R16

III B.TECH II SEM

SUPPLEMENTARY EXAMINATIONS

MARCH 2025

Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CE3203

III B.Tech II Semester Supple Examinations, March-2025

GEOTECHNICAL ENGINEERING–II

(CE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) What are the factors that affect the sample disturbance?
   (b) What is passive earth pressure?
   (c) List out various factors affecting stability of retaining walls.
   (d) Define 'ultimate bearing capacity'.
   (e) What are the different circumstances under which a pile foundation is used?
   (f) What are different forces acting on the well foundation?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) State the various methods of soil exploration and explain in detail the penetration test
   (b) Draw a neat sketch of split spoon sampler showing all the salient parts
3. (a) Explain the step by step procedure of Culmann's graphical method to determine the active earth pressure for cohesionless backfill with a neat sketch.
   (b) Discuss the differences between Rankine's and Coulomb's theories of earth pressure.
4. (a) Design a retaining wall for a 8 m sandy soil backfill with unit weight as 17.5 kN/m^3 and frictional resistance as 30^0 . Check the stability of the designed retaining wall.
   (b) What are the types of retaining walls? Discuss their practical importance with neat sketches.
5. (a) Determine the ultimate bearing capacity of a strip footing,1.2m wide and having the depth of foundation of 1m .Use Terzaghi's theory and assume general shear failure. Take ø=35°, γ=18kN/m^3 ,C^1 =15kN/m^2
   (b) Using Skemption theory, compute the bearing capacity of a square footing of 2 x 2 m, resting on the saturated clay at undrained condition at a depth of 1.5 m from the ground level. Depth correction factor, $d_c = 1 + 0.2D/B$, shape correction factor, $s_c = 1 + 0.2\ B/L$, where D, B and L are the depth of foundation, width and length of the footing respectively.
6. (a) Define negative skin friction. Discuss the reasons for negative skin friction and its controlling techniques
   (b) A six piles group is driven into a sandy soil up to 7 m depth. The piles are 300 mm in diameter at 750 mm c/c spacing. The soil properties are C=0; ϕ= 30^0 ; δ=20^0 ; γ=18KN/m^3; Nq= 18; Nr=37. Use FOS = 3 for end bearing & FOS = 2 for skin friction & calculate the safe load on the pile group
7. (a) Briefly explain the types of wells with neat sketches.
   (b) Discuss the construction aspects of well foundations

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Subject Code: R16CE3204

III B.Tech II Semester Supple Examinations, March-2025

TRANSPORTATION ENGINEERING-II

(CE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) List various types of Engineering Surveys?
   (b) Discuss about the adzing of sleepers?
   (c) What are the functions of turnouts?
   (d) What is the purpose of Wind rose diagram?
   (e) What are the requirements of Airport drainage?
   (f) Differentiate between Natural and Artificial harbours?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Discuss merits and limitations of railway Transportation?
   (b) Discuss about the Basic Requirements of an Ideal Alignment?

3. (a) What is meant by a turn out? Enumerate components parts of a turnout?
   (b) Draw a neat diagram of simple left hand turnout and show its various component parts?

4. (a) Government is planning an Airport in your district. In view of this, What arethe requirements of Airport Site Selection?
   (b) What are the corrections to be applied of Runway Length? Explain.

5. The length of a runway at mean sea level, standard temperature and zero gradients is 1690m. The site has an elevation of 330m, with a reference temperature of 33.6°C. The runway has to be constructed with an effective gradient of 0.25%. Determine the actual length of the runway at site.

6. (a) Explain about the different types of break waters with the sketches?
   (b) What are the different components of a harbor? And explain them with the layout

7. (a) What is a Transition curve, what are the different types and what are the requirements for an ideal transition curve.
   (b) Compute the maximum permissible speed for the following data on a curve of high speed B.G for the following data. Degree of curve = 1.2, Amount of super elevation = 8 cm, Length of transition curve = 150 m, Maximum sanctioned speed likely to be 145 kmph.

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME3201

III B.Tech II Semester Supple Examinations, March-2025

METROLOGY AND INSTRUMENTATION

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) What are the key factors that influence the accuracy of a measuring system?
   (b) What are the key limitations of using a sine bar?
   (c) Mention some of the applications where a toolmaker's microscope commonly used?
   (d) What is the difference between reliability and repeatability?
   (e) What are the key specifications used to define a transducer?
   (f) Define thermistor?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) With a neat sketch explain the various types of fits, including clear illustrations.
   (b) Given a basic dimension of 60.00, a tolerance of 0.002 for the hole, a tolerance of 0.03 for the shaft, and an allowance of 0.02, determine the following using the basic hole system:
      i) The limits of the shaft
      ii) The limits of the hole.

3. (a) How is a micrometer constructed, and what is its working principle? Explain.
   (b) Describe the construction of a bevel protractor and explain how it measures angles.

4. (a) Explain the construction of an auto-collimator with the help of a sketch and discuss its applications.
   (b) State and explain the Taylor's principle of gauge design with neat sketch of Plug gauge and Snap gauges.

5. (a) What are the different types of errors in measurements, and how are they rectified?
   (b) What are the static and dynamic characteristics of an instrument, and how do they differ?

6. (a) Describe the working principle of a piezoelectric transducer with a neat sketch, and list out its limitations.
   (b) Explain which important considerations should be made when choosing a transducer?

7. (a) How is stress measured using variable resistance strain gauges, and how do they work?
   (b) What are the key properties of thermistors, and where are they typically applied?

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME3202

III B.Tech II Semester Supple Examinations, March-2025

DESIGN OF MECHANICAL COMPONENTS

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) What is the key difference between thrust bearings and radial bearings?

(b) What role does the crankshaft play in an IC engine?

(c) What is the function of a cylinder liner in an IC engine?

(d) What is the key difference between stress distribution in curved beams and straight beams?

(e) What is the primary difference between a flat belt and a V-belt?

(f) What is the difference between spur gears and helical gears?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) A deep groove ball bearing is used to support a radial load of 2000 N and an axial load of 500 N. The inner diameter of the bearing is 30 mm, and the outer diameter is 62 mm. The bearing operates at a speed of 1200 RPM. Calculate the dynamic load rating (C) of the bearing required for this application. Additionally, determine the life of the bearing in hours. Use a life factor of 1.5 for the operating conditions. [6]

(b) Explain the construction, working, advantages, and applications of roller bearings. [6]

3. A connecting rod in a 4-stroke internal combustion engine is subjected to maximum gas pressure of 3.5 MPa. The length of the connecting rod is 0.25 m, and the crank radius is 0.05 m. The engine runs at 3000 RPM, and the connecting rod has a cross-sectional area of 1000 mm². [12]

Determine:

1. The maximum compressive force acting on the connecting rod during operation.
2. The maximum bending stress in the connecting rod assuming a bending moment acts due to crankshaft rotation.
3. The factor of safety if the yield strength of the connecting rod material is 500 MPa.

4. A connecting rod in a 4-stroke internal combustion engine is subjected to maximum gas pressure of 3.5 MPa. The length of the connecting rod is 0.25 m, and the crank radius is 0.05 m. The engine runs at 3000 RPM, and the connecting rod has a cross-sectional area of 1000 mm^2. [12]

Determine:

1. The maximum compressive force acting on the connecting rod during operation.
2. The maximum bending stress in the connecting rod assuming a bending moment acts due to crankshaft rotation.
3. The factor of safety if the yield strength of the connecting rod material is 500 MPa.

5. Explain the theory behind curved beams and how it differs from straight beams in terms of stress distribution. Derive the expression for stress in a curved beam and explain the concept of the neutral axis shift. Discuss the applications of curved beams and the factors that affect their strength and design. [12]

6. A V-belt drive transmits 10 kW of power from a 1440 RPM electric motor to a compressor running at 480 RPM. The diameters of the motor pulley and the compressor pulley are 250 mm and 750 mm, respectively. The angle of contact on the smaller pulley is 160°, and the coefficient of friction between the belt and the pulleys is 0.3. The density of the belt material is 1000 kg/m^3, and the cross-sectional area of the belt is 300 mm^2. The groove angle of the pulley is 40°. [12]

Determine the following:

1. The belt speed.
2. The tension in the tight and slack sides of the belt.
3. The length of the belt.
4. The required initial tension in the belt.

7. (a) Explain the construction, working, advantages, and applications of a spur gear. [6]
(b) Explain the concept of load concentration factor in gears. [6]

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME3203

III B.Tech II Semester Supple Examinations, March-2025

HEAT TRANSFER

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12. Heat Transfer Data Book is allowed.

PART-A

1. (a)What do you understand by Critical Radius of Insulation? Give its significance.
   (b) Establish the equation of Fourier number of unsteady state conduction.
   (c) Define and discuss the significance of Reynolds number.
   (d) What is Thermal Entry Length for the flow of fluid through a circular pipe?
   (e) List the assumptions in the Nusselt's theory of Condensation on a vertical plate.
   (f) Distinguish between Black and Grey bodies.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Discuss the conditions for which temperature distribution in a medium conducting heat is linear. [4]
   (b) Derive the general heat conduction equation in spherical coordinate system, assuming isotropic material and unsteady state. [8]
3. (a) Define efficiency and effectiveness of a fin. Discuss the importance of the assumption for the short fin with insulated end. [4]
   (b) A spherical steel ball of 2 cm diameter is cooled in a controlled ambience from 600^{0}C to 50^{0}C in 10 minutes. If the body is a cube of 2 cm of the same material, what would be the time required for cooling to achieve the same temperature at the end of cooling process. [8]

4. (a) Distinguish between Free and Forced Convective heat transfer. [4]
   (b) By using Buckingham's π-method prove that for forced convection Nusselt number is a function of Reynolds number and Prandtl number. [8]

5. (a) Explain the classification of Heat Exchangers. [4]
   (b) Air enters at a temperature of 60^{0}C and flows through a 2.5 cm diameter tube with a velocity of 0.8 ms^{-1}. It can be heated either by (i) condensing steam on its outer surface or (ii) by electric resistance heating. Calculate the heat transfer coefficient in both the cases, assuming fully developed flow. [8]

6. (a) Differentiate Film wise and Drop wise condensation. [4]
   (b) Explain the different regimes of pool boiling heat transfer from a heated electric wire. [8]

7. (a) Explain Lambert's Cosine Law of Black body radiation. [4]
   (b) Derive the expression for surface resistance and shape resistance using electrical analogy. [8]

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Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME3204

III B.Tech II Semester Supple Examinations, March-2025

AUTOMOBILE ENGINEERING

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Explain the importance of cooling system in an Automobile.
   (b) What is a Clutch ?
   (c) What is the purpose of torque converter?
   (d) What are shock absorbers, mention any four type of shock absorbers.
   (e) Write about cut out relay.
   (f) Name the main pollutants in the engine exhaust.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Explain briefly the constructional features of the various parts of a car body
   (b) Explain the types of water cooling systems with neat sketches.

3. What are the different types of differentials? Write a short note on Limited slip differential and mention its advantages and disadvantages

4. (a) Define i) Camber ii) Caster iii) Toe-in and Toe-Out iv) SAI v) Slip Angle
   (b) Explain the term "Backlash" in Steering Gear. Write the common procedure adopted to adjust the backlash in steering gear

5. (a) What are the different types of automobile braking systems? Write short notes on pneumatic braking system with a neat sketch
   (b) Explain briefly the following independent suspension system used in automobiles
   i) Wishbone arm system ii) Trailing link system.

6. Explain the need for an automotive air conditioning. Explain the working of an automotive air conditioning system with a neat sketch.

7. (a) Write about thermal and catalytic converters? Explain
   (b) Explain PCV emission control system briefly?

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Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16EC3203

III B.Tech II Semester Supple Examinations, March-2025

DIGITAL SIGNAL PROCESSING

(ECE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Determine the value of power in the signal $y(n)=e^{j\left(\frac{\pi}{2}n+\frac{\pi}{8}\right)}$
   (b) Illustrate the time-shifting property of DTFT.
   (c) Differentiate poles and zeros.
   (d) Compare and contrast the Butterworth and Chebyshev filters.
   (e) Comment on the bilinear transformation method.
   (f) Specify the non-causal rectangular window expression used in the FIR filter design.

[2+2+2+2+2+2]

PART-B

4 × 12 = 48

2. (a) Determine the values of power (P_x) and energy (E_x) for each of the following signal.

   i) $x_1(n)=\left(\frac{1}{2}\right)^n u(n)$ ii) $x_2(n)=\cos\left(\frac{\pi}{4}n\right)$

   (b) Show that all the finite periodic signals are power signals

3. Design the radix-2 DIT-FFT to the following sequence.x(n)=(1,2,1,2,1,2,1,2)

4. Explain the properties of Z transforms

5. (a) Obtain the cascade realization of the system function,

   $$H(z)=\left(1-\frac{5}{2}z^{-1}+3z^{-2}\right)\left(1+z^{-1}+z^{-2}\right).$$

   (b) Determine the lattice form of the FIR filter defined by

   $$y(n)=2x(n)+\frac{3}{2}x(n-1)+\frac{2}{3}x(n-2)+\frac{4}{5}x(n-3).$$

6. (a) Determine the system function $H_a(s)$ for a second order Butterworth filter.
   (b) Outline the design method of a Butterwoth LPF using bilinear transformation. Given

   $$\delta_1 \le \left|H\left(e^{j\omega}\right)\right| \le 1 \quad 0 \le |\omega| \le \omega_p$$
   $$\left|H\left(e^{j\omega}\right)\right| \le \delta_2 \quad \omega_s \le \omega \le \pi$$

7. (a) Estimate the frequency response of the causal rectangular window which is given as
   (b) Design a linear phase FIR digital LPF of unity gain using hamming window whose cut-off frequency is 1.8 rad/sample and length of the window M= 7.

Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS3201

III B.Tech II Semester Supple Examinations, March-2025

CRYPTOGRAPHY AND NETWORK SECURITY

(CSE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Define security mechansim
   (b) Draw the structure of CTR Mode.
   (c) State Fermat's and Euler's Theorems.
   (d) Differentiate between Fermat's and Euler's Theorems.
   (e) List the PGP services
   (f) List out various Types of Firewalls.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Let us consider Jack observes all the messages those are being sent by Alice to Bob and Vice versa. Assume, Alice was sent a message as "Ten Mangoes" in secure format. Determine the secure message if it was generated by
   i) ceaser cipher with a key **'5'**.
   ii) Rail fencing Transposition technique with depth **'2'**
   (b) Explain various security attacks and the effected security services from them over the communicational data.

3. (a) Illustrate the process of following block cipher modes of Operation- ECB, **CBC**, OFB,CFB.
   (b) Elaborate the functioning process of DES and its strengths.

4. (a) Discuss the process of Diffie-Hellman Key Exchange Algorithm.
   (b) Apply encryption and decryption process of RSA algorithm for p=3,q=11,e=7 and M=5. Explain RSA algorithm with step wise.

5. (a) How does SHA-512 generates Hash value? Explain in detail about its process.
   (b) How digital Signatures will generate? Elaborate digital signature standards

6. (a)Describe in detail about Pretty Good Privacy (PGP) Operations.
   (b) Compare Kerberos 4 and Kerberos 5. Also discuss about Realms of Kerberos 4 with a neat architectur

7. (a) Draw the structure of SSL Architecture, and Discuss the functioning of SSL Record Protocol
   (b) Analyse the process of Packet filter firewall and Application level firewall