

III Year B. Tech II- Semester MECHANICAL ENGINEERING



MODEL QUESTION PAPERS



MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

(Autonomous Institution-UGC, Govt. of India)
Secunderabad-500100, Telangana State, India.

www.mrcet.ac.in



AUTOMOBILE ENGINEERING



MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

IV B. Tech I Semester Supplementary Examinations, May 2019**Automobile Engineering**

(ME)

Roll No									
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (25 Marks)

- 1). a Explain the need of crank case ventilation [2M]
- b Compare rear wheel drive and front wheel drive [3M]
- c Define evaporating cooling [2M]
- d Explain the necessity of spark advance in ignition system [3M]
- e Explain the working of wiper [2M]
- f Give merits and demerits of Electrical energy for automobile as alternative source [3M]
- g What are the functions of a clutch [2M]
- h Why slip joint is important? Explain [3M]
- i Define camber and toe – out [2M]
- j Compare Pneumatic and vacuum brakes [3M]

PART-B (50 MARKS)**SECTION-I**

- 2 Explain the operation of the typical turbocharger with sketch and write the advantages over super charger [10M]

OR

- 3 Sketch and explain dry sump lubrication systems and write the advantages over wet sump lubricating system [10M]

SECTION-II

- 4 Explain the construction and working of pressure sealed cooling [10M]

OR

- 5 Explain the construction and working of electronic ignition system [10M]

SECTION-III

- 6 Briefly discuss the working of bendix drive starting system [10M]

OR

- 7 Analyse how Multipoint fuel injection system for SI Engines control emissions [10M]

SECTION-IV

- 8 Explain the construction and working of a differential with a neat sketch [10M]

OR

- 9 Explain in detail the automatic transmission system [10M]

SECTION-V

- 10 Explain the working of tandem master cylinder [10M]

OR

- 11 Briefly discuss the importance of Independent suspension system with the help of a sketch [10M]

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) What is the use of carburetor in S.I. engine? [2]
- b) Explain about the requirements of diesel injection system. [3]
- c) What is the spark advance and retard mechanism? [2]
- d) Explain about the starting system of automobile. [3]
- e) What are the functions of clutch? [2]
- f) Why the shock absorbers are used in automobile. [3]
- g) What do you mean by master cylinder? [2]
- h) Explain about the king pin rake. [3]
- i) What are the advantages of using hydrogen as fuel? [2]
- j) What are the merits and demerits of biomass? [3]

PART - B**(50 Marks)**

- 2.a) Discuss about the fuel supply system in S.I. engine.
 - b) Explain about the different types of air filters. [5+5]
- OR**
- 3.a) Explain about the formation of spray in C.I. engine.
 - b) Discuss about the chassis and body components in automobile. [5+5]
- 4.a) What do you mean by the term "Ignition"? How is it related with "combustion"?
 - b) Sketch and explain different types of Ignition systems used in automotive engines. [5+5]
- OR**
- 5.a) Explain in detail about the liquid cooling system with a diagram.
 - b) Discuss about the bendix drive mechanism. [5+5]
- 6.a) Discuss the working principles of
 - i) Torque tube drive.
 - ii) Hotchkiss drive.
 - b) What are the functions of universal joint and Propeller shaft? [5+5]
- OR**
- 7.a) Describe in detail about single plate clutch with a neat diagram.
 - b) Explain about the differential rear axle with neat sketch. [5+5]

- 8.a) Explain the working principles of Hydraulic braking system with neat sketches.
b) Sketch and explain various steering geometries. [5+5]

OR

- 9.a) Discuss about the Davis steering mechanism in the automobiles.
b) Describe about the mechanical brake system. [5+5]

10. Describe in detail about the multipoint fuel injection for S.I. engines. [10]

OR

- 11.a) What are the pollution standards for automobile.
b) Discuss different energy alternatives with their merits and demerits. [5+5]

Code No: RT41031

R13

Set No. 1

IV B.Tech I Semester Supplementary Examinations, February/March - 2018

AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

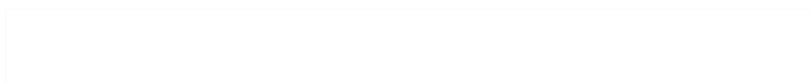
Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) How can turbo-charging improve performance of an engine? [4]
- b) Why it is important to maintain tyre pressure? [4]
- c) What is centre point steering? [3]
- d) What are basic requirements of braking fluid? [4]
- e) Explain why engines should not be sub-cooled. [3]
- f) Explain why pollution standards have to be maintained. [4]

PART-B (3x16 = 48 Marks)

2. a) Explain how a four wheel drive mechanism offers better power transmission in a automobile. [8]
- b) Draw and explain with a simple sketch, pressurized lubrication system with its relative advantages. [8]
3. a) What is the necessity for clutch assembly in transmission system and explain the construction and working of a single plate clutch. [8]
- b) Explain with a simple sketch, working of differential in a automobile. [8]
4. a) Define camber, castor, king pin rake angles and their significance in steering geometry. [8]
- b) With the help of a schematic diagram, explain Ackerman steering mechanism. [8]
5. a) Explain the functioning of independent front wheel suspension system with torsion bar in a automobile. [8]
- b) Explain with a suitable schematic diagram, working of hydraulic braking system in a vehicle. [8]
6. a) What is ABS and how does ABS helps in improving uncontrolled skidding? [8]
- b) Why bull bars are being discouraged legally by Indian government – comment? [8]
7. a) Briefly discuss the mechanism of formation of pollutants in engine exhaust. [8]
- b) Discuss the tests that a crank shaft should be subjected to before re-installation in a engine. [8]



Code No: RT41031

R13

Set No. 1

IV B.Tech I Semester Supplementary Examinations, March - 2017

AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A

1. a) What is crank case ventilation? [3]
- b) Explain the important functions of centrifugal clutch. [4]
- c) Enumerate the differences between Davis and Ackermann steering gears. [4]
- d) Write about bendix drive mechanism solenoid switch. [4]
- e) What is meant by traction control? [3]
- f) State the precautions to be considered in engine reassembly. [4]

PART-B

2. a) With the help of a neat sketch explain Splash Lubrication system? Also discuss its advantages and disadvantages? [8]
- b) Explain how the power can be transmitted in front wheel drive by using a neat diagram. [8]
3. a) Explain the construction working and performance of a fluid flywheel. Enumerate the advantages of fluid flywheel over the other types of clutches. [8]
- b) Write about functions of a propeller shaft and Torque tube drive? [8]
4. a) Explain the term "Backlash" in Steering Gear. Write the common procedure adopted to adjust the backlash in steering gear. [8]
- b) Explain why the front wheels have to toe-out in turns. Explain what is meant by center point steering. [8]
5. a) Explain the functioning of rigid axle suspension system with a neat sketch. [6]
- b) Explain the requirements of braking fluids. [5]
- c) Explain Compensated voltage control with the help of a diagram. [5]
6. a) With the help of a neat diagram explain the construction and working of telescopic type of shock absorber? [8]
- b) What are various safety systems adopted for automobiles? Explain wind shield and speed control in detail. [8]
7. a) Explain about service details of valves and valve mechanism. [8]
- b) Explain the use of alternative fuels for emission control? [8]



Code No: RT41031

R13

Set No. 1

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Why does the lower end of the connecting rod have to be spilt? [3]
- b) What are the advantages of synchromesh transmission? [4]
- c) Define camber angle and its function in modern cars. [3]
- d) How does torsion type spring shackle differ from compression type? [4]
- e) Uses of engine specifications. [4]
- f) How catalytic convertors help in controlling pollution? [4]

PART-B (3x16 = 48 Marks)

2. a) Explain with a simple schematic diagram, working of a four wheel drive automobile. [8]
- b) Why lubrication system is essential in a automobile, explain working of pressurized lubrication system. [8]
3. a) Explain with a simple sketch, working of centrifugal type of clutch and why free play should be provided for clutch. [8]
- b) Draw and explain with a simple sketch, working of a constant mesh gear box. [8]
4. a) Explain with a simple sketch, working of worm and ball bearing nut steering mechanism. [8]
- b) What are the functions of steering system, explain with relevant sketch Ackerman steering mechanism. [8]
5. a) Explain with a schematic diagram, working of rigid axle front wheel suspension system. [8]
- b) Briefly discuss the functional requirements of braking fluids. [8]
6. a) How effective are seat belts and explain why is it safer to wear seat belts. [8]
- b) What is cruise control, explain briefly its working. [8]
7. a) Briefly explain the mechanism of formation of pollutants in automobile exhaust. [8]
- b) Explain briefly the procedure for service of valve mechanism in a automobile. [8]

Code No: **RT41031**

R13

Set No. 4

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) List all functions performed by lubricating oil in automobile engine. [4]
- b) Why are overdrives designed to be used above a set car speed? [3]
- c) Why do the front wheels have to toe-out during turns? [3]
- d) Differentiate between dead axle and live axle. [4]
- e) Why seat belts are essential in modern cars? [4]
- f) Why stringent norms are emphasized by pollution control boards? [4]

PART-B (3x16 = 48 Marks)

2. a) Give the comparison between front wheel drive and rear wheel drive. Also mention advantages of four wheel drive. [8]
- b) What is a super charger and explain how it can improve performance of an engine. [8]
3. a) Explain with relevant schematic diagram, working of a multi plate clutch assembly in a automobile. [8]
- b) Why synchromesh gear box are more advantageous than constant mesh gear box, Comment. [8]
4. a) What are camber and castor angles, what are its significance in steering geometry. [8]
- b) Explain with a simple sketch, conventional type of linkage used in commercial cars. [8]
5. a) What are the advantages of independent suspension system, explain independent front wheel suspension using torsion bars. [8]
- b) Draw and explain with simple layout hydraulic braking system in a commercial automobile. [8]
6. a) Explain how air bags work and why it is essential in a automobile. [8]
- b) What are suspension sensors and explain how these improve comfort levels in a automobile. [8]
7. a) Explain briefly the methods available to control emissions from a automobile. [8]
- b) Discuss various methods by which amount of wear can be estimated in big end bearing of connecting rod. [8]



Code No: RT41031

R13

Set No. 3

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Why mineral oils used almost exclusively for engine lubrication? [4]
- b) What is the function of torsion spring in clutch assembly? [4]
- c) What are the functions of steering gears in steering mechanism? [4]
- d) Explain how hydraulic brakes are naturally self equalizing. [3]
- e) What are functional requirements of wind screen? [3]
- f) List all indications for cylinder wall wear. [4]

PART-B (3x16 = 48 Marks)

2. a) Explain the working of a turbocharger in a automobile and comment on how it improves engine performance. [8]
- b) What are the different methods of repairing an engine which has worn out cylinder walls? [8]
3. a) Explain with a simple sketch, construction and working of differential in a automobile. [8]
- b) Draw a schematic diagram and explain the working of a torque convertor. [8]
4. a) Why steering system is essential in a automobile, explain with relevant sketch Davis steering mechanism? [8]
- b) Define directional stability and explain the factors which influence directional stability in a automobile. [8]
5. a) Draw and explain in detail with a simple sketch, working of master cylinder in braking system. [8]
- b) Explain with a simple sketch, working of Bendix mechanism in a automobile. [8]
6. a) Explain the working of ABS in a automobile with simple sketch with its uses. [8]
- b) Briefly explain how engine specifications logically guide a customer while purchasing a new vehicle. [8]
7. a) What are catalytic convertors and explain how they help in containing emissions from a automobile. [8]
- b) Discuss briefly inspection and repair procedures for engine crank shafts in automobiles. [8]

Code No: **RT41031**

R13

Set No. 4

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017
AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) List all functions of a piston rings in an engine. [3]
- b) Why is clutch pedal free play important? [3]
- c) How does castor angle help in directional stability in automobiles? [4]
- d) Explain why a high pedal produces better braking action than a low one? [4]
- e) Is speed control essential in modern cars if so why? [4]
- f) Why should aluminum heads be tightened only when cold? [4]

PART-B (3x16 = 48 Marks)

2. a) Draw a simple sketch of a supercharger and explain how its presence can improve performance of an engine. [8]
- b) Why crankcase ventilation essential in a engine, explain with a simple sketch working of it. [8]
3. a) Explain with a simple sketch, construction and working of epicyclic gear box in a automobile. [8]
- b) What are the different types of wheels used in passenger cars and what are the advantages of tubeless tires. [8]
4. a) What are the different types of steering gears used in commercial automobiles, explain working of it. [8]
- b) What is steering geometry and explain it briefly. [8]
5. a) Explain with a simple sketch, working of power brakes in a commercial automobile. [8]
- b) Draw and explain with relevant circuit diagram, working of a windscreen wiper in a automobile. [8]
6. a) What are the advantages and disadvantages of central locking system in a automobile. [8]
- b) Explain with relevant sketches, working of electric windows in a automobile. [8]
7. a) What are the advantages and disadvantages of use of alternate fuels in automobiles? [8]
- b) Discuss briefly the procedure for repair of cylinder wear in a automobile engine. [8]

Code No: RT41031

R13

Set No. 1

IV B.Tech I Semester Regular Examinations, November - 2016

AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Write the components of four wheeler automobile. [4]
- b) Explain the importance and functions of transmission system. [4]
- c) Explain the integral power steering? [3]
- d) Write about requirements of brake fluid? [4]
- e) Explain the importance of airbags? [3]
- f) Explain why engine service is required? [4]

PART-B (3x16 = 48 Marks)

2. a) Explain about turbo charging and super charging. [8]
- b) Write about oil pumps and engine service? [8]
3. a) Explain about centrifugal clutch with neat diagram? [8]
- b) Explain about sliding mesh and synchro mesh gear boxes with neat diagrams? [8]
4. a) Explain the Davis Steering Mechanism? Write its relative merits? [8]
- b) Explain about steering geometry in detail? [8]
5. a) Sketch the arrangement of pneumatic braking system used in automobiles and explain? [8]
- b) Name the various electrical components used in an automobile & give their functions? [8]
6. a) Write about engine specification with regard to number of cylinders and arrangement? [8]
- b) Explain about central locking and electric windows? [8]
7. a) Write about thermal and catalytic converters? [8]
- b) Explain service details of engine cylinder head? [8]



Code No: RT41031

R13

Set No. 2

IV B.Tech I Semester Regular Examinations, November - 2016

AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Write about the types of automobile engines? [4]
- b) What is the purpose of the pressure plate in a clutch? Explain? [4]
- c) Explain about linkage power steering? [3]
- d) Write about the current – voltage regulator? [4]
- e) Explain the importance of seat belt regarding safety system? [3]
- f) Write about International pollution standards? [4]

PART-B (3x16 = 48 Marks)

2. a) Explain how the power can be transmitted in front wheel drive by using a neat diagram? [8]
- b) Write about splash and pressure lubrication systems? [8]
3. a) Explain about magnetic clutch and fluid fly wheel in detail? [8]
- b) Write about functions of a propeller shaft and Hotch – Kiss drive? [8]
4. a) Explain about the types of steering gears? [8]
- b) Explain clearly how the King-Pin inclination produces directional stability? [8]
5. a) Write about rigid axle suspension system and shock absorber? [8]
- b) Explain about Mechanical braking system? [8]
6. a) Write about engine specification with regard to torque? [8]
- b) Explain about anti lock brake system (ABS) in detail? [8]
7. a) Explain the use of alternative fuels for emission control? [8]
- b) Write about service details of valves and valve mechanism? [8]

Code No: **RT41031**

R13

Set No. 3

IV B.Tech I Semester Regular Examinations, November - 2016

AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Explain about oil filters? [4]
- b) Write about types of gear boxes? [4]
- c) Explain why do the front wheels have to toe-out in turns? [3]
- d) Explain about vacuum brakes? [4]
- e) Write about importance of the wind shield? [3]
- f) Write about the National pollution standards? [4]

PART-B (3x16 = 48 Marks)

2. a) Explain how the power can be transmitted in rear wheel drive by using a neat diagram? [8]
- b) What is crankcase ventilation? Explain positive crankcase ventilation system with a neat sketch. [8]
3. a) Write about single plate clutch and multi plate clutch in detail? [8]
- b) Explain about torque tube drive and universal joint with neat diagram? [8]
4. a) Explain the Ackermann Steering Mechanism? Write its relative merits? [8]
- b) Describe the cam and roller type of Steering Gear with neat diagram? [8]
5. a) Explain about independent suspension system? [8]
- b) Explain about bendix drive mechanism and solenoid switch? [8]
6. a) Write about engine specification with regard to speed? [8]
- b) Explain about suspension sensors in detail? [8]
7. a) Explain the procedure for concentration measurement of pollutants? [8]
- b) Write about service details of piston-connecting rod assembly? [8]



Code No: RT41031

R13

Set No. 4

IV B.Tech I Semester Regular Examinations, November - 2016

AUTOMOBILE ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Explain about nitriding of crank shaft? [4]
- b) Write about types of wheels and tyres? [4]
- c) Explain what is meant by center point steering? [3]
- d) Write the objects of suspension systems? [4]
- e) Explain about bumper in safety system? [3]
- f) Explain the types of pollutants? [4]

PART-B (3x16 = 48 Marks)

2. Sketch a chassis of any four wheelers and mark various parts on it. Explain the functions of various components of automobile. [16]
3. a) Explain about cone clutch with neat diagram? [8]
- b) Write about differential rear axles in detail? [8]
4. a) Sketch and explain the construction and working principle of the recirculating Ball type steering gear? [10]
- b) What requirements are expected in a good steering system? [6]
5. a) Explain about hydraulic brake system in detail? [8]
- b) Explain about horn, wiper, fuel gauge and engine temperature indicator? [8]
6. a) Write about engine specification with regard to power? [8]
- b) Explain about traction control and speed control? [8]
7. a) Explain the mechanism of pollutants formation? [8]
- b) Explain about engine reassembly and its precautions? [8]





CAD/CAM



Code No: **R15A0331****MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

IV B. Tech I Semester Regular Examinations, November 2018**CAD/CAM****(ME&AE)**

Roll No									
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (25 Marks)

- 1). a List out the various input devices [2M]
- b Explain three dimensional transformations with an example? [3M]
- c What are the different types of curve fitting techniques? [2M]
- d What is the importance of layers in drafting? Explain with an example [3M]
- e Write about three Boolean operations in used in solid modeling [2M]
- f What is NC modes? [3M]
- g Write the Benefits of CAPP? [2M]
- h Explain the MICLASS coding system with an example? [3M]
- i Discuss about Loop layout in Flexible Manufacturing System [2M]
- j Define off-line and on-line inspections. [3M]

PART-B (50 MARKS)**SECTION-I**

- 2 a) Describe briefly the types of storage devices used in computers [5+5M]
 - b) What is product life cycle in CAD/CAM. Describe with neat sketch
- OR
- 3 a) Explain the concept of obtaining a rotation about an arbitrary point in XY [5+5M] plane.
 - b) 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 co-ordinates of the new end points.

SECTION-II

- 4 a) Explain the composite surface and Bezier surfaces. What are the differences [5+5M] and applications for which these are used?
 - b) Differentiate between linear sweep and rotation sweep.
- OR
- 5 a) Find the equation of a Bezier curve which is defined by four control points [5+5M] as (80,30,0), (100,100,0), (200,100,0) and (250,30,0).
 - b) Distinguish between interpolation and approximation approaches used in design of curves.

SECTION-III

- 6 a) Explain linear and circular interpolations in CNC systems [5+5M]
b) Can you list out some editing Commands and explain their function.

OR

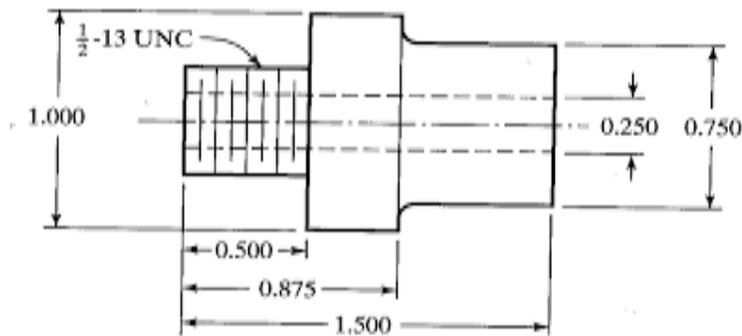
- 7 a) What basic assumptions are made while programming in APT language? [5+5M]
b) Discuss the special features of computer assisted part programming over manual part programming.

SECTION-IV

- 8 a) Compare and contrast retrieval and generative type CAPP systems. [5+5M]
b) What is part family? State advantages and limitations of Group Technology

OR

- 9 a) Explain about the OPITZ coding system generally used in Group Technology [10M]
b) Define part family in GT. Develop the Optiz form code with justification for the component shown in figure



SECTION-V

- 10 a) How does Lean production differ from Flexible production system? [5+5M]
b) Describe different types of material handling systems used in CIM briefly?

OR

- 11 a) Discuss various types of contact inspection methods with neat diagram [5+5M]
b) With the help of schematic diagram explain the measurement system based on scanning laser beam system explain its applications in CAQC systems?

Code No: R15A0331

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

IV B. Tech I Semester Supplementary Examinations, May 2019**CAD/CAM****(ME & AE)**

Roll No										
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (25 Marks)

- 1). a What is the structure of computing system? [2M]
- b What is hidden surface removal [3M]
- c What are the functions of Geometric Modelling in design [2M]
- d Why rapid prototyping is used? [3M]
- e What is the difference between NC and CNC? [2M]
- f What are M02, M04, M13 codes stands for in NC Programming? [3M]
- g List the methods available for taking decisions in a process plan [2M]
- h What are the various approaches available for CAPP? [3M]
- i Define off-line and on-line inspections [2M]
- j State the objectives of quality control. [3M]

PART-B (50 MARKS)**SECTION-I**

- 2 a) What do you understand by raster scanning? Why it is preferred to the storage tube in the display of graphics information? [5+5M]
- b) Describe the functioning of a central processing unit with the aid of a block diagram.

OR

- 3 a) Explain the importance of clipping. Give the details of method used for line clipping. [5+5M]
- b) A square with an edge length of 15 units is located in the origin with one of the edge at an angle 30° with the +X axis. Calculate the new position of the square if it is rotated about Z axis by an angle 30° in the clockwise direction.

SECTION-II

- 4 a) Explain the coon and Bezier surfaces. What are the differences and applications for which these are used? [5+5M]
- b) What are the limitations in utilising the sweep method for geometric construction?

OR

- 5 a) Find the equation of a Bezier curve which is defined by four control points [5+5M]

as (30,30,0), (50,80,0), (100,100,0) and (150,30,0).

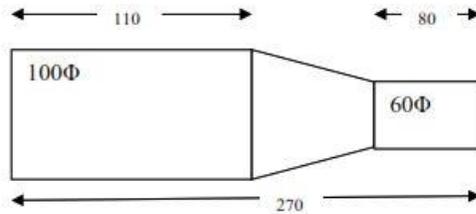
- b) What are the limitations found in the general wireframe modelling systems? Explain with an example.

SECTION-III

- 6 a) Explain the concept of the three basic Booleans operations used in solid modelling. Give neat sketches showing the effect of these operators [5+5M]
b) What are advantages and disadvantages of C-rep & B-rep approaches in solid modelling?

OR

- 7 Write the CNC turning programme for given figure [10M]



SECTION-IV

- 8 a) Briefly explain the methodology to be followed for developing a retrieval type of computer aided process planning system [5+5M]
b) Explain the guide lines for implementing group technology

OR

- 9 What are the differences between retrieval and generative type of computer aided process planning? Which is better? Explain your choice [10M]

SECTION-V

- 10 a) Describe the Scheduling and Dispatching issues related to FMS [5+5M]
b) State the advantages of CIM in manufacturing industry in detail

OR

- 11 a) Explain various non-Contact inspection methods optical with neat sketches [5+5M]
b) Conceptually show the organisation of information for tool management in a FMS. How is this different from a manufacturing shop?

Code No: 117BD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, November/December - 2016

CAD/CAM

(Common to ME, AE, AME, MSNT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

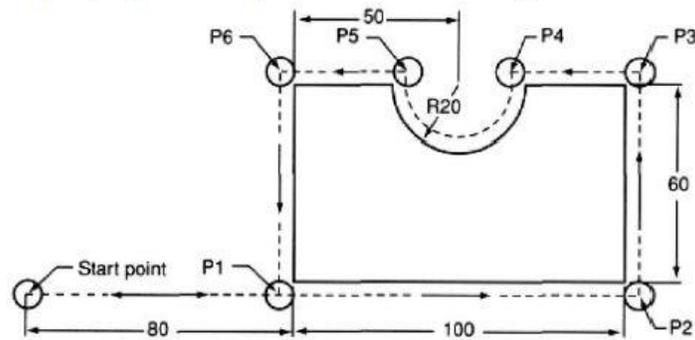
PART- A**(25 Marks)**

- 1.a) Write any five advantages and disadvantages by the adoption of CAD. [2]
- b) Write any 10 AutoCAD commands with small description. [3]
- c) Differentiate between Algebraic and Geometric form of a curve. [2]
- d) Write Bezier surface and B-Spline surface mathematical relations. [3]
- e) What are M03, M30 codes stands for in NC Programming? [2]
- f) Explain the use of MACROs in part programming? [3]
- g) List the methods available for taking decisions in a process plan. [2]
- h) What do you understand by the terms PDIR, MRIR and PPIR? [3]
- i) Enumerate the benefits of FMS. [2]
- j) Define off-line and on-line inspections. [3]

PART-B**(50 Marks)**

- 2.a) Briefly explain the conventional process of the product cycle in conventional manufacturing environment.
 - b) Draw the block diagram of the data exchange method between two different CAD systems using neutral data format. [5+5]
- OR**
- 3.a) How do you distinguish between a CPU and a Microprocessor.
 - b) What are the Input devices and Output devices, explain them briefly. [5+5]
- 4.a) Give a classification of the different surfaces that can be used in Geometric modelling applications.
 - b) What is meant by sweep? Discuss in detail the various types of sweep techniques available for 3D geometric construction. [5+5]
- OR**
- 5.a) What is meant by continuity of curves? What are the types of continuity curves?
 - b) Find the equation of a Bezier curve which is defined by four control points as (80,30,0), (100,100,0), (200,100,0) and (250,30,0). [5+5]

- 6.a) Explain the principle of CNC system with a block diagram.
 b) Write NC part program for the part shown in the below figure. [5+5]



OR

- 7.a) Explain linear and circular interpolations in CNC systems.
 b) What is manual CNC part programming? Explain with an example. [5+5]

- 8.a) What is part family? State advantages and limitations of Group Technology.
 b) Briefly explain the need of CAPP (Computer Aided Process Planning). [5+5]

OR

- 9.a) Explain about the OPITZ coding system generally used in Group Technology.
 b) What are the main objectives of MRP (Manufacturing Resource Planning)? Explain them briefly. [5+5]

- 10.a) Discuss the various topologies used in CIM with their relative advantages and disadvantages.
 b) How does Lean production differ from Flexible production system? Explain. [5+5]

OR

- 11.a) Describe the Scheduling and Dispatching issues related to FMS (Flexible Manufacturing System).
 b) Define computer aided quality control. Explain how it is implemented. [5+5]

---ooOoo---

Code No: 117BD

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, November/December - 2017

CAD/CAM

(Common to AE, AME, MSNT, ME)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) What are the computer peripherals of CAD? [2]
- b) What are the functions of Geometric Modelling in design? [3]
- c) What are the properties of B-spline curve? [2]
- d) Distinguish between Algebraic and Geometric form of a curve. [3]
- e) What are M03, M30 codes stands for in NC Programming? [2]
- f) What are the elements of NC system? [3]
- g) What are the various approaches available for CAPP? [2]
- h) What factors must be considered in selecting a classification and coding systems? [3]
- i) What are the benefits of CIM? [2]
- j) What are the inputs and outputs of FMS? [3]

PART-B

(50 Marks)

- 2.a) What are the requirements of geometric modeling?
- b) Describe with the help of neat sketches the major surfaces entities provided by the CAD/CAM systems. [5+5]

OR

- 3.a) What is the most commonly used graphics terminal? Explain its working?
- b) Define the cubic spline and bezier curves? Which of them is more popular in CAD and Why? [5+5]

4. Explain the following terms in detail with respect to surface modelling?
 - a) Cylindrical surface
 - b) Ruled Surface and
 - c) Composite surface. [10]

OR

- 5.a) Distinguish between surface modelling and wire frame modelling in detail?
- b) What is meant by sweep? Discuss in detail the various types of sweep techniques available for 3Dgeometric construction. [5+5]

- 6.a) Distinguish between ACO (Adaptive Control Optimization) and ACC (Adaptive control constraint) types of adaptive control systems?
- b) With a neat sketch, explain the functioning of a NC machine. State two important differences between NC and CNC? [5+5]

OR

- 7.a) Discuss the basic feedback control system used in CNC machine tools.
- b) Write the procedure for writing computer assisted part programming? [5+5]

- 8.a) Discuss how part classification is done in the context of GT. What are the essential attributes such a coding system should take care of?
- b) Explain the various difficulties in traditional process planning in detail. [5+5]

OR

- 9.a) Distinguish between MRP and ERP with suitable examples.
- b) Discuss how a company can benefit from a suitable classification and coding systems? [5+5]

- 10.a) Describe the Scheduling and Dispatching issues related to Flexible Manufacturing System.
- b) Does CIM required for Indian industry? Discuss various issues of implementations, challenges in CIM. [5+5]

OR

- 11.a) Define computer aided quality control. Explain how it is implemented.
- b) State the advantages of CIM in manufacturing industry in detail. [5+5]

--ooOoo--

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

Part- A (25 Marks)

- 1.a) List out the computer peripherals' for CAD [2]
- b) Differentiate between the database and data structure [3]
- c) What is blending function? [2]
- d) Write the parametric equation of Surface of revolution [3]
- e) Define the MCU, DPU, CLU in NC system [2]
- f) Differentiate the ACO and ACC type adaptive controllers [3]
- g) What is an ideal cell? [2]
- h) What are the benefits of MRP [3]
- i) State the objectives of quality control [2]
- j) Distinguish between the FMS and FMC [3]

Part- B (50 Marks)

- 2.a) How CAD/CAM systems are evaluated? Explain in detail by categorizing different evaluation parameters during selection.
- b) What is automation? Explain the various categories of automation. [5+5]

OR

- 3.a) Compare the Bezier and B spline curves and derive the parametric equations of both.
- b) What are the manipulation curve fitting techniques used in wire frame modeling? [5+5]
- 4.a) What is the difference between the B spline and Coon's surface? Explain.
- b) An ellipse with semi major axis $a=1$ and semi minor axis $b=5$ is to be rotated, the axis of revolution passes through center of the ellipse and lies in the plane xy . Revolve this curve about x axis through 2π to obtain a surface revolution. Calculate the surface point at $\theta = \pi/2$ and $\Phi = \pi$. [5+5]

OR

- 5.a) With suitable example briefly explain about the C rep modeling and B rep modeling.
- b) Differentiate between the linear sweep and rotational sweep. [5+5]
- 6.a) What are the major components of NC machine? Explain in detail
- b) What are the advantages of computer assisted part programming over manual part programming. [5+5]

OR

- 7.a) Briefly explain functions of CNC and DNC systems.
- b) What are the four types of statement in APT language? [5+5]

- 8.a) What factors must be considered in selecting a classification and coding system
b) Discuss with examples of the following.

i) Mono code ii) Poly code iii) Mixed code.

[5+5]

OR

- 9.a) Discuss a variant process planning system.

b) Explain the enterprise resource planning and capacity requirements planning.

[5+5]

- 10.a) Explain principal components of FMS.

b) Discuss various attributes of guidance and AGV systems.

[5+5]

OR

- 11.a) Sketch and explain elements of machine vision system.

b) What are benefits of CIM?

[5+5]

--ooOoo--



FINITE ELEMENT METHOD



Code No: R15A0322

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)

III B.Tech II Semester Regular/supplementary Examinations, April/May 2019
Finite Element Methods

(ME)

Roll No									
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Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE

Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (25 Marks)

- 1). a What is meant by finite Element method [2M]
- b Name the weighted residual techniques? [3M]
- c Write down the expression of stiffness matrix for a truss element. [2M]
- d Define plane strain problem. [3M]
- e What is CST element? [2M]
- f Write down the shape functions for an axisymmetric triangular element. [3M]
- g Write the governing equation for a steady flow heat conduction. [2M]
- h Write down the expression of stiffness matrix for a beam element. [3M]
- i What is meant by discretization and assembling? [2M]
- j What is the difference between static and dynamic analysis? [3M]

PART-B (50 MARKS)

SECTION-I

- 2 Describe advantages, disadvantages and applications of finite element analysis. [10M]

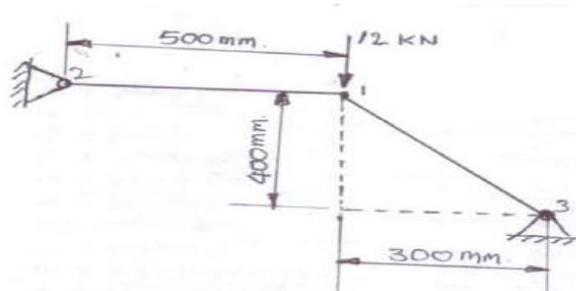
OR

- 3 The following equation is available for a physical phenomena [10M]

$$\frac{d^2 y}{dx^2} - 10x^2 = 5; \quad 0 < x < 1, \text{ Boundary Conditions; } y(0) = 0, y(1) = 0,$$
 Using Galarkin method of weighted residual find an approximate solution of the above differential equation.

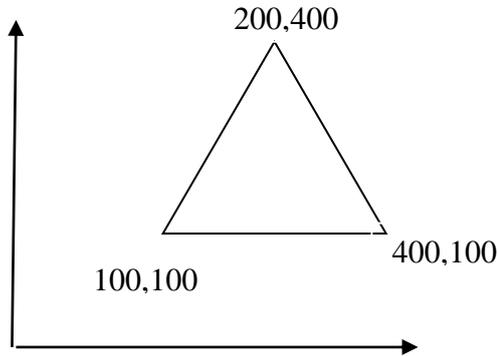
SECTION-II

- 4 For the two bar truss shown in figure, determine the displacement at node 1 and stresses in element2, Take E=70GPa, A= 200mm². [10M]



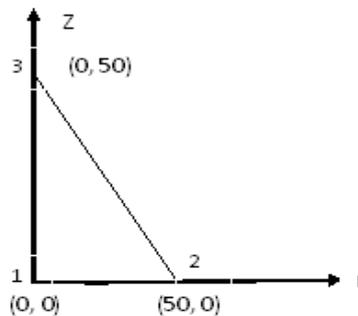
OR

- 5 For the plane stress element shown in figure the nodal displacements are [10M]
 $U_1 = 2.0\text{mm}$, $V_1 = 1.0\text{mm}$
 $U_2 = 1.0\text{mm}$, $V_2 = 1.5\text{mm}$, $U_3 = 2.5\text{mm}$, $V_3 = 0.5\text{mm}$, Take $E = 210\text{GPa}$, $\nu = 0.25$,
 $t = 10\text{mm}$. Determine the strain-Displacement matrix [B].



SECTION-III

- 6 For axisymmetric element shown in figure, determine the strain-displacement matrix. Let $E = 2.1 \times 10^5 \text{N/mm}^2$ and $\nu = 0.25$. The co-ordinates shown in figure are in millimeters.



[10M]

OR

- 7 Evaluate the following integral using Gaussian quadrature, so that the result is exact. [10M]

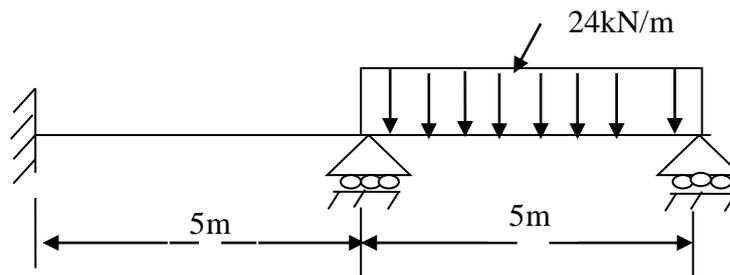
$$f(r) = \int_{-1}^1 \left(\frac{1}{1+x^2} + 2x - \sin x \right) dx$$

SECTION-IV

- 8 Estimate the temperature distribution in a fin whose cross section is 15mm X 15mm and 500mm long. Take Thermal conductivity as 50W/m-k and convective heat transfer coefficient as 75 W/m²-k at 25°C. The base temperature is assumed to be constant and its value may be taken as 900°C. And also calculate the heat transfer rate? [10M]

OR

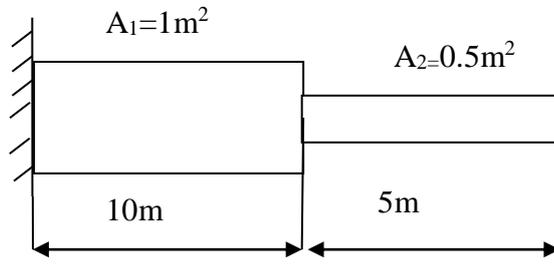
- 9 For the beam loaded as shown in figure, determine the slope at the simple supports. Take $E = 200\text{GPa}$, $I = 4 \times 10^6 \text{m}^4$.



[10M]

SECTION-V

- 10 Determine the Eigen values and Eigen vectors for the beam shown in figure



$$E=30 \times 10^5 \text{N/m}^2$$
$$\rho=0.283 \text{kg/m}^3$$

[10M]

OR

- 11 Write short note on
- (a) Eigen vectors for a stepped beam
 - (b) Evaluation of Eigen values.

[10M]

Code No: R15A0322

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech II Semester Regular Examinations, April/May 2018**Finite Element Method**

(ME)

Roll No									
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART- A

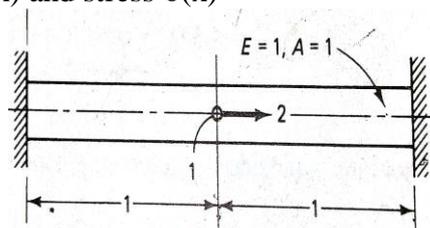
- 1a. What is the shape function? Give its practical importance. [2]
- b) Briefly discuss the Gherkin's approach in solving FEA problems [3]
- c) Define is axisymmetric element with 2 practical applications [2]
- d. What are the differences between plane stress and plane strain problems [3]
- e. Briefly discuss the advantages of Axisymmetric Elements [2]
- f. Describe the shape functions in natural coordinates for 2-D Quadrilateral element. [3]
- g. Write the governing equation for a steady flow heat conduction [2]
- h. Write short notes on applications of FEM [3]
- i. What are the practical importance of Eigen values and Eigen vectors [2]
- j. Write the Gradient matrix[B] for CST element. [3]

PART – B

10 * 5 = 50 Marks

2. **SECTION-1** [5]

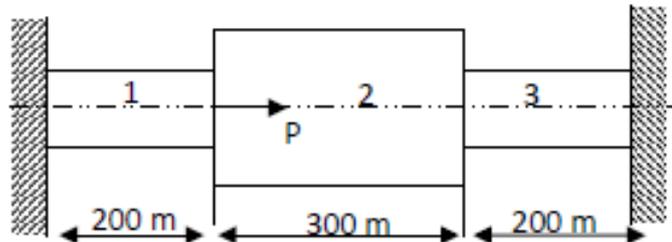
(a) A rod fixed at its ends is subjected to a varying body force as shown in Figure.1.

Use the Rayleigh-ritz method with an assumed displacement field $u=a_0+a_1x+a_2x^2$ to determine displacement $u(x)$ and stress $\sigma(x)$ 

- (b) Write the Potential function for a continuum under all possible loads and indicate all the variables involved. Also express the total potential of general finite element in terms of nodal displacements [5]

OR

3. An axial load $P = 200 \times 10^3$ N is applied on a bar shown in figure, determine nodal displacements, stress in each material and reaction forces. If $A_1 = 2400 \text{ mm}^2$, $A_2 = 600 \text{ mm}^2$, $A_3 = 2000 \text{ mm}^2$, $E_1 = 70 \text{ GPa}$, $E_2 = 200 \text{ GPa}$, $E_3 = 67 \text{ GPa}$ [10]



4. [5]

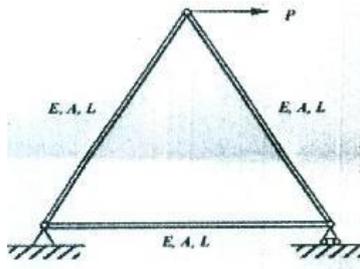
SECTION - II

(a) Derive the B Matrix (relating strains and nodal displacements) for an iso parametric triangular element with linear interpolation for the geometry as well as field variables.

b) Explain why the above element is popularly known as CST. Discuss about the advantages and disadvantages of the element [5]

OR

5. For the truss shown in figure establish the element stiffness matrices and assemble the global stiffness matrix for the active degrees of freedom and determine a) Nodal displacements b) Stress in the members and c) The reaction at the roller support, Take $E = 100 \text{ GPa}$. Area of c/s section = 100 mm^2 Length = 100 cm , $P = 100 \text{ kN}$. [10]

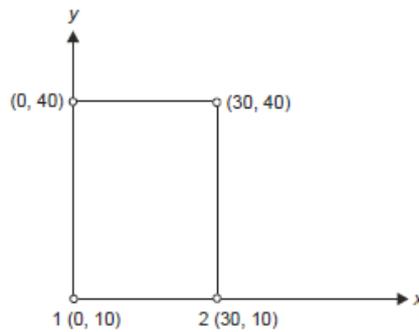


SECTION-III

6. Derive the B Matrix (relating strains and nodal displacements) for an axi-Symmetric iso parametric triangular element with linear interpolation for the geometry as well as field variables. [10]

OR

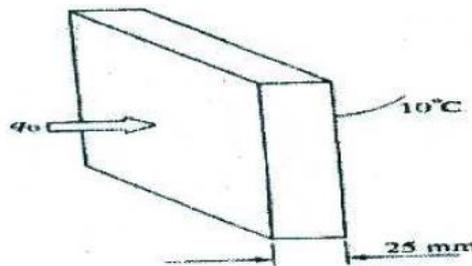
- 7.(a) Consider a quadrilateral element as shown in figure, Evaluate Jacobian matrix and strain-Displacement matrix at local coordinates $\xi = 0.5$, $\eta = 0.5$. [7]



(b) Evaluate the integral $\int_{-1}^{+1} \left[3e^x + 2x^2 + \frac{1}{(3x+4)} \right] dx$ using one point and two point Gauss quadrature. [3M]

SECTION-IV

8. Heat is entering into a large plate at the rate of $q_0 = -300 \text{ W/m}^2$ as shown in Figure, the plate is 25 mm thick. The outside surface of the plate is maintained at a temperature of 10°C . Using two finite elements, solve for the vector of nodal temperatures T , thermal conductivity $k = 1.0 \text{ W/m}^\circ\text{C}$ [10]

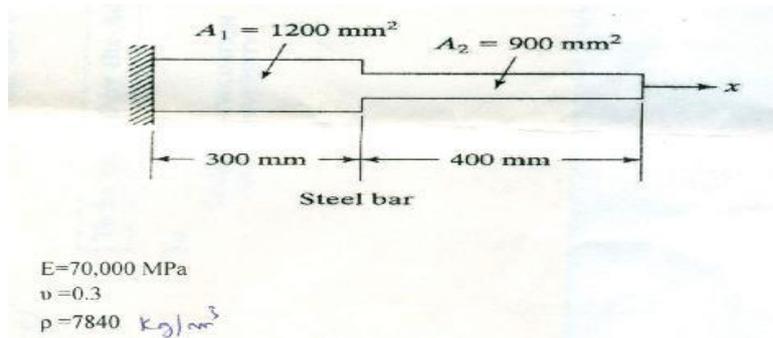


OR

9. Estimate the temperature profile in a fin of diameter 25 mm, whose length is 400 mm. [10]
The thermal conductivity of the fin material is 50 W/m K and heat transfer coefficient over the surface of the fin is $50 \text{ W/m}^2 \text{ K}$ at 30°C . The tip is insulated and the base is exposed to a temperature of 150°C . Evaluate the temperatures at points separated by 100 mm each.

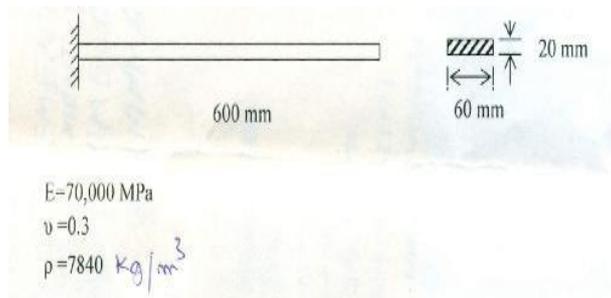
SECTION-V

10. 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 1 and 2 [10]



OR

11. Write the step by step procedure to determine the frequencies and nodal displacements of the steel cantilever beam shown in Fig. [10]



Code No: R15A0322

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech II Semester supplementary Examinations, Nov/Dec 2018

Finite Element Methods

(ME)

Roll No									
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Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART – A

- 1.a. Briefly discuss weighted residual method for giving approximate solutions for complicated domains [2M]
- b. Write the stiffness matrix for 1-d element with linear interpolation functions [3M]
- c. Differentiate iso-parametric, sub-parametric, and super parametric elements? [2M]
- d. What is the difference between plane truss and space truss? [3M]
- e. What are the uses of natural coordinates in 2d- Quadrilateral elements [2M]
- f. What are the suitable applications of axi-symmetric elements in FEM? [3M]
- g. Write the governing equation for FEA formulation for a fin [2M]
- h. Express the stiffness matrix for a 1-D conduction problem [3M]
- i. What do you understand by mode shapes? [2M]
- j. How principle of minimum potential energy is useful in dynamic analysis of systems [3M]

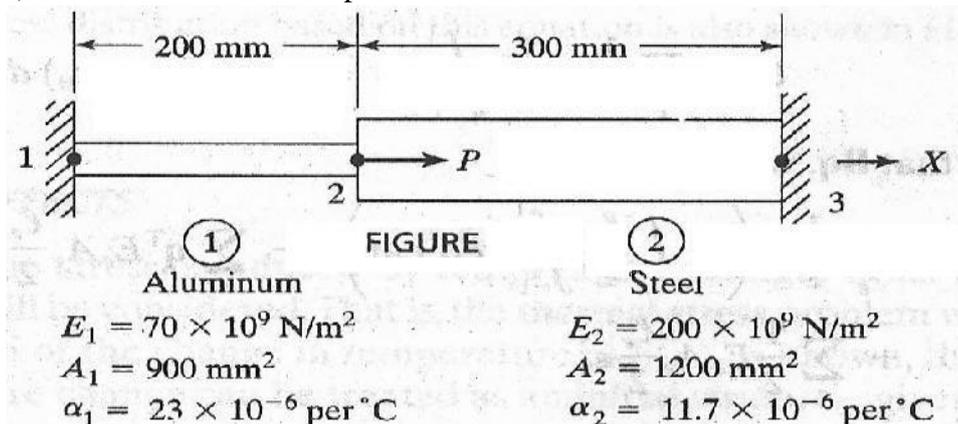
PART – B 10 * 5 = 50 Marks

SECTION-I

2. Derive the equations equilibriums for 3-D body [10M]

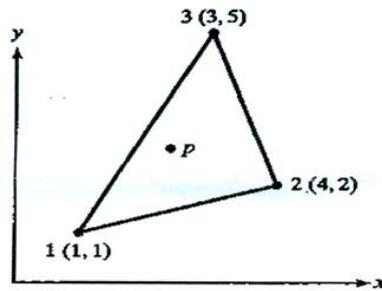
OR

3. An axial load $P=300 \times 10^3 \text{N}$ is applied at 200°C to the rod as shown in Figure below. [10M]
 The temperature is the raised to 600°C .
 a) Assemble the K and F matrices.
 b) Determine the nodal displacements and stresses.



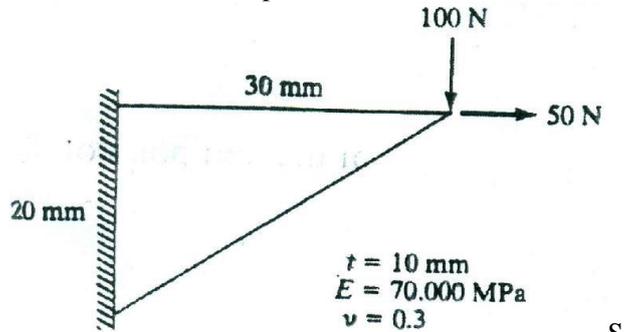
SECTION-II

4. a) Write the difference between CST and LST elements [3M]
 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. [7M]



OR

5. For the configuration shown in Fig. determine the deflection at the point of load application [10M]
 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

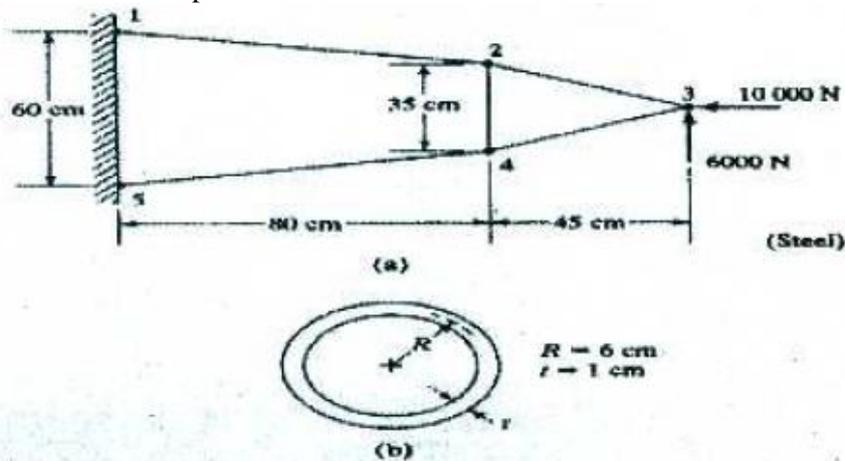


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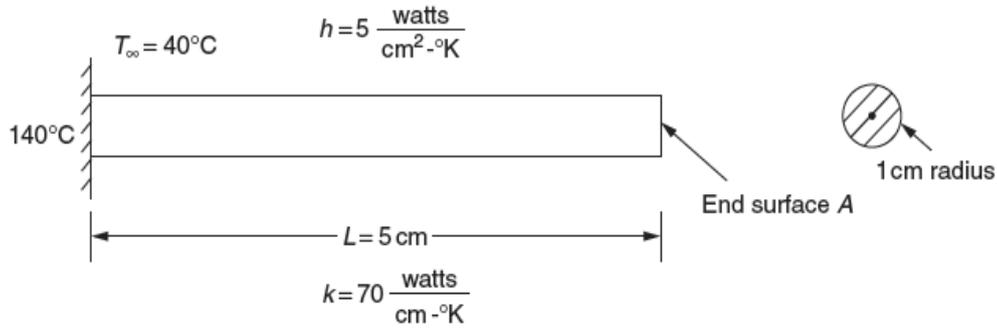
6. Derive the strain displacement matrix for axisymmetric triangular element. Discuss advantages of axisymmetric modelling in FEM [10M]

OR

7. Figure shows a five – member steel frame subjected to loads at the free end. The cross section of each member is a tube of wall thickness $t=1$ cm and mean radius= 6 cm. Determine the following: [10M]
 a) The displacement of node 3 and
 b) The maximum axial compressive stress in a member

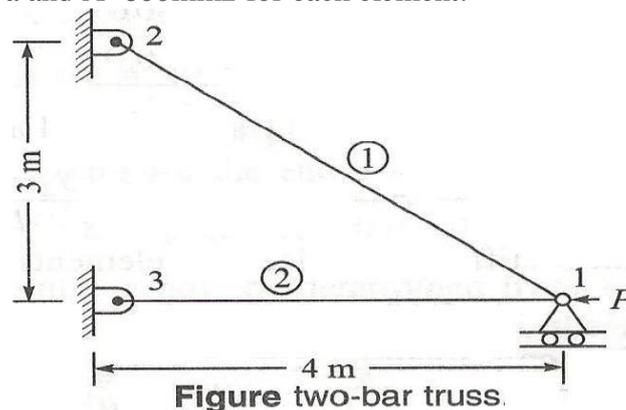


8. Find the temperature distribution in the one-dimensional fin shown in Figure below [10M]
 using two finite elements.



OR

9. (a) A 20-cm thick wall of an industrial furnace is constructed using fireclay bricks that have a thermal conductivity of $k = 2 \text{ W/m}\cdot\text{°C}$. During steady state operation, the furnace wall has a temperature of 800°C on the inside and 300°C on the outside. If one of the walls of the furnace has a surface area of 2 m^2 (with 20-cm thickness), find the rate of heat transfer and rate of heat loss through the wall. [5M]
- (b) A metal pipe of 10-cm outer diameter carrying steam passes through a room. The walls and the air in the room are at a temperature of 20°C while the outer surface of the pipe is at a temperature of 250°C . If the heat transfer coefficient for free convection from the pipe to the air is $h = 20 \text{ W/m}^2\cdot\text{°C}$ find the rate of heat loss from the pipe. [5M]
10. For the two-bar truss shown in Figure below, determine the nodal displacements, element stresses and support reactions. A force of $P=1000\text{kN}$ is applied at node-1. Assume $E=210\text{GPa}$ and $A=600\text{mm}^2$ for each element. [10M]



OR

11. A bar of length 1 m; cross sectional area 100 mm^2 ; density of 7 gm/cc and Young's modulus 200Gpa is fixed at both the ends. Consider the bar as three bar elements and determine the first two natural frequencies and the corresponding mode shapes. Discuss on the accuracy of the obtained solution [10M]

- 1.a) Derive the interpolation functions at all nodes for the quadratic serendipity element.
- b) Evaluate the integral by using one and two-point Gaussian quadrature and compare with exact value.

$$I = \int_{-1}^{+1} \int_{-1}^{+1} (x^3 + x^2 y + xy^2 + \sin 2x + \cos 2y) dx dy$$

- 2.a) Clearly explain the finite element formulation for an axisymmetric shell with an axisymmetric loading. Determine the matrix relating strains and nodal displacements for an axisymmetric triangular element.
 - b) Establish the Hermite shape functions for a beam element Derive the equivalent nodal point loads for a u.d.l. acting on the beam element in the transverse direction and also determine stiffness matrix.
- 3.a) Write about different boundary considerations in beams.
 - b) Determine the support reactions and maximum vertical deflection for the continuous beam shown in Figure.1.

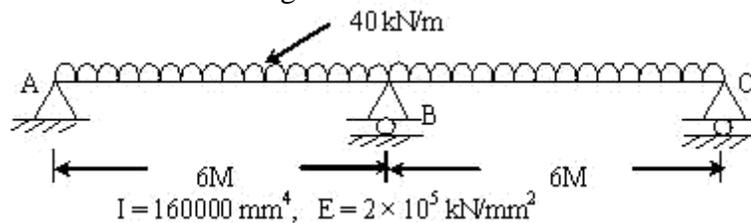


Figure.1

- 4.a) Discuss in detail about 2D heat conduction in Composite slabs using FEA.
- b) Using the isoparametric element, find the Jacobian and inverse of Jacobian matrix for the element shown in Fig.2, 3(a) & 3(b) for the following cases.
 - i) Determine the coordinate of a point P in x-y coordinate system for the $\xi = 0.4$ and $\eta = 0.6$.
 - ii) Determine the coordinate of the Q in ξ and η system for the $x = 2.5$ and $y = 1.0$.

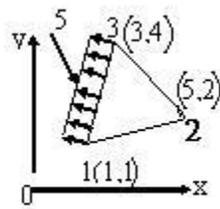


Fig. 2

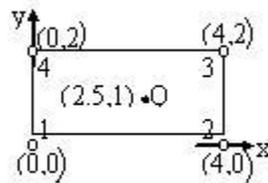


Fig. 3 (a)

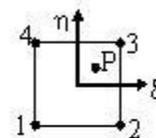


Fig. 3 (b)

**B. Tech III Year II Semester
FINITE ELEMENT METHODS**

1)a) Discuss in detail about the concepts of FEM formulation .How is that FEM emerged as powerful tool. Discuss in detail about applications of finite element method.

b)Derive an equation for finding out the potential energy by Rayleigh –Ritz method. Using Rayleigh – Ritz method, find the displacement of the midpoint of the rod shown in Fig.1. Assume $E = 1$, $A = 1$, $\rho g = 1$ by using linear and quadratic shape functions concept.

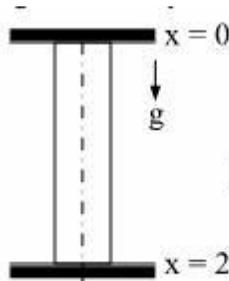


Fig. 1

2. a) Discuss in detail about Linear and Quadratic shape functions with examples.
- b) For the truss shown in fig.2 determine the displacements at point B and stresses in the bars by considering linear and quadratic shape functions.

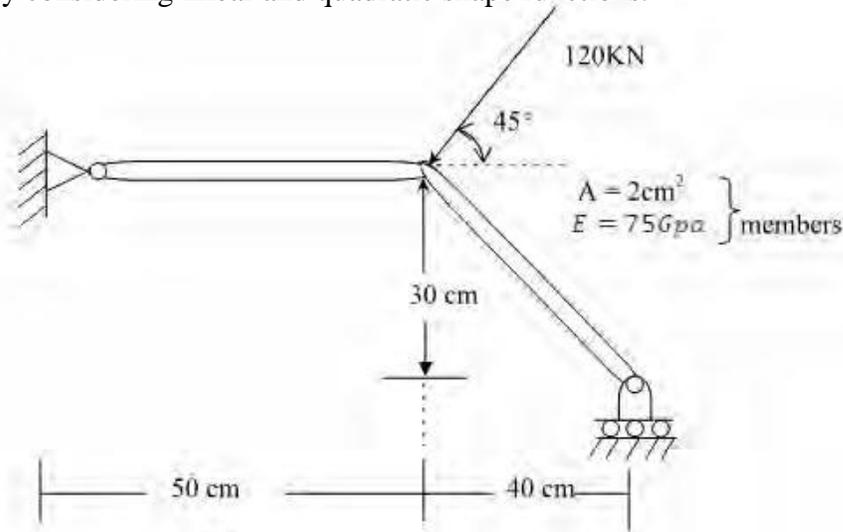


Fig. 2

3. a) Consider axial vibration of the Aluminum bar shown in Fig.3, (i) develop the global stiffness and (ii) determine the nodal displacements and stresses using elimination approach and with help of linear and quadratic shape function concept. Assume Young's Modulus $E = 70\text{Gpa}$.
- b) Determine the mass matrix for truss element with an example.

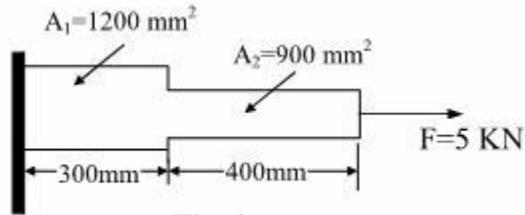


Fig. 3

4. a) Establish the shape functions for a 3 – noded triangular element.
- b) Find the deformed configuration, and the maximum stress and minimum stress locations for the rectangular plate loaded as shown in the fig.4. Solve the problem using 2 triangular elements. Assume thickness = 10cm; $E = 70\text{ Gpa}$, and $\nu = 0.33$.

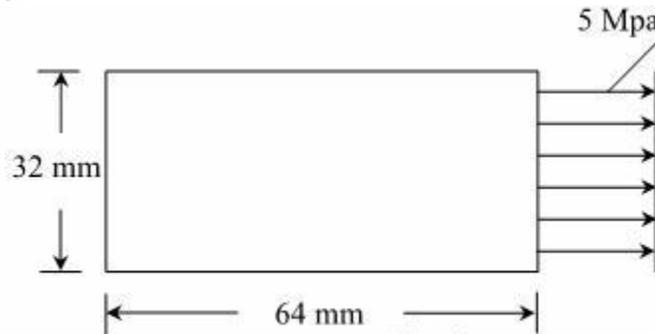


Fig. 4

5. a) Determine the shape functions for 4 – noded quadrilateral element.
- b) For a beam and loading shown in fig.5, determine the slopes at 2 and 3 and the vertical deflection at the midpoint of the distributed load.

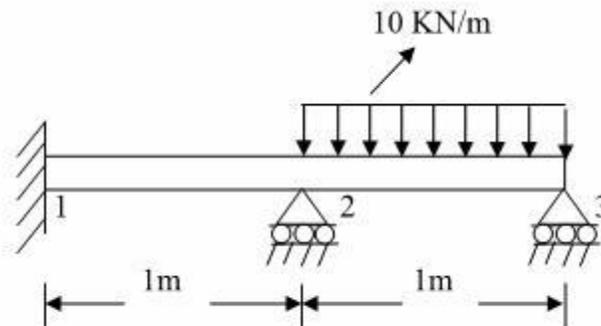


Fig.5

6. a) Clearly explain the finite element formulation for an axisymmetric shell with an axisymmetric loading. Determine the matrix relating strains and nodal displacements for an axisymmetric triangular element.
- b) Determine the temperature distribution in a straight fin of circular c/s. Use three one dimensional linear elements and consider the tip is insulated. Diameter of fin is 1 cm, length is 6 cm, $h = 0.6 \text{ W/cm}^2 -\text{C}$, $\varphi_{\infty} = 25^{\circ}\text{C}$ and base temperature is $\varphi = 80^{\circ}\text{C}$.
7. a) Determine the element stresses, strains and support reactions for the given bar problem as shown in Fig. 6

$$= 1.2 \text{ mm}; \quad L = 150 \text{ mm}; \quad P = 60000 \text{ N}; \quad E = 2 \times 10^4 \frac{\text{N}}{\text{m}}; \quad A = 250 \text{ mm}^2.$$

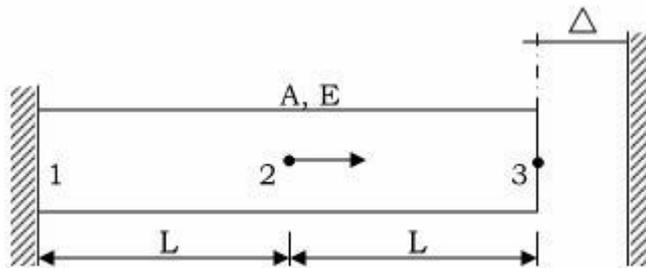


Fig. 6

- b) What are shape functions? Indicate briefly the role of shape functions in FEM analysis.
8. a) Derive one dimensional steady state heat conduction equation.
- b) An axisymmetric triangular element is subjected to the loading as shown in fig.7 the load is distributed throughout the circumference and normal to the boundary. Derive all the necessary equations and derive the nodal point loads.

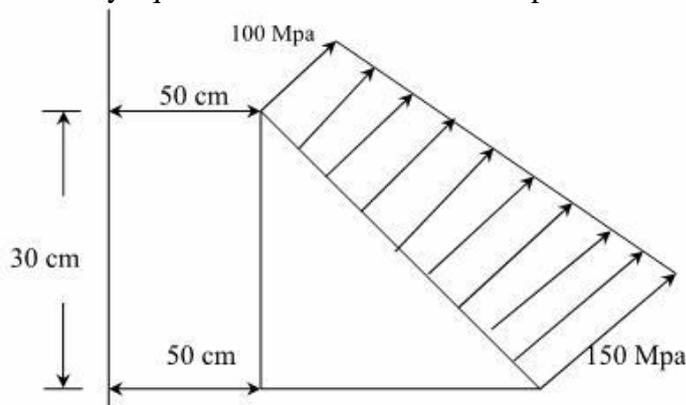


Fig. 7

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Finite Element Methods

- 1.a) Write the strain stress relations based on generalized Hooke's law and derive the elasticity matrix for 3-D field problems.
- c) Describe the standard procedure to be followed for understanding the finite element method step by step with suitable example.
- 2.a) Derive the stiffness matrix of axial bar element with quadratic shape functions based on first principles.
- c) Calculate the nodal displacements and forces for the stepped bar with the stiffness values of 10 kN/m and 18 kN/m and a load of 32 kN is subjected at the end of the stepped bar and other end of the bar is fixed.
- 3.a) Derive the shape functions and stiffness matrix of a two noded beam element.
- c) Derive the load vector for the beam element when a uniformly distributed load is applied.
- 4.a) For a plane strain problem, the nodal displacements are $u_1 = 4.4 \mu\text{m}$, $u_2 = 2.2 \mu\text{m}$, $u_3 = 2.2 \mu\text{m}$, $v_1 = 3.8 \mu\text{m}$, $v_2 = 2.9 \mu\text{m}$, $v_3 = 4.5 \mu\text{m}$. Take $E = 200 \text{ GPa}$, $\mu = 0.3$ and $t = 10 \text{ mm}$. Find the stresses, principal stresses. The coordinates of triangular element are 1(5,25), 2(15,5) and 3(25,15). All dimensions are in millimeters.
- c) Show that the stiffness for a triangular element is $[B]^T[D][B]$ At using variational principle. Where A = area of the triangle and t = thickness.
- 5.a) Compute the strain displacement matrix and also the strains of a axisymmetric triangular element with the coordinates $r_1 = 3 \text{ cm}$, $z_1 = 4 \text{ cm}$, $r_2 = 6 \text{ cm}$, $z_2 = 5 \text{ cm}$, $r_3 = 5 \text{ cm}$, $z_3 = 8 \text{ cm}$. The nodal displacement values are $u_1 = 0.01 \text{ mm}$, $w_1 = 0.01 \text{ mm}$, $u_2 = 0.01 \text{ mm}$, $w_2 = -0.04 \text{ mm}$, $u_3 = -0.03 \text{ mm}$, $w_3 = 0.07 \text{ mm}$
- b) Differentiate between Axi symmetric elements and symmetric elements with suitable examples.
- 6.a) Explain the methodology to estimate the stiffness matrix of four noded quadrilateral element.
- b) Evaluate $\int [e^{2x} + x^3 + 1 / (x^2 + 2)] dx$ over the limits -1 and +1 using one point and three point quadrature formula and compare with exact solution.
- 7.a) What are different thermal applications of finite element analysis? Compare the structural analysis with thermal analysis.
- b) Calculate the temperature distribution in the fin of 10 mm diameter, which is exposed to the convective b.c. of $40 \text{ W/m}^2 \text{ K}$ with 30° C . The base of the fin is exposed to a heat flux of 450 kW/m^3 and the thermal conductivity of fin material is 30 W/m K .
8. Determine natural frequencies and corresponding mode shapes for the figure 8.
Take $L_1 = 1 \text{ m}$, $L_2 = 2 \text{ m}$, $A_1 = 2 \text{ m}^2$, $A_2 = 1 \text{ m}^2$, $\rho = 7850 \text{ kg/m}^3$, $E = 200 \text{ GPa}$

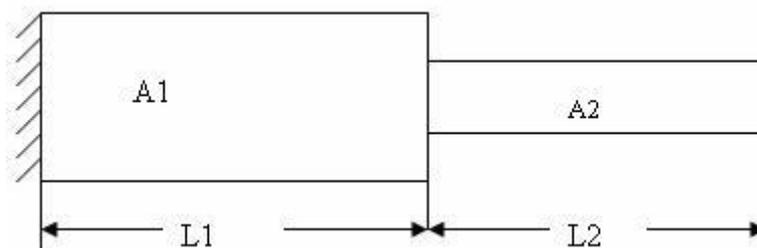


Fig: 8



HEAT TRANSFER



Code No: 126EF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year II Semester Examinations, April - 2018****HEAT TRANSFER**
(Common to AME, MSNT, ME)**Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

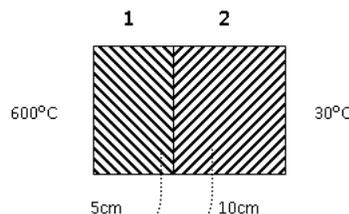
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) What do you mean by steady state heat transfer. [2]
- b) What are the initial and boundary conditions for conduction of heat transfer? [3]
- c) What is heat generation in a solid? Give examples. [2]
- d) What is lumped heat capacity method? Explain. [3]
- e) Draw boundary layer over a flat plate in moving fluid and mark various salient points. [2]
- f) What is the significance of non- dimensional numbers? [3]
- g) Define critical heat flux. [2]
- h) Define Stefan Boltzmann constant. [3]
- i) What is LMTD correction factor? [2]
- j) List out the applications of heat exchangers. [3]

PART - B**(50 Marks)**

2. Find the steady state heat flux through the infinite composite slab made up of two materials. Also find the interface temperature T_i . The thermal conductivities of the two materials vary linearly with temperature as [10]
 $k_1 = 0.05 (1 + 0.008T) \text{ W/mK}$
 $k_2 = 0.04 (1 + 0.075T) \text{ W/mK}$
 Where T is $^{\circ}\text{C}$

**OR**

3. A furnace wall is built up of two layers laid of fireclay 12cm thick and red brick 25 cm thick while the annular space between the two is filled with diatomite brick (15cm). What should be the thickness of the red brick layer if the wall is to be constructed without diatomite brick, so that the heat flow through the wall remains constant? The thermal conductivities of fireclay, diatomite and red brick being 0.929, 0.129 and 0.699 $\text{W/m}^{\circ}\text{C}$ respectively. [10]

4. Derive the equation for steady-state heat transfer through a spherical shell of inner radius r_1 and outer radius r_2 and compare the result with the solution obtained for a thick walled cylinder. [10]

OR

- 5.a) Derive an expression for heat flow through solid sphere with heat generation.
b) Derive an expression for the heat loss per square metre of the surface area for a furnace wall when the thermal conductivity varies with temperature according to the relation, $K = a + bT^2$. [5+5]

- 6.a) Discuss briefly thermal and hydrodynamic boundary layer and obtain Reynold's analogy in forced convection.

- b) A plate 20cm height and 1m wide is placed in air at 20°C . If the surface of the plate is maintained at 100°C calculate the boundary layer thickness and local heat transfer coefficient at 10cm from the leading edge. Also calculate the average heat transfer coefficient over the entire length of the plate. [5+5]

OR

7. Determine the heat transfer rate by free convection from a plate $0.3\text{m} \times 0.3\text{m}$ for which one surface is insulated and the other surface is maintained at 110°C and exposed to atmosphere air at 30°C for the following arrangements:

- a) The plate is vertical
b) The plate is horizontal with the heating surface facing up
c) The plate is horizontal with the heating surface facing down. [10]

- 8.a) Using dimensional analysis obtain an expression for Nusselt number in terms of Reynolds and Prandtl numbers.

- b) A light oil with 20°C inlet temperature flows at the rate of 500 kg/minute through 5cm inner diameter pipe which is enclosed by a jacket containing condensing steam at 150°C . If the pipe is 10 meter long, find the outlet temperature of the oil. [5+5]

OR

- 9.a) Two parallel plate $3\text{m} \times 2\text{m}$ are spaced at 1m apart one plate is maintained at 500°C and other at 200°C . The emissivity of the plates are 0.3 and 0.5. The plates are located in a large room and room walls are maintained at 40°C . If the plates exchange heat with each other and with the room, find the heat lost by the hotter plate.

- b) Define absorptivity, reflectivity and transmissivity. [7+3]

10. Calculate the heat transfer area required for a 1-1 shell and tube heat exchanger which is used to cool 55000 kg/hr of alcohol from 66°C to 40°C using 40,000 kg/hr of water entering at 5°C . $U = 580 \text{ W/m}^2 \text{ K}$, consider

- a) counter flow b) parallel flow.

$$C_p \text{ water} = 4.18 \times 10^3 \text{ J/kg K}$$

$$C_p \text{ alcohol} = 3.76 \times 10^3 \text{ J/kg K}$$

[10]

OR

11. It is required to design a shell and tube heat exchanger for heating 9000 kg/hr of water from 15°C to 88°C by hot engine oil ($C_p = 2.35 \text{ kJ/kg-K}$) flowing through the shell of the heat exchanger. The oil makes a single pass, entering at 150°C and leaving at 95°C with an average heat transfer coefficient of $400 \text{ W/m}^2\text{-K}$, the water flow through 10 thin walled tubes of 25mm diameter with each tube making 8 passes through the shell. The heat transfer coefficient on the water side is $3000 \text{ W/m}^2\text{-K}$. Find the length of the tube required the heat exchanger. [10]

Code No: 126EF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech III Year II Semester Examinations, May - 2016****HEAT TRANSFER****(Common to ME, AME, MSNT)****Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) Define thermal diffusivity. [2]
- b) What is the difference between homogeneous and isotropic material. [3]
- c) Discuss about semi infinite body. [2]
- d) What are Biot and Fourier numbers? Explain their physical significance. [3]
- e) State the scope and application of dimensional analysis in heat transfer process. [2]
- f) Draw boundary layer growth in a pipe for laminar and turbulent flows in a pipe and indicate salient features. [3]
- g) Define irradiation and radiosity. [2]
- h) What are the differences between drop wise and film wise condensation? [3]
- i) What is the difference between regenerator and recuperator? [2]
- j) What is LMTD correction factor? [3]

PART - B**(50 Marks)**

- 2.a) Derive general heat conduction equation in Cartesian Co-ordinates.
- b) What is meant by conduction shape factor? Explain its significance along with periodic and aperiodic heat transfer. [5+5]

OR

3. What is the use of initial and boundary conditions? Discuss the conditions:
 - a) Prescribed surface temperature
 - b) Prescribed heat flux
 - c) Convective condition in detail. [3+3+4]

- 4.a) Define the overall heat transfer coefficient? Obtain the expression for composite wall with three layers with convective conditions over the wall.
- b) Distinguish between steady state conduction and unsteady state conduction. [6+4]

OR

- 5.a) Develop an expression for temperature distribution in a slab made of single material.
- b) Sheets of brass and steel, each of thickness 1cm, are placed in contact. The outer surface of brass is kept at 100°C and the outer surface of steel is kept at 0°C. What is the temperature of the common interface? The thermal conductivities of brass and steel are in the ratio of 2:1. [5+5]

- 6.a) Differentiate between mechanisms of heat transfer by free and forced convection. Mention some of the areas where these mechanisms are predominant.
- b) A nuclear reactor with its core constructed of parallel vertical plates 2.25 m high and 1.5 wide has been designed on free convection heating of liquid bismuth. Metallurgical considerations limit the maximum surface temperature of the plate to 975°C and the lowest allowable temperature of bismuth is 325°C . Estimate the maximum possible heat dissipation from both sides of each plate. The appropriate correlation for the convection coefficient is $Nu = 0.13(Gr Pr)^{1/3}$ where the different parameters are evaluated at the mean film temperature. [5+5]

OR

- 7.a) How are the local and average convection coefficients for flow past a flat plate are related? Derive the relationship.
- b) Water at 75°C flows through a 0.005 m diameter tube with a velocity of 1m/s. If the tube wall temperature is 25°C , make calculations for the heat transfer coefficient. Use the correlation, $St = 0.023 Re^{0.2} Pr^{-0.667}$.
The thermo-physical properties of water are:
Thermal conductivity is 0.647 W/(m.K); Viscosity is 1.977 kg/h.m;
Density is 1000 kg/m^3 ; Specific heat 4.187 kJ/(kg.K). [5+5]

- 8.a) What is Stefan-Boltzmann Law? Explain the concept of total emissive power of a surface.
- b) Saturated steam at 2 bar condenses on a cylindrical vertical drum having an outside diameter of 25 cm and a temperature of 90°C . Calculate how long must the drum be to condense 50 kg of steam per hour. Also estimate the thickness of condensate layer. [5+5]

OR

- 9.a) Derive general relation for the radiation shape factor in case of radiation between two surfaces.
- b) A copper pan of 35 cm diameter contains water and its bottom surface is maintained at 115°C by an electric heater. Calculate the power required to boil water in this pan and the rate at which water evaporates from the pan due to the boiling process. Also make calculations for the heat flux for these conditions. [5+5]

10. It is required to design a shell and tube heat exchanger for heating 9000 kg/hr of water from 15°C to 88°C by hot engine oil ($C_p = 2.35\text{ kJ/kg-K}$) flowing through the shell of the heat exchanger. The oil makes a single pass, entering at 150°C and leaving at 95°C with an average heat transfer coefficient of $400\text{ W/m}^2\text{-K}$, the water flow through 10 thin walled tubes of 25mm diameter with each tube making 8 passes through the shell. The heat transfer efficient on the water side is $3000\text{ W/m}^2\text{-K}$. Find the length of the tube required for the heat exchanger. [10]

OR

- 11.a) Derive an expression for LMTD in case of a counter – current flow double pipe heat exchanger.
- b) A hot fluid enters a heat exchanger at a temperature of 200°C at a flow rate of 2.8 kg/sec (sp. heat 2.0 kJ/kg-K) it is cooled by another fluid with a mass flow rate of 0.7 kg/sec (Sp. heat 0.4 kJ/kg-K). The overall heat transfer coefficient based on outside area of 20 m^2 is $250\text{ W/m}^2\text{-K}$. Calculate the exit temperature of hot fluid when fluids are in parallel flow. [5+5]

Code No: 126EF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year II Semester Examinations, October/November - 2016****HEAT TRANSFER****(Common to ME, AME, MSNT)****Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) Differentiate between Steady, Unsteady and Periodic heat transfer. [2]
- b) What are the different modes of heat transfer? Explain. [3]
- c) Define thermal conductivity. [2]
- d) Briefly explain lumped heat capacity method. [3]
- e) Define an ideal fluid and a real fluid. [2]
- f) Differentiate between laminar and turbulent flow. [3]
- g) Why drop wise condensation is preferred to film wise condensation? [2]
- h) What are the types of condensation processes? Explain. [3]
- i) What is fouling factor? [2]
- j) How are heat exchangers classified? [3]

PART - B**(50 Marks)**

2. Derive the heat conduction equation in Spherical coordinates. [10]

OR

- 3.a) Define thermal diffusivity? What is the significance of thermal diffusivity in heat conduction process?
- b) A plane wall is 150mm thick and its wall area is 4.5m^2 . Its conductivity is 9.35W/m-K and temperatures are steady at 150°C and 45°C on both sides. Determine the temperature gradient in flow direction. [3+7]

4. A long cylinder of ($\alpha = 6.11 \times 10^{-6} \text{m}^2/\text{s}$, $k = 21 \text{W/m-K}$) 12 cm in diameter, initially at 20°C , is placed into a furnace at 800°C . Calculate the time required for the centre to reach 760°C . Also calculate the temperature at a radius of 5.4 cm at the same time. (Take $h = 140 \text{W/m}^2\text{-K}$). [10]

OR

5. A steel pipe ($k = 43.25 \text{W/m-K}$) of 5cm inner diameter and 7.5cm outer diameter is covered with 2.5cm layer of asbestos insulation ($k = 0.205 \text{W/m-K}$). The inside surface of the pipe receives heat by convection from a hot gas at a temperature of 315°C with a heat transfer coefficient of $285 \text{W/m}^2\text{-K}$ while the outer surface is exposed to ambient air at 37°C with a heat transfer coefficient of $17 \text{W/m}^2\text{-K}$.

Estimate: (a) The heat loss to ambient air for 3m length of the pipe and

(b) The temperature drop across the pipe material and the insulation layer. [5+5]

6. Determine the heat transfer rate by free convection from a plate $0.3\text{m} \times 0.3\text{m}$ for which one surface is insulated and the other surface is maintained at 110°C and exposed to atmosphere air at 30°C for the following arrangements:
- a) The plate is vertical
 - b) The plate is horizontal with the heating surface facing up
 - c) The plate is horizontal with the heating surface facing down.
- [10]

OR

- 7.a) What are the advantages and limitations of dimensional analysis?
- b) Determine the thickness of velocity boundary layer and local shear stress at $x=2\text{m}$ from the leading edge of the plate for the boundary layer flow of air at atmosphere pressure of 80°C with a velocity of 2m/s .
- [3+7]

- 8.a) What are the types of boiling processes?

- b) Saturated water at 100°C is boiled inside a copper pan having a heating surface area $5 \times 10^{-2}\text{m}^2$ which is maintained at uniform surface temperature of 110°C . Calculate the surface heat flux and the rate of evaporation.
- [3+7]

OR

- 9.a) Define radiation shape factor.

- b) Two circular disc of diameter 20cm each are placed 2m apart. Calculate the radiant heat exchange for these plates if these are maintained at 800°C and 300°C respectively and their corresponding emissivities are 0.3 and 0.5 .
- [2+8]

- 10.a) What is a heat exchanger?

- b) In a counter flow double pipe heat exchanger, water is heated from 25°C to 65°C by oil with a specific heat of 1.45kJ/kg-K and mass flow rate of 0.9kg/s . the oil is cooled from 230°C to 160°C . If overall heat transfer coefficient is $420\text{W/m}^2\text{-K}$. Calculate the rate of heat transfer, mass flow rate of water and surface area of heat exchanger.
- [2+8]

OR

- 11.a) Define effectiveness of heat exchanger.

- b) Derive the equation for parallel flow heat exchanger using NTU method.
- [2+8]

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Code No: 126EF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year II Semester Examinations, December - 2017****HEAT TRANSFER****(Common to AME, MSNT, ME)****Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

Assume suitable data, if necessary:**PART - A****(25 Marks)**

- 1.a) Give some examples of heat transfer in engineering. [2]
- b) State Fourier's law of heat conduction? Why the negative sign is used. [3]
- c) What is heat generation in a solid? Give examples. [2]
- d) What is the difference between the fin effectiveness and the fin efficiency? [3]
- e) Differentiate between Natural and Forced convection. [2]
- f) Sketch the temperature and velocity profiles in free convection on a vertical wall. [3]
- g) What is condensation? How does it occur? [2]
- h) Discuss some methods of enhancing pool boiling heat transfer permanently. [3]
- i) What is a heat exchanger? What are its applications? [2]
- j) Discuss the advantage of NTU method over the LMTD method. [3]

PART - B**(50 Marks)**

- 2.a) Derive conduction equation for spherical coordinate systems.
- b) An insulated pipe of 50 mm outside diameter ($\epsilon=0.8$) is laid in a room at 30°C . If the surface temperatures is 250°C and the convective heat transfer coefficient is $10\text{ W/m}^2\text{K}$. Calculate the heat loss per unit length of pipe. [5+5]

OR

- 3.a) Does any of the energy of the sun reach the earth by conduction or convection? Explain.
 - b) A pipe 2 cm in diameter at 30°C is placed in (i) an air flow at 50°C with $h=20\text{ W/m}^2\text{K}$ and in (ii) water at 30°C with $h=70\text{ W/m}^2\text{K}$. Find the heat transfer rate per unit length of the pipe. [5+5]
- 4.a) Derive the expression for heat transfer in fins in case of (i) Rectangular plate fin of uniform cross section (ii) insulated end.
 - b) Determine the heat transfer rate from the rectangular fin of length 20 cm, width 40 cm and thickness 2 cm. The tip of the fin is not insulated and the fin has a thermal conductivity of 150 W/m K . The base temperature is 100°C and the fluid is 20°C . The heat transfer coefficient between the fin and the fluid is $30\text{ W/m}^2\text{K}$. [5+5]

- 5.a) Derive the expression for heat transfer under transient mode.
- b) Two large steel plates at temperatures of 120°C and 80°C are separated by a steel rod 300 mm long and 25 mm in diameter. The rod is welded to each plate. The space between the plates is filled with insulation, which also insulates the circumference of the rod. Because of a voltage difference between the two plates, current flows through the rod, dissipating electrical energy at a rate of 150W. Find out the maximum temperature in the rod and the heat flux. Take k for the rod as 47 W/m K . [5+5]

- 6.a) State Buckingham pi theorem . What are the merits and demerits?
- b) Air at 200 kPa and 200°C is heated as it flows through a tube with a diameter of 25 mm at a velocity of 10 m/sec. The wall temperature is maintained constant and is 20°C above the air temperature all along the length of tube. Calculate: (i) The rate of heat transfer per unit length of the tube. (ii) Increase in the bulk temperature of air over a 3 m length of the tube. [5+5]

OR

- 7.a) A 2.2cm outer diameter pipe is to cross a river at a 30m wide section while being completely immersed in water The average flow velocity of water is 4 m/s and the water temperature is 15°C . Determine the drag force exerted on the pipe by the river.
- b) A steam pipe 10 cm OD runs horizontally in a room at 23°C . Take outside temperature of pipe as 165°C . Determine the heat loss per unit length of the pipe. Pipe surface temperature reduces to 80°C with 1.5 cm insulation. What is the reduction in heat loss? [5+5]

- 8.a) Explain what do you mean by absorptivity, reflectivity and transmissivity.
- b) Estimate the power required to boil water in a copper pan, 0.35m in diameter. The pan is maintained at 120°C by an electric heater. What is the evaporation rate? Estimate the critical heat flux. [5+5]

OR

- 9.a) Write expression for blackbody radiation.
- b) A thin aluminium sheet with an emissivity of 0.1 on both sides is placed between two very large parallel plates that are maintained at uniform temperatures $T_1 = 800 \text{ K}$ and $T_2 = 500 \text{ K}$ and have emissivities $\epsilon_1'' = 0.2$ and $\epsilon_2'' = 0.7$ respectively. Determine the net rate of radiation heat transfer between the two plates per unit surface area of the plates and compare the result to that without shield. [5+5]

- 10.a) Derive NTU of parallel flow and counter flow heat exchangers.
- b) In a Double pipe counter flow heat exchanger 10000 kg/h of an oil having a specific heat of 2095 J/kgK 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 $300 \text{ W/m}^2\text{K}$. Take C_p for water as 4180 J/kgK . [5+5]

OR

- 11.a) Derive an expression for effectiveness of counter flow heat exchanger.
- b) After a long time in service, a counter flow oil cooler is checked to ascertain if its performance has deteriorated due to fouling. In the heat transfer surface is 3.33 m^2 and the design value of the overall heat transfer coefficient is $930 \text{ W/m}^2\text{K}$, how much has it been reduced by fouling? C_p of oil as 2330 J/kg K and c_p of water as 4174 J/kgK . [5+5]



MACHINE DESIGN-II



Code No: **R15A0321****MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

III B.Tech II Semester supplementary Examinations, Nov/Dec 2018**Machine Design-II**

(ME)

Roll No									
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART – A**(25 Marks)**

Q. No. 1.

- (a) What is the difference between full journal and partial journal bearing? 2 M
- (b) What is Bearing Characteristic Number and Bearing Modulus? 3 M
- (c) State the function of Piston Rings and Piston Skirt for an IC engine piston. 2 M
- (d) Explain Full-Floating and Semi-Floating type of connection between piston pin and small end of connecting with neat sketches. 3 M
- (e) What are the factors affects the amount of power transmission in belt drive? 2 M
- (f) Under what circumstances a fibre rope and a wire rope is used? What are the advantages of a wire rope over fibre rope? 3 M
- (g) What is the advantage of herringbone gear over single helical gear? 2 M
- (h) What condition must be satisfied in order that a pair of spur gears may have a constant velocity ratio? 3 M
- (i) How does the helix angle influence on the efficiency of square threaded screw? 2 M
- (j) What is self locking property of threads and where it is necessary? 3 M

PART – B**(50 Marks)****SECTION – I**

Q. No. 2

- a) 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. 5 M

OR

Q. No. 3

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/m²/°C. 10M

SECTION – II

Q. No. 4

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/cm².

10 M

OR

Q. No. 5

Design a plain carbon steel centre crankshaft for a single acting four stroke single cylinder engine for the following data:

Bore = 400 mm ; Stroke = 600 mm ; Engine speed = 200 r.p.m. ; Mean effective pressure = 0.5 N/mm²; Maximum combustion pressure = 2.5 N/mm²; Weight of flywheel used as a pulley = 50 kN; Total belt pull = 6.5 kN.

When the crank has turned through 35° from the top dead centre, the pressure on the piston is 1N/mm² and the torque on the crank is maximum. The ratio of the connecting rod length to the crank radius is 5. Assume any other data required for the design.

10M

SECTION – III

Q. No. 6

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.

10 M

OR

Q. No. 7

An extra flexible 8 × 19 plough steel wire rope of 38 mm diameter is used with a 2m diameter hoist drum to lift 50 kN of load. Find the factor of safety (ratio of the breaking load to the maximum working load) under the following conditions of operation :

The wire rope is required to lift from a depth of 900 metres. The maximum speed is 3 m / s and the acceleration is 1.5 m / s², when starting under no slack condition. The diameter of the wire may be taken as 0.05 d, where d is the diameter of wire rope. The breaking strength of plough steel is 1880 N/mm² and modulus of elasticity of the entire rope is 84 × 10³ N/mm². The weight of the rope is 53 N/m length.

10 M

SECTION – IV

Q. No. 8

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.

10 M

OR

Q. No. 9

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° pressure angle in diameter plane have helix angle of 45°. 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.

10 M

SECTION – V

Q. No. 10

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. **10 M**

OR

Q. No. 11

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? **10 M**

Code No: **R15A0321****MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

III B.Tech II Semester Regular/supplementary Examinations, April/May 2019**Machine Design-II**

(ME)

Roll No									
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (25 Marks)

- 1). a Differentiate full and partial journal bearings? [2M]
- b If life of the bearing is 50×10^6 revolutions and operating speed is 1000rpm, what is the life of the bearing in hours. [3M]
- c Differentiate the full floating and semi floating type of connection between piston pin and small end of connecting rod. [2M]
- d State the function of the following i) compression rings ii) oil rings. [3M]
- e What is centrifugal tension and state whether centrifugal tension affects the amount of transmitted power? [2M]
- f When power is transmitting between pulleys of same diameter but different coefficient of friction, then on which pulley basis the design should be carried. [3M]
- g What is the advantage of using helical gear over spur gear? [2M]
- h Explain the Law of gearing? [3M]
- i What is the virtual coefficient of friction that makes the acme threaded screws equivalent to square threads. [2M]
- j What is distance raised/lowered for one complete revolution for compound screws made of two screws with same pitch (10mm). [3M]

PART-B (50 MARKS)**SECTION-I**

- 2 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 $210 \text{ W/m}^2/^\circ\text{C}$. [10M]

OR

- 3 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. [10M]
Also find the life of the selected bearing with 95% reliability.

SECTION-II

- 4 A connecting rod is required to be designed for a high speed, four stroke I.C. [10M]
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 .

OR

- 5 Design a CI piston for a single acting four stroke petrol engine of the following [10M]
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

SECTION-III

- 6 An open belt 100 mm wide connects two pulleys mounted on parallel shafts with [10M]
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..

OR

- 7 Select a suitable wire rope for a vertical mine hoist to lift a load of 10 kN from 60 [10M]
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.

SECTION-IV

- 8 A pair of 20° full-depth involute tooth spur gears is to transmit 30 kW at a speed [10M]
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, $\sigma_o = 100 \text{ MPa}$, while the gear is made of
cast iron having allowable static stress, $\sigma_o = 55 \text{ MPa}$. 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.

OR

- 9 A pair of helical gears with 30° helix angle is used to transmit 15 kW at 10 000 [10M]
r.p.m. of the pinion. The velocity ratio is 4 : 1. Both the gears are to be made of
hardened steel of static strength 100 N/mm^2 . 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
wear.

SECTION-V

- 10 A power screw having double start square threads of 25 mm nominal diameter and [10M]
5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters

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/mm^2 , 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.

OR

- 11 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/mm^2 . Determine, **[10M]**
- i) Power required to rotate the screw
 - ii) Stresses in screw Body & threads
 - iii) No. of threads of nut in engage with screw.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech II Semester Regular Examinations, April/May 2018

Machine Design-II

(ME)

Roll No									
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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART – A**(25 Marks)**

Q. No. 1.

- (a) What is meant by Basic Dynamic Load Rating of Rolling Contact Bearings? 2 Marks
- (b) Define Reliability of a Bearing. 3 Marks
- (c) Under what force, the big end bolts and caps of connecting rod are designed? 2 Marks
- (d) Write about Dry and Wet liners. 3 Marks
- (e) Explain slip of the belt (at both driver and driven pulleys), in belt drive. 2 Marks
- (f) Derive the condition for maximum power transmission in belt drive. 3 Marks
- (g) What are the materials used for spur gear and helical gear. 2 Marks
- (h) Define Equivalent Number of Teeth for Helical Gears? 3 Marks
- (i) Differentiate between differential screw and compound screw. 2 Marks
- (j) Prove that the efficiency of self locking screw is less than 50%. 3Marks

PART – B**(50 Marks)****SECTION – I**

Q. No. 2

A ball bearing operates on the following work cycle:

Element No.	Radial load(N)	Speed (RPM)	Element time (%)
1	3000	720	30
2	7000	1440	40
3	5000	900	30

The dynamic load capacity of the bearing is 16600 N. Calculate

- (a) The average speed of rotation;
- (b) The equivalent radial load and
- (c) The bearing life.

10 Marks**OR**

Q. No. 3

a) 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 :

- Length of the bearing if the allowable bearing pressure is 1.6 N/mm^2 , and
- 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 .

b) 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%.

10 Marks

SECTION – II

Q. No. 4

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/mm^2 ; 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) = $44 \times 10^3 \text{ kJ/kg}$; Difference of temperatures at the centre and edges of the piston head = 200°C ; 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/mm^2 and allowable bearing pressure on the gudgeon pin = 17 N/mm^2 .

10 Marks

OR

Q. No. 5

Design a plain carbon steel centre crankshaft for a single acting four stroke single cylinder engine for the following data:

Bore = 400 mm ; Stroke = 600 mm ; Engine speed = 200 r.p.m. ; Mean effective pressure = 0.5 N/mm^2 ; Maximum combustion pressure = 2.5 N/mm^2 ; Weight of flywheel used as a pulley = 50 kN; Total belt pull = 6.5 kN.

When the crank has turned through 35° from the top dead centre, the pressure on the piston is 1 N/mm^2 and the torque on the crank is maximum. The ratio of the connecting rod length to the crank radius is 5. Assume any other data required for the design.

10 Marks

SECTION – III

Q. No. 6

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.

10 Marks

OR

Q. No. 7

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 = 40° , area of the belt section is 400 mm^2 and permissible stress is 2.46 MPa. Calculate the number of belts required and the length of belt.

10 Marks

SECTION – IV

Q. No. 8

A pair of 5 mm module, 20° involute full depth spur gears, with a face width of 40 mm are made of steel having 350 BHN. The pinion has 28 teeth and runs at 1200 rpm. The gear ratio is 4. What power can be transmitted as per Lewis strength design? Assuming that this much power is being transmitted, check the design for dynamic and wear loads. The static strength of the material of the gears is 210 MPa, and surface endurance limit is nearly 900 MPa.

10 marks

OR

Q. No. 9

A pair of helical gears are to transmit 15kw. The teeth are 20° stud in diametral plane and have a helix angle of 45° . The pinion runs at 10000 rpm and has 80mm pitch diameter. The gear has 320mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 mpa . Determine a suitable module and face width from static strength considerations and check the gears for wear, given allowabl stress 618mpa

10 Marks

SECTION – V

Q. No. 10

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. **10 marks**

OR

Q. No. 11

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. **10 Marks**
