations. B) Preprocessing, Solution and Post processing features in ANSYS or similar FEA software.	10 10
Q.7	A) Show that area co-ordinates L_1, L_2 and L_3 for a linear triangular element are identical to the shape functions.	10
	B) With own example explain the steps in calculation of nodal displacements in case of inclined support in trusses.	10

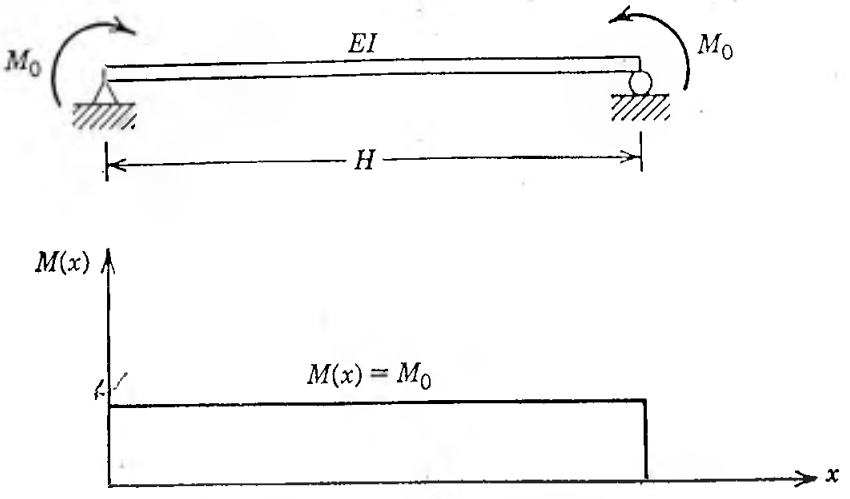


Figure 1 A simply supported beam with concentrated end moments.

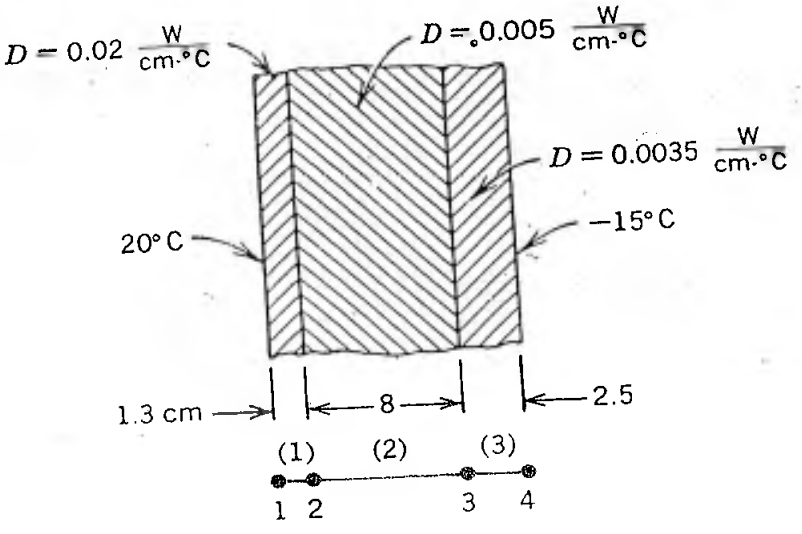


Figure 2

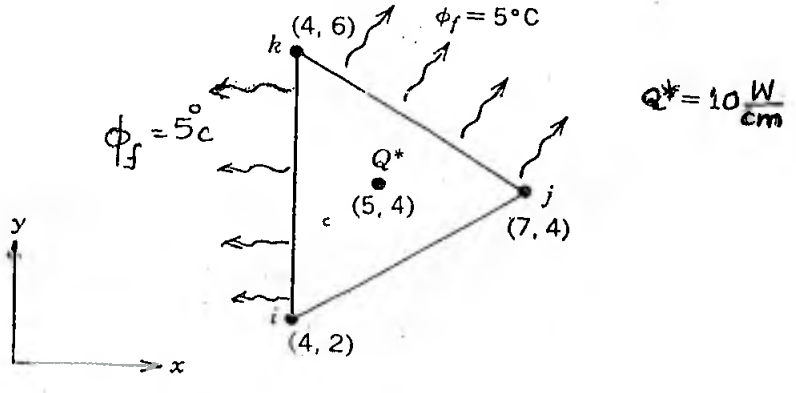


Figure 3

Sketch page 1

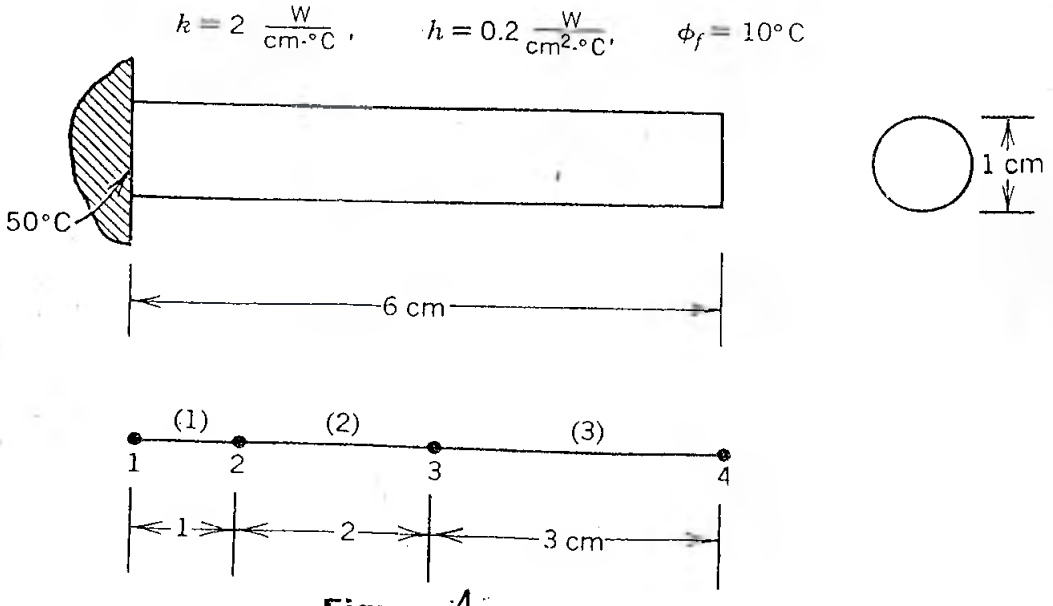
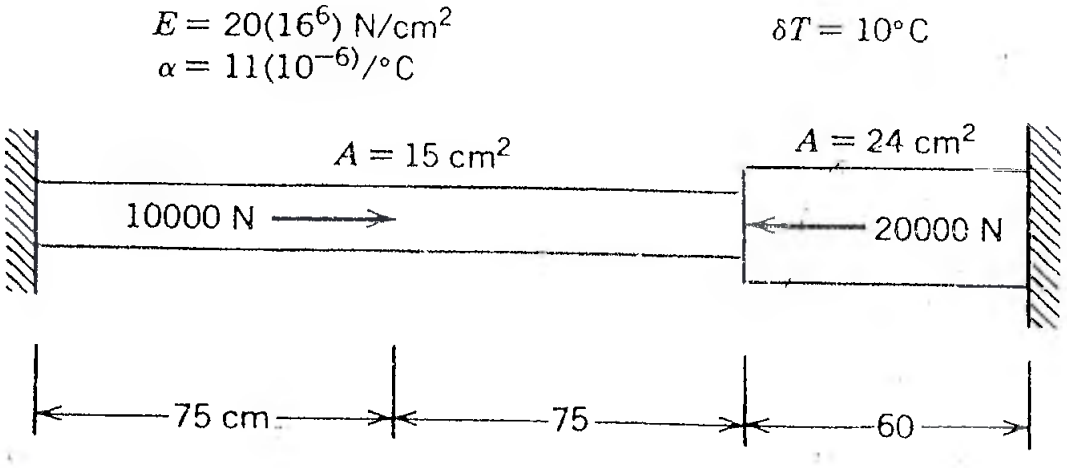


Figure 4



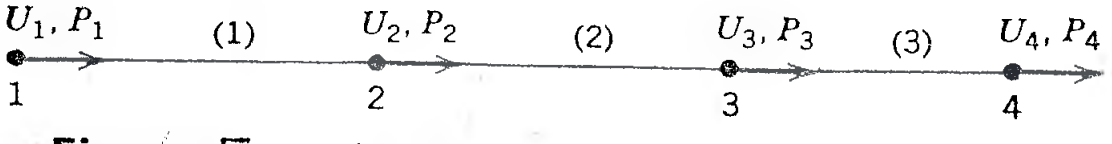


Figure 5 A system of three axial force members.

Sketch page. 2

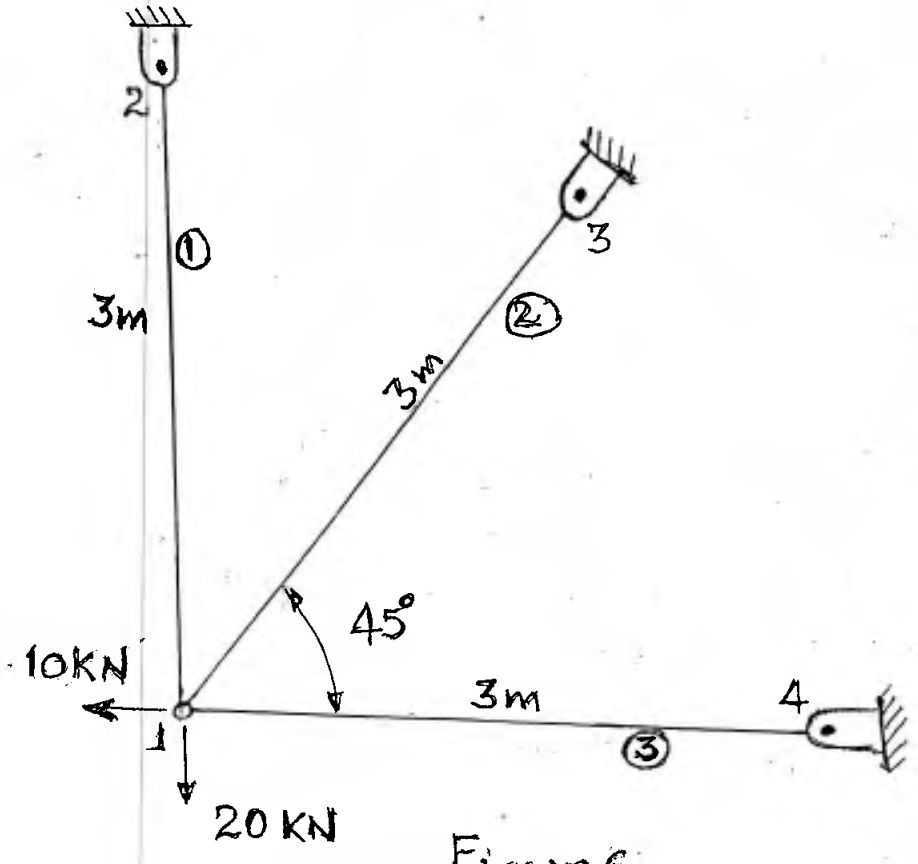


Figure.6

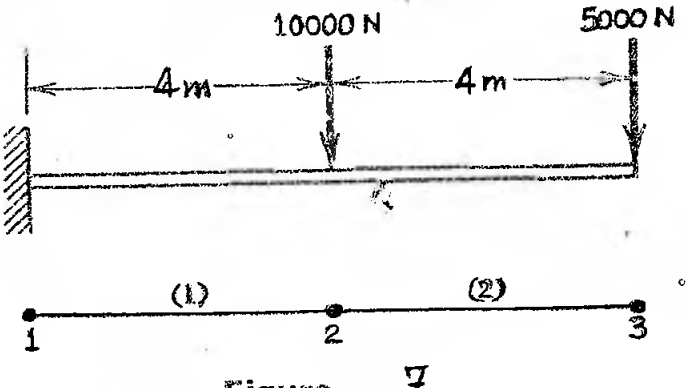


Figure . . 7

Sketch page 3

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

END SEM - May 2019 Examinations

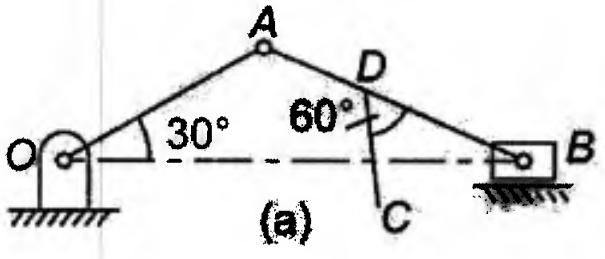
Program: F.Y. M.Tech Machine Design **Duration: 3 Hour**

Course Code: EC-MDPE08 **Maximum Points: 100**

Course Name: Analysis and Synthesis of Mechanisms **Semester: II**

Notes:

- **Question No. 1 is compulsory, Attempt any four questions out of remaining six.**
- **Use of Scientific calculator is allowed.**
- **Answers to all sub questions should be grouped together.**
- **Assume suitable data if necessary justify the same and state the assumptions clearly.**
- **Draw Diagrams Wherever Necessary.**

Q. No.	Questions	Points	CO	BL	PI
1.	**Give** the two forms of Euler's Savary Equation and consider a four bar mechanism and find out the center of curvature of the coupler curve traced by any point, using Euler's Savary Equation.	20	1	L1,L2	2.2.2
2.	**(a)** Use the bobillier theorem to **show** that the inflection circle can be drawn without requiring the curvatures of centrodes. **(b)** A Slider crank mechanism is shown in fig. (a) The dimensions are OA= 20 mm, AB=25mm, AD= 10mm and DC = 10 mm. Draw the inflection circle for the motion of the coupler and **find** the instantaneous radius of curvature of the oath of the coupler point C.  (a)	10 10	3 3	L3	2.1.3
3.	**(a) State and Prove** Robert-Chebyshev Theorem. **(b) Categorize** between Path generation, Motion generation and Function generation.	10 10	1 1	L4	1.3.1

4.	**(a) Synthesize** the function y = cos (x) for 0°≤ x≤ 90°. The range in φ is 120° and the range in ψ is 60°. Chebyshev spacing yielded the following precision points: $\varphi_2 - \varphi_1 = 55°$ $\psi_2 - \psi_1 = 34°$ $\varphi_3 - \varphi_1 = 102°$ $\psi_3 - \psi_1 = 42°$ Here $R_\varphi = ½$ and $R_\psi = 60°$, using freudenstein equation. **(b) Determine** the Chebyshev spacing for a four bar linkage generating the function $y = 2x^2 - 1$, in the range of $1 \le x \le 2$, Where four precision points are to be prescribed (n=4). Take $\Delta x = 1.0$ (circle diameter), sides of polygon is 2n.	10 10	4 4	L5	3.1.3
5.	**(a) Design** a four-link mechanism that coordinates the following three positions of the input and the output links given by $\theta_1 = 25°$ $\varphi_1 = 30°$ $\theta_2 = 35°$ $\varphi_2 = 40°$ $\theta_3 = 50°$ $\varphi_3 = 60°$ **(b) Develop** the four bar coupler curve equation with the example.	10 10	4 3	L6	3.1.3
6.	**(a) Design** a four-link mechanism if the motions of the input and the output links governed by a function $y = x^{1.8}$ and x varies from 1 to 4. Assume θ to vary from 30° to 120° and φ from 60° to 130°. The length of the fixed link is 30 mm. Use Chebyshev spacing of accuracy points. **(b) Explain** the Graphical Overlay Method of Kinematic Synthesis.	10 10	4 1	L6	3.2.3
7.	**Answer any Four the following questions:** (a) Enlist the MATLAB codes for accuracy points. (b) Type, Number and Dimensional Synthesis (c) Errors in Mechanisms. (d) Matrix – Method. (e) Equivalent Mechanisms.	20 05 05 05 05 05	2 1 1 3 3	L4	1.1.2

Lab. Exam
[17/5/19]

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

[1, 30]

End Sem- May 2019 Examinations

Program: M.Tech F. Y. Machine Design | **Duration: 3 Hour**

Course Code: EC-MDPE 13 | **Maximum Points: 100**

Course Name: Advanced Engineering Materials | **Semester: II**

Notes:

- **Question No. 1 is compulsory, Attempt any four questions out of remaining six.**
- **Use of Scientific calculator is allowed.**
- **Answers to all sub questions should be grouped together.**
- **Assume suitable data if necessary justify the same and state the assumptions clearly.**
- **Draw Diagrams Wherever Necessary.**

Q. No.	Questions	Point	CO	BL	PI
1.	**(a) Derive equations**, which may be used to convert mass fraction to volume fraction, and vice versa.	10	01	L3	1.3.1
	(b) What are the different types of fractures in metallic materials? Formulate the important features of these fractured surfaces. What is the use of this study?	10	04	L2	2.3.2
2.	**(a) Draw and appropriately label** the Iron- Carbide equilibrium diagram **and how would you explain** the Invariant Reactions in it.	20	03	L3	2.2.2
3.	**(a) Explain in detail** the effect of alloy elements and micro-structural effects in super alloys.	05	01	L2	1.2.1
	(b) Explain the purpose and process of Normalizing.	05	01	L3	2.3.1
	(c) Describe with neat sketch fatigue test.	05	04	L2	1.1.1
	(d)Write a note on thermal stresses in materials.	05	05	L3	2.3.1
4.	**(a) Which** alloying elements of steel combines with carbon forms simple and complex carbides and which properties are affected by their formation?	12	03	L5	2.1.2
	(b) Describe the specific requirements for the advance materials that are used in nuclear applications? List the applications of Shape memory alloys.	08	01	L2	1.3.1
5.	**(a) Draw** a typical creep curve and explain the various stages of creep	10	04	L3	2.3.2
	(b)Describe (i) Particle reinforced composites (ii) Fiber reinforced composites & (iii) Structural composites.	10	05	L2	1.2.1

6.	**(a) Define** hardenability and case depth. Why is it necessary to temper hardened steel?	6	04	L3	6.1.1
	(b) For economic, environmental and social issues of material usage, What aspects should we take into consideration, discuss regarding product **Life cycle analysis (LCA) and its use in design.**	14	06	L2	1.2.1
7.	(a) **Describe** the mechanisms of deformation and strengthening of polymers.	10	05	L5	2.2.2
	(b) What is the influence of temperature on magnetic behaviour? Discuss Ferromagnetism, Anti-ferromagnetism and Ferrimagnetism in detail.	10	05	L3	6.1.1

Lab
20/5/19 [1:30]

BharatiyaVidyaBhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination May 2019

Program: M.Tech (Mech) M/C Design **Duration:3 hr.**

Course Code: EC-MDPE11 **Maximum Points: 100**

Course Name: DESIGN OF POWER TRANSMISSION SYSTEMS **Semester: II**

Notes: 1) Answer any five questions.
2) Use of Design Data Book by Bhandari is permitted.
3) Assume suitable additional data if needed and state the same.

Q. No.	Questions	Points	CO	BL	PI
1	A) The following data is given for a pair of parallel helical gears made of steel. Power transmitted=20kW; Pinion speed=720 rpm; Pinion= 35 teeth; Gear= 70 teeth; Centre distance= 285mm; Normal module= 5mm; Face width=50mm; Normal pressure angle= 20^0; Ultimate tensile strength=600 N/ mm^2; Surface hardness= 300 BHN; Grade of machining=Gr6; Service factor=1.25. Calculate:- i) Design twisting moment; ii) Design bending stress; iii) Design contact stress; iv) Check with design formulae for beam strength for normal module selected and bending stress induced.	12	02	01	1.4.1
	B) A pair of worm gears is designated as 1/40/10/4. The input speed of worm shaft is 1000 rpm. The worm wheel is made of phosphor bronze (sand cast), while the worm is of case hardened steel 10C4. Determine the power transmitting capacity based on wear strength.	08	03	03	2.2.2
2	A) A pair of straight bevel gears is mounted on shafts, which are intersecting at right angles. The gears are made of steel (S_{ut} =570N/mm^2) and heat treated to 350 BHN. The number of teeth on the pinion and gear are 40 and 65 teeth respectively. The module at the outside diameter is 3mm, while the face width of the tooth is 35mm. Calculate the beam strength and wear strength.	10	02	03	5.1.2
	B) A double threaded power screw with ISO metric trapezoidal threads is used to raise a load of 350kN.The nominal diameter is 100 mm and the pitch is 12mm.The coefficient of friction at the screw threads is 0.15.	10	03	05	8.2.2

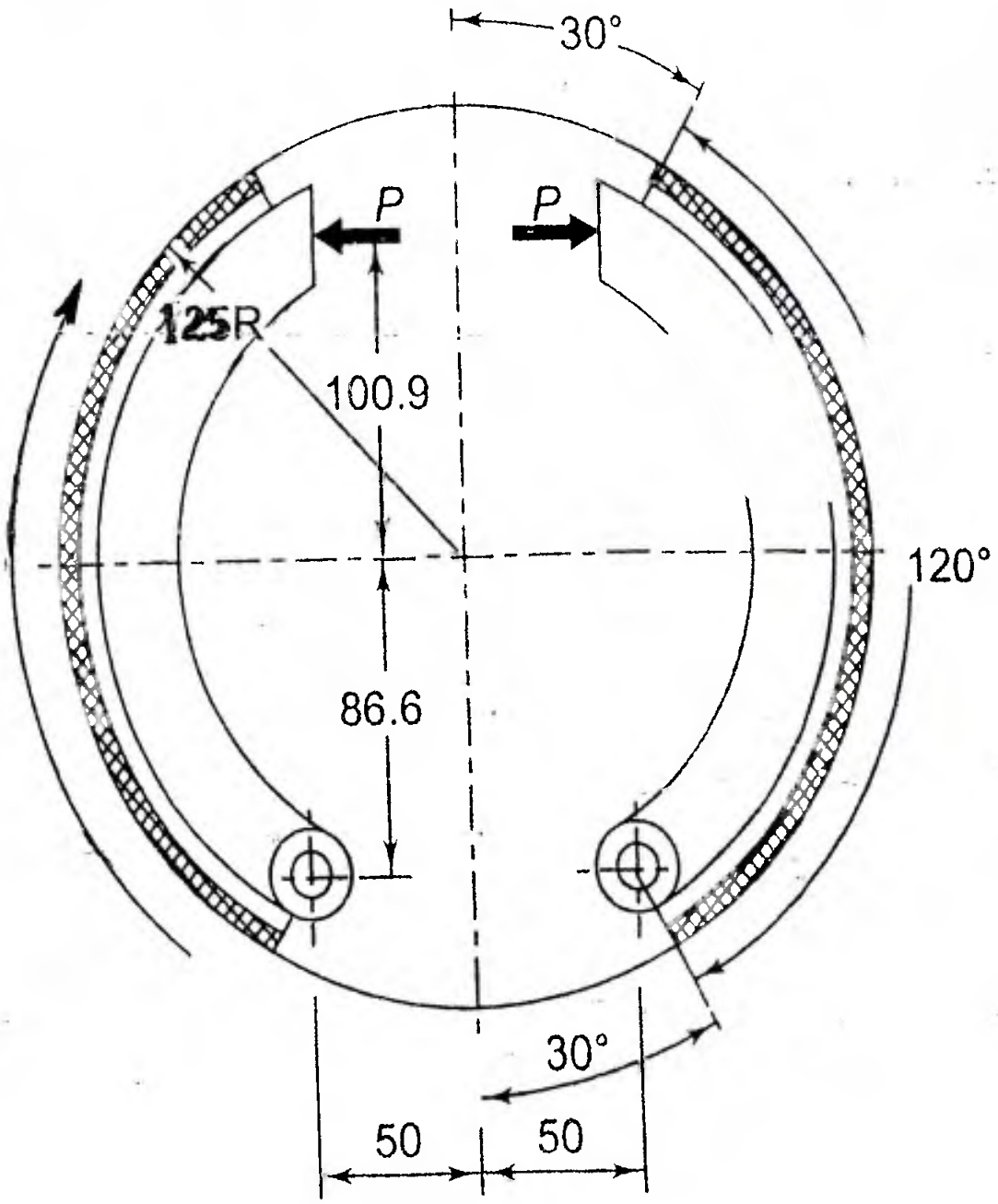

Fig. 1 *Automotive Double Shoe Brake*

Q. No. 6(A)

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

EVEN SEM JULY 2019 RE-EXAMINATIONS

(OLD COURSE)

Program: M.Tech M/C Design **Duration:3Hrs**

Course Code:MTMD 212 **Maximum Points:100**

Course Name: Design of Power Transmission Systems **Semester:II**

Notes: 1) Answer any five questions.

2) Use of Design Data Book by Bhandari is permitted.

3) Assume suitable additional data if necessary and state the same.

Q.No.	Questions	Points
Q.1	A) A pair of worm gears is designated as 1/40/10/4. The input speed of worm shaft is 1200 rpm. The worm wheel is made of phosphor bronze (sand cast), while the worm is of case hardened steel 10C4. Determine the power transmitting capacity based on wear strength.	10
	B) A pair of straight bevel gears is mounted on shafts, which are intersecting at right angles. The gears are made of steel (S_{ut} =600N/mm^2) and heat treated to 350 BHN. The number of teeth on the pinion and gear are 42 and 66 teeth respectively. The module at the outside diameter is 3mm, while the face width of the tooth is 35mm. Calculate the beam strength and wear strength.	10
Q.2	A) A double threaded power screw with ISO metric trapezoidal threads is used to raise a load of 400kN.The nominal diameter is 100 mm and the pitch is 12mm.The coefficient of friction at the screw threads is 0.15. Neglecting collar friction , calculate: i) torque required to raise the load; ii) torque required to lower the load; and iii) efficiency of the screw.	10
	B) A transmission shaft is supported between two bearings, which are 750 mm apart. Power is transmitted to the shaft through a coupling, which is located to the left of the left-hand bearing. Power is transmitted from the shaft by means of a belt pulley, 450mm in diameter, which is located at a distance of 200mm to the right of the left-hand bearing. The weight of the pulley is 350N and the ratio of belt tension to tight and slack side is 2:1. The belt tensions act in vertically downward direction .The shaft is made of steel (S_{yt}=300N/mm^2) and the factor of safety is 3. Determine the shaft diameter if it transmits 12.0 kW power at 350 rpm from the coupling to the pulley.(Assume S_{sy} =0.5 S_{yt})	10
Q.3	A) Two pneumatic double acting cylinders are A and B. The motion sequence is as given below:-	10

	A + B + / delay B – A - Select either Cascade or Shift Register method and draw the circuit. Auxiliary condition is single or Continuous cycle. Next cycle can commence only after completion of previous cycle. B) Explain the application of the following in hydraulic circuits with own simple circuits. a) Accumulator b) Intensifier c) Sequencing valve.	10
Q.4	A) It is required to design and select a V- belt drive to connect a 9 kW, 1440rpm induction motor to a fan, running approximately 480 rpm, for a service of 24hr per day. Space is available for a center distance of about 1.2m. B) The cylinder of a four stroke diesel engine has the following specifications:- a) Cylinder bore diameter = 150 mm; Max gas pressure = 3.5 Mpa; Cylinder material is Grey Cast Iron FG 200(S_{ut} =250N/mm^2); Factor of safety =5; Poisson's ratio= 0.25. Determine the thickness of the cylinder wall. Also calculate the apparent and net circumferential and longitudinal stress in the cylinder wall.	10 10
Q.5	A) A pair of spur gears consists of a 24 teeth pinion, rotating at 1000rpm and transmitting power to a 48 teeth gear. The module is 6mm, while the face width is 60mm.Both the gears are made of steel with an ultimate tensile strength of 450 N/mm^2. They are heat treated to a surface hardness of 250 BHN. Assume the velocity factor accounts for the dynamic load. Calculate:- i) Beam strength; ii) Wear strength; iii) Rated power that the gears can transmit, if service factor and factor of safety are 1.5 and 2, respectively. B) It is required to design a chain drive to connect 5 kW, 1440 rpm electric motor to a drilling machine. The speed reduction is 3:1.The centre distance should be approximately 500mm. i) Select a proper chain for the drive; ii) Determine the number of links; iii) Specify the correct centre distance between the axis of sprockets.	10 10
Q.6	A) A single deep groove ball bearing is subjected to a radial force of 8kN and a thrust force of 3kN.The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75mm and Bearing No. 6315(C =112000N) is selected for this application. i) Estimate the life of this bearing, with 90% reliability; ii) Estimate the reliability for 20000 hr life. B) A centrifugal clutch, transmitting 22 kW at 800 rpm consists of four shoes. The clutch is to be engaged at 600 rpm. The inner radius of the drum is 165 mm. The radius of the centre of gravity of the shoes is 140mm, when the clutch is engaged. The coefficient of friction is 0.3, while the permissible pressure on friction lining is 0.1 N/mm^2. Calculate: i) the mass of each shoe; ii) the dimensions of friction lining.	10 10

Q.7	Explain the following:- a) Recommendations for the design of chain drive. b) Steps to be followed in routine energy efficiency assessment of DG sets(prime movers) on shop floor c) Advantages of disc brakes. d) Steps in selection of flat belts from manufacturer's catalogue.	20

Lab
22/5/19 1:30

Bharatiya Vidya Bhavan's

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End Semester Exam May-2019

Program: M. Tech TE/MD/PEP/CM
Course Code: THAU4/MDAU4/AUMTPX201/CMAU2
Course Name: Stress management by yoga

Duration: 3 Hour
Maximum Points: 100
Semester: II

Notes:

1. Question number ONE is compulsory and solve any four out of remaining six.

Q.No.	Questions	Points	CO	BL	PI
1.	"Integral yoga for integrated personality" Explain?	20	1	1	1.2.1
2.	How yoga helps in education?	20	2	2	1.2.1
3.	How yoga helps in healthy lifestyle?	20	2	2	1.3.1
4.	Health is the key of blissful living, Explain	20	1	1	1.2.1
5	45 minutes of yoga a day keeps the tension away?	20	1	1	1.3.1
6	How yoga helps the executives in corporate sector?	20	2	2	1.3.1
7	Explain how yoga helps in modern living	20	1	2	1.3.1

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Sardar Patel College of Engineering

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RE EXAM

July 2019 **Date: 15 July 2019**

Program: M.Tech Machine Design **Duration: 3 Hours**

Course code: MTMD216 **Maximum Marks: 100**

Name of the Course: Optimization Methods **Semester: II**

Instructions:

- **Question No. 1 is compulsory, Attempt any four questions out of remaining six.**
- **Use of Scientific calculator is allowed.**
- **Answers to all sub questions should be grouped together.**
- **Assume suitable data if necessary justify the same and state the assumptions clearly.**

Q. No.		Points	CO	BL	PI
Q1	**(a) Discuss** the purpose of optimum design, What is LPP? What are the advantages of simplex method?	10	1	L3	1.2.1
	(b) Find local minimum for function $f(\bar{x}) = x_1 + (4*10^6) / x_1 x_2 + 250x_2$, the necessary condition for optimality is $\Delta f(\bar{x}) = 0$, using unconstrained optimum design for several variables.	10	1		
Q2	**(a) State** the necessary and sufficiency conditions for the minimum of the single variable function f(x).	10	3	L2	2.1.2
	(b) Find the minimum of the function: $f(X) = 10x^6-48x^5+15x^4+200x^3-120x^2-480x+100$	10	3		
Q3	**(a) (b) Define** an Optimal Control Problem and give an Engineering example.	10	1	L2	1.4.1
	(b) Explain how to solve a maximization problem as a minimization problem with suitable examples.	10	2		
Q4	**(a) Predict** any five MATLAB codes; which are operate to solve any linear programming functions with equality or inequality constraints.	10	4	L6	5.1.1
	(b) State the selection criteria for optimum configuration and explain with suitable example.	10	3	L2	

Q5	**(a) Bracket** the minimum of the following function using the bounding phase method $f(x) = x^3 - 2x + 10$	**10**	**2**	**L3**	**2.3.2**
	(b) Define the following terms: 1. Behavior Constraint 2. Feasibility Solution 3. Maxima and Minima 4. Infeasibility form 5. Geometric Programming Problem	**2*5**	**1**	**L2**	
Q6	**(a) Classify** the constrained optimization techniques and briefly explain each technique.	**10**	**1**	**L2**	**2.2.3**
	(b) Calculate gradient vector, hessian matrix for the function and Taylor series at point (1,0, -2) and compare with exact $f(x) = x_2^2 x_3 + x_2 e^x$	**10**	**4**	**L3**	
Q7	A store stocks and sells three model of AC sets. The store cannot afford to have an inventory worth more than Rs. 45,000 at any time. The AC sets are ordered in lots. It costs Rs. a j for the store whenever a lot of AC model j is ordered. The cost of one AC set of model j is c_j. The demand rate of AC j is d j units per year. The rate at which inventory costs accumulate is known to be proportional to the investment in inventory at any time, with $q_j = 0.5$, denoting the constant of proportionality for AC model j. Each AC set occupies an area of $S_j = 0.40\ m^2$ and the maximum storage space is $90\ m^2$. The data known from the past experience is given below: AC MODEL 1 2 3 Ordering Cost a_j 50 80 100 Unit Cost c_j 40 120 80 Demand Rate d_j 800 400 1200 **Formulate & Solve** the problem to minimizing the average annual cost of ordering and storing.	**20**	**3**	**L5**	**2.3.2**