

R16

III B.TECH II SEM

SUPPLEMENTARY EXAMINATIONS

MARCH / APRIL 2024



**Subject Code: R16CE3201**

**III B.Tech II Semester Supple Examinations, March 2024.**

**DESIGN AND DRAWING OF STEEL STRUCTURES**

**(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 is meant by pitch of rivet
- (b) Explain the types of failures in tension members
- (c) Discuss about slenderness ratio
- (d) What is splicing of columns
- (e) What is the purpose of lacings in built up columns
- (f) Distinguish between plate girder and gantry girder

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

**PART-B**

**4 X 12 = 48**

2. Design a connection to joint two plates of size 200 mm x 10 mm of grade Fe 410 to mobilize full plate tensile strength using shop fillet welds if (i) a lap joint is used (ii) a double cover butt joint is used
3. Design a continuous beam of span 5.0 m, 6 m and 5.0 m carrying a total uniformly distributed load of 30 kN/m and laterally unrestrained with a bearing length of 100 mm
4. Design a bridge truss diagonal subjected to a factored tensile load of 400 kN. The length of the diagonal is 3.0 m. The tension member is connected to a gusset plate 16 mm thick with one line of 20 mm diameter bolts of grade 8.8.
5. Design a laced column for a load carrying capacity of 1500 kN. The effective length of the column is 6m. Use channel sections. Design lacing system also.
6. A column ISHB 350 @661.2 N/m carries an axial compression factored load of 1500 kN. Design a suitable welded gusset base. The base rests on M-15 grade of concrete.
7. Design a gantry girder (without lateral restraint along its span) for an Industrial building to support overhead travelling crane. Use the following data: Centre to centre distance between column (span of gantry) 6 m, Crane capacity 150 kN, Self weight of crane girder (exclude trolley) 160 kN, Self weight of trolley motor and other accessories 40 kN, Minimum hook approach 1.00 m, Distance between wheel centers of trolley 2.00 m, Centre to centre between gantry rails (span of crane) 12 m, Self weight of rail section 250 N/m, Yield strength of steel 250 MPa. Apply necessary design checks.

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**Subject Code: R16CE3203**

**III B.Tech II Semester Supple Examinations, March-2024**

**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) List the different types of soil samplers available.
- (b) Define earth pressure at rest. Write the expression for determining the same.
- (c) List the possible types of failures in a finite slope.
- (d) Differentiate between shallow and deep foundations.
- (e) Give any four uses of pile foundations.
- (f) What are the types of well foundations.

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

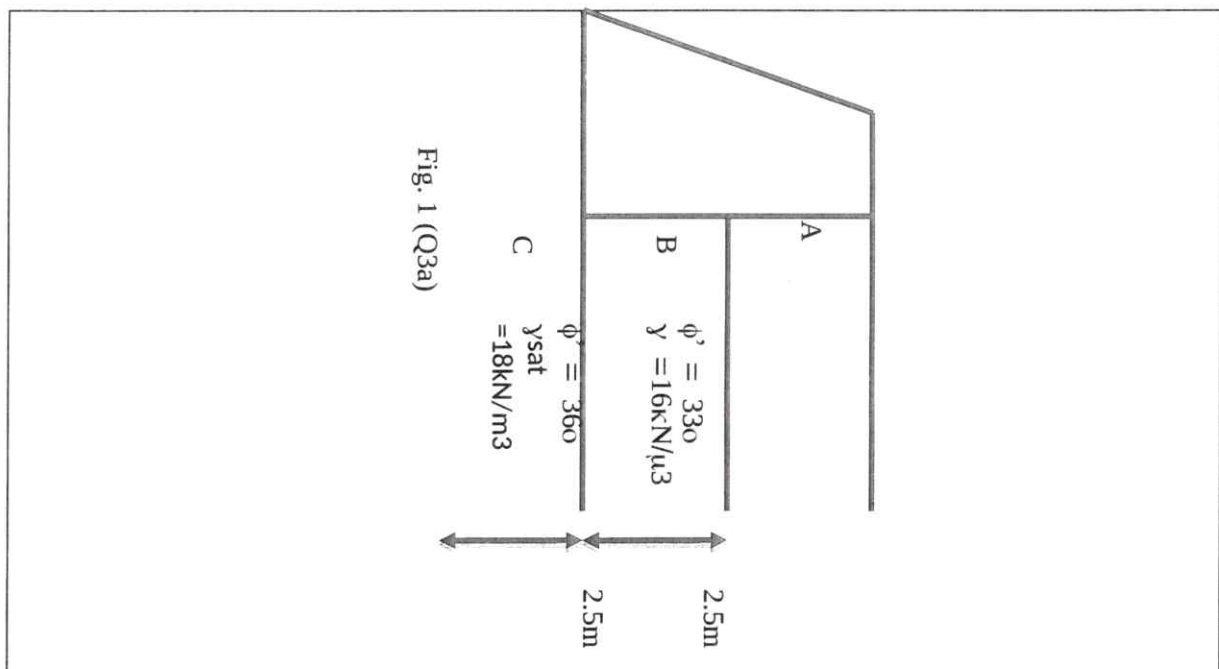
**PART-B**

**4 X 12 = 48**

2. (a) List out different methods of soil boring? Explain each of them briefly. [6]
- (b) Explain any two penetration tests implemented on field during soil exploration, in detail. [6]
3. (a) Determine the active earth pressure on the retaining wall shown in Fig. 1. Take  $\gamma_w = 10 \text{ kN/m}^3$ . Also determine the resultant active thrust and its location. [6]
- (b) Describe the Culmann's graphical method for determining the passive earth pressure in cohesionless soils. [6]
4. (a) A wall with a smooth vertical back and 9 meters high retains a moist cohesionless soil with a horizontal surface. The soil weighs  $15 \text{ kN/m}^3$  and has an angle of internal friction of  $30^\circ$ . Determine the total thrust at rest and its location. If, subsequently, the water table rises to the ground surface, determine the increase in earth pressure at rest. Assume the effective unit weight of soil as  $9 \text{ kN/m}^3$ . [6]
- (b) The unit weight of a soil of a  $30^\circ$  slope is  $17.5 \text{ kN/m}^3$ . The shear parameters  $c$  and  $\phi$  for the soil are  $10 \text{ kN/m}^2$  and  $20^\circ$  respectively. Given that the height of the slope is 12 m and the stability number obtained from the charts for the given slope and angle of internal friction is 0.025, compute the factor of safety. [6]
5. (a) A column carrying a load of 750 kN, has to be supported by a square footing with its base at 1.5 m depth. What is the required size of the foundation, which will provide a factor of safety of 3 against shear failure? Assume  $c' = 10 \text{ kN/m}^2$ ,  $\phi = 30^\circ$ ,  $\gamma_t = 18 \text{ kN/m}^3$ ,  $\gamma' = 10 \text{ kN/m}^3$ . Water table is at 1.5 m depth. Use Terzaghi's equation. Table for Bearing capacity factors is provided in the question paper. [6]
- (b) List and explain with neat sketches different types of shallow foundation. [6]

6. (a) A pile group consists of 9 friction piles of 30 cm diameter and 10 m length driven in clay ( $c_u = 100 \text{ kN/m}^2$ ,  $\gamma = 20 \text{ kN/m}^3$ ). Determine the safe load for the group (FOS = 3,  $\alpha = 0.06$ ). [6]
- (b) Explain the various types of pile foundations in use. [6]

7. (a) A rectangular footing (3 m x 2 m) exerts a pressure of  $100 \text{ kN/m}^2$  on a cohesive soil ( $E_s = 5 \times 10^4 \text{ kN/m}^2$  and  $\mu = 0.50$ ). Determine the immediate settlement at the center, assuming (a) the footing is flexible; (b) the footing is rigid. [6]
- (b) Explain any six measures for rectification of tilts and shifts followed in sinking of well foundation. [6]



**BEARING CAPACITY FACTORS OF TERZAGHI**

$\phi^\circ$	$N_c$	$N_q$	$N_\gamma$
0	5.7	1.0	0.0
5	7.3	1.6	0.14
10	9.6	2.7	1.2
15	12.9	4.4	1.8
20	17.7	7.4	5.0
25	25.1	12.7	9.7
30	37.2	22.5	19.7
35	57.8	41.4	42.4
40	95.7	81.3	100.4
45	172.3	173.3	360.0
50	347.5	415.1	1072.8

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**Subject Code: R16CE3204**

**III B.Tech II Semester Supple Examinations, March-2024**

**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)What are components of Permanent Way?
- (b)List various Gradients in Railways
- (c)Draw a neat sketch of line diagram of left hand turn out.
- (d)Write a short note on taxiway marking.
- (e)What is design criteria for design of drainage.
- (f)Write short note on Harbours.

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

**PART-B**

**4 X 12 = 48**

2. (a)Explain briefly about the requirements of an ideal permanent way. (6M)
- (b)Describe the sleeper density and spacing of sleepers. (6M)
3. (a)What are the basic requirements of an Ideal railway alignment? (6M)
- (b)What would be the permissible speed on the curve? If on an 80 M.G. track, the average speed of different trains is 50 kmph and allowable cant deficiency is half that of maximum cant deficiency. (6M)
4. (a)What essential purposes are served by Signalling and Interlocking? What do you understand by route relay interlocking? (6M)
- (b)Differentiate between Mechanical and Electrical signalling systems. (6M)
5. (a)Write notes on corrections for elevation and temperature for a runway? (6M)
- (b)Explain about the factors to be considered for selecting a site for an airport? (6M)
6. Discuss how the analytical methods differ empirical methods and semi empirical methods for the design of airfield pavements. (12M)
7. (a)What are the factors to be considered for the selection of harbours on a sandy coast and Lower reach of a river? (8M)
- (b)What are the requirements of navigational aids? (4M)

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Subject Code: R16CE3207

**III B.Tech II Semester Supple Examinations, March-2024**  
**GROUND IMPROVEMENT TECHNIQUES**

(CE)

Max Marks: 60

Time: 3 hours

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) State any four objectives of ground improvement.
- (b) What is the principle of dynamic compaction of granular soils?
- (c) List any four dewatering techniques.
- (d) What are the advantages of soil stabilization using fly ash?
- (e) Give any four specifications of soil nails.
- (f) List any four types of geotextiles.

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

**PART-B**

4 X 12 = 48

2. (a) Give the classification of ground modification techniques with explanation.
- (b) Explain how the suitability and feasibility of a method for ground improvement shall be decided.
3. (a) What are the different deep compaction techniques adopted on field. Explain the specifications, factors affecting and their suitability on various soils for any one of the deep compaction techniques.
- (b) Explain the procedure of densification of cohesive soils using stone columns.
4. (a) Describe the procedure involved in dewatering of soil using open sumps and ditches.
- (b) Briefly explain the electro-osmosis method of dewatering of soil.
5. (a) Compare the performance and properties of cement and lime in soil stabilization.
- (b) Discuss the origin, properties and use of granulated blast furnace slag as a soil stabilizing material.
6. (a) What are the applications of geotextiles. Explain the role of geotextile for each application listed.
- (b) Explain the significance of Reinforced earth structures. What materials are suitable for soil reinforcement and give their applicability for different types of soils.
7. (a) What are the objectives of grouting. Also discuss the applications of grouting with a case study.
- (b) List and elaborate the five types of grouting techniques available for soil modification.

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Subject Code: R16CC32OE23

**III B.Tech II Semester Supple Examinations, March-2024**  
**DISASTER MANAGEMENT (OPEN ELECTIVE-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) How Tsunami is different from flood?
- (b) What are the types of fire hazards?
- (c) What is the effect of vulnerability?
- (d) What are main causes of earthquake?
- (e) What is the basis of disaster resilience?
- (f) What is the effect of deprivation?

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

**PART-B**

**4 X 12 = 48**

2. (a) What are various steps to follow in rescue operations during massive floods?
- (b) Illustrate the differences between hazard and disaster
3. (a) Describe various approaches to vulnerability analysis during a hazard like a bio terrorism
- (b) Explain in detail transport hazards, its causes and mitigation measures
4. (a) Relate the disaster, vulnerability and risk with neat figure/flow chart
- (b) Explain about climate change and probable impacts of climate change
5. (a) Explain about the role of Indigenous knowledge in Natural Resource Management
- (b) Explain the activities related to earthquake mitigation in Northern India
6. (a) Explain the components of the Community based Disaster Preparedness
- (b) Discuss the essentials of school disaster education
7. (a) Write in detail about disaster risk reduction
- (b) Discuss the impact of disaster on poverty

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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-2024

### 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

- (a) Define the terms precision and accuracy.  
(b) Classify the dial indicators.  
(c) What are the applications of autocollimator?  
(d) What is static and dynamic response?  
(e) State the working principle of a transducer.  
(f) List out some applications of Thermistors.

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

#### PART-B

4 X 12 = 48

- (a) What are limits and Fits? Explain about the types of Fits with neat sketches. 6M  
(b) Differentiate between Line standard and end standard. 6M
- (a) Explain the principle and working of sine bars with neat sketches. 6M  
(b) Write a short note on uses and applications of angle slip gauges. 6M
- (a) Discuss about the Tools maker's microscope with a neat sketch and mention its uses. 12M
- (a) How are errors occurred in measuring instruments and how are they calibrated. 6M  
(b) Define the terms sensitivity, hysteresis and accuracy. 6M
- (a) Explain the working principle of Piezoelectric transducer with neat sketch and also list out its limitations. 6M  
(b) Discuss about the actuating mechanisms. 6M
- (a) With a neat sketch explain about the resistance strain gauges for bending and tensile strain measurements. 6M  
(b) Discuss in detail about the electrical strain gauge with a neat sketch 6M

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**Subject Code: R16ME3202****III B.Tech II Semester Supple Examinations, March-2024****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**

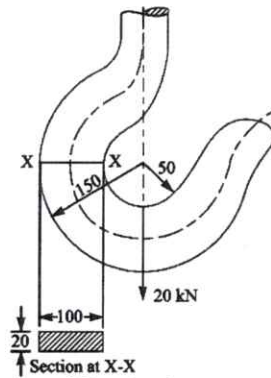
1. (a) What are journal bearings? Give a classification of these bearings.
- (b) What is the function of a connecting rod of an I.C. engine?
- (c) Classify the various types of cylinder liners used in I.C. engines.
- (d) Write the important applications of curved beams.
- (e) Why the face of a pulley is crowned?
- (f) Why are square threads preferable to V-threads for power transmission?

**[2+2+2+2+2+2]****PART-B****4 X 12 = 48**

- 2 A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of  $1.4 \text{ N/mm}^2$ . The speed of the journal is 900 r.p.m. and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of  $75^\circ\text{C}$  may be taken as  $0.011 \text{ kg/m-s}$ . The room temperature is  $35^\circ\text{C}$ .  
Find:
  1. The amount of artificial cooling required, and
  2. The mass of the lubricating oil required, if the difference between the outlet and inlet temperature of the oil is  $10^\circ\text{C}$ . Take specific heat of the oil as  $1850 \text{ J/kg}^\circ\text{C}$ . Assume suitable data if needed.
- 3 Design a plain carbon steel centre crankshaft for a single acting four stroke, single cylinder engine for the following data: [12]  
Piston diameter = 250 mm  
Stroke = 400 mm  
Maximum combustion pressure =  $2.5 \text{ N/mm}^2$   
Weight of the flywheel = 16 kN  
Total belt pull = 3 N  
Length of connecting rod = 950 mm.  
When the crank has turned through  $30^\circ$  from top dead centre, the pressure on the piston is  $1 \text{ N/mm}^2$  and the torque on the crank is maximum.  
Any other data required for the design may be assumed
- 4 (a) State the function of the following for an IC engine piston [4]
  - (i) Ribs
  - (ii) Piston Rings

- (b) Design a cast iron piston for a single acting four stroke engine for the following data: [8]
- Cylinder bore = 100 mm  
 Stroke = 125 mm  
 Maximum gas pressure = 5 N/mm<sup>2</sup>  
 Indicated mean effective pressure = 0.75 N/mm<sup>2</sup>  
 Mechanical efficiency = 80%  
 Fuel consumption = 0.15 kg per brake power per hour  
 Higher calorific value of fuel = 42 × 10<sup>3</sup> kJ/kg  
 Speed = 2000 r.p.m.  
 Any other data required for the design may be assumed

- 5 (a) The crane hook carries a load of 20 kN as shown in Fig.1. The section at X-X is rectangular whose horizontal side is 100 mm. Find the stresses in the inner and outer fibres at the given section. [8]



Section of X-X (All dimensions in mm)

Fig.1

- (b) Distinguish clearly between direct stress and bending stress. [4]
- 6 (a) Discuss the different types of pulleys used in belt drives. [4]
- (b) Two pulleys, one 450 mm diameter and the other 200 mm diameter, on parallel shafts 1.95 m apart are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. [8]
- What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25?
- 7 (a) The cutter of a broaching machine is pulled by square threaded screw of 55 mm external diameter and 10 mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60 mm and 90 mm internal and external diameters respectively. If the coefficient of friction is 0.15 for all contact surfaces on the nut, determine the power required to rotate the operating nut when the cutting speed is 6 m/min. Also find the efficiency of the screw. [8]
- (b) Briefly discuss the any one type of power threads and also list its few practical applications. [4]

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Subject Code: R16ME3203

**III B.Tech II Semester Supple Examinations, March-2024**

**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.

**PART-A**

- (a) State Fourier's law of heat conduction. Describe the variables involved in the equation and their meanings. How does Fourier's law help in understanding the heat transfer process through a material?  
(b) What is the significance of Biot and Fourier numbers in transient conduction heat transfer?  
(c) What is the significance of non-dimensional numbers in the context of convection heat transfer? Provide an example of a non-dimensional number and its application.  
(d) Define Hydrodynamic Entry Length (TEL) and Thermal Entry Length (TEL) in the context of internal flows.  
(e) What are the different regimes of pool boiling?  
(f) Define emissivity and explain its significance in radiation heat transfer. Provide an example of how emissivity affects heat exchange between two surfaces.

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

**PART-B**

**4 X 12 = 48**

- (a) A composite system consists of a 10 cm thick slab of thermal conductivity 20 W/mK sandwiched between two 5 cm thick slabs of thermal conductivity 10 W/mK. The temperature of the faces of the system are 100 K and 50 K, respectively. Calculate the heat flux through the system. [6M]  
(b) Describe the method of solving one-dimensional steady-state conduction problems using the electrical analogy approach. Provide a step-by-step explanation of how you would apply this method to solve a scenario involving a composite wall with multiple layers. [6M]
- (a) A long fin is made of a material with a thermal conductivity of 20 W/mK and a thickness of 10 cm. The fin is 1 m long and is exposed to a fluid at a temperature of 250 K. The temperature of the base of the fin is 100 K. Calculate the heat transfer rate from the fin to the fluid. [6M]  
(b) Explain the difference between a long fin and a short fin. Discuss the effect of Fourier number on transient conduction heat transfer. [6M]
- (a) Compare and contrast the hydrodynamic boundary layer and the thermal boundary layer in forced convection heat transfer. Explain how these boundary layers develop and their significance in determining heat transfer rates. [6M]  
(b) Explain Buckingham Pi theorem of producing non-dimensional numbers [6M]

5. (a) A counterflow heat exchanger is used to heat water from 25°C to 65°C. The hot fluid is steam at 100°C and the mass flow rate of the hot and cold fluids are equal. The heat exchanger has a total surface area of 20 m<sup>2</sup>. Calculate the overall heat transfer coefficient and the effectiveness of the heat exchanger. [6M]
- (b) Define the overall heat transfer coefficient and fouling factor in the context of heat exchangers. Explain how fouling impacts the performance of heat exchangers and describe methods to mitigate its effects. [6M]
6. (a) Derive an expression for the heat transfer coefficient for nucleate boiling on a vertical plate. [6M]
- (b) A horizontal tube of 2 cm diameter is subjected to saturated steam condensing on the outside. The steam temperature is 100°C and the ambient air temperature is 25°C. If the heat transfer coefficient is 1000 W/m<sup>2</sup>K, determine the rate of condensation in kg/h. [6M]
7. (a) A radiation shield is placed between two black bodies with temperatures of 800 K and 400 K. The shield has an emissivity of 0.2. What is the net rate of heat transfer between the two blackbodies after the shield is placed? [6M]
- (b) Explain the analogy and how it can be used to solve practical problems involving radiation heat transfer. [6M]

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Subject Code: R16ME3204

**III B.Tech II Semester Supple Examinations, March-2024**  
**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) What are the functions of piston rings?
- (b) State the purpose of ignition advance.
- (c). What means are used to shorten the required propeller shaft length?
- (d). State the purpose of shock absorbers used in suspension systems.
- (e). Discuss refrigerant importance and its effects on the environment.
- (f).Name commonly used automotive materials.

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

**PART-B**

**4 X 12 = 48**

2. (a) Explain briefly various types of chassis construction with the help of neat sketches 8M
- (b).Describe various parts of a water cooling system. 4M
3. (a) With the help of a neat diagram, explain the working of battery ignition systems 6M
- (b) Elucidate the working and advantages of multipoint fuel injection system. 6M
4. (a) Explain the working of a diaphragm clutch. How does it differ from a single-plate clutch? 6M
- (b). Describe the operation of planetary gears when the system is in reverse. 6M
5. (a) Explain Ackerman principle. 6M
- (b). Draw the layout of Air-brake system and write the functions of all the components. 6M
6. (a) Draw simple wiring diagram of electric system of an automobile with clear indication of various components. 6M
- (b). Describe the operation of air bags 6M
7. (a). Explain the purpose and working of the catalytic converter 6M
- (b). Discuss the steps involved in engine service. 6M

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**Subject Code: R16EC3201**

**III B.Tech II Semester Supple Examinations, March-2024**

**VLSI DESIGN**

**(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) Differentiate between Enhancement mode and Depletion mode of transistor.
- (b) Mention the advantages and applications of GaAs technologies.
- (c) Explain layout diagram and why it is needed?
- (d) Explain about fan-in and fan-out and what is the need of calculating both?
- (e) What are the architectural issues in the design of sub systems?
- (f) What is the difference between FPGA and ASIC.

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

**PART-B**

**4 X 12 = 48**

2. (a) With neat sketches, explain the fabrication of twin tub process. [12]
3. (a) Derive the Pull-up to Pull-down Ratio for NMOS inverter driven by one or more Pass transistor. [6]
- (b) Explain the body effect of MOS Transistor. [6]
4. (a) Draw the stick diagram for two input nMOS NAND gate. [6]
- (b) Explain  $\lambda$ - based design rules. [6]
5. (a) Explain the concept of scaling of MOS circuits and why it is needed? And mention the limitations of Scaling. [6]
- (b) Briefly discuss on Fringing fields, interlayer capacitances, peripheral capacitances [6]
6. (a) Design a 4-line gray code to binary code converters. [6]
- (b) Explain how nMOS transistor is used as a switch. [6]
7. (a) Explain FPGA Design flow. [6]
- (b) Draw and explain the basic architecture of FPGA. [6]

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**Subject Code: R16EC3202**

**III B.Tech II Semester Supple Examinations, March-2024**

**MICROWAVE AND OPTICAL COMMUNICATIONS**

**(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) Describe the various problems of Circular wave guides
- (b) Show that TM<sub>01</sub> and TM<sub>10</sub> modes does not exist in a rectangular waveguide
- (c) Discuss the various applications of Gunn Diode
- (d) Explain the advantages of optical fiber communications
- (e) Explain the importance of Quantum efficiency
- (f) Define Effective Refractive Index

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

**PART-B**

**4 X 12 = 48**

2. (a) Derive the expression for the E and H field components for TE waves in a parallel plane wave guide using Maxwell's equations approach. [6]
- (b) A parallel plate wave guide made of two perfectly conducting infinite planes spaced 3cm apart in air operates at a frequency of 10 GHz. Find the maximum time average power that can be propagated per unit width of the guide for TE<sub>1</sub> and TM<sub>1</sub> modes. [6]
3. (a) Define group velocity and phase velocity of a rectangular wave guide. [6]
- (b) A reflex Klystron operates at the peak of n = 2 mode with beam voltage  $V_0 = 200$  V, beam current  $I_0 = 10$  mA, and signal voltage  $V_1 = 30$  V. Determine the input power, output power and efficiency. [6]
4. (a) Explain the Gunn Effect and its various modes? [6]
- (b) Explain the operation of IMPATT diode. [6]
5. (a) Explain the procedure for measuring VSWR > 10 using microwave test bench. [6]
- (b) Describe the various elements of Optical communication system with the help of block diagram. [6]
6. (a) Explain the working principle of LASER and compare it with LED using neat diagrams. [6]
- (b) Describe the fundamental receiver operation in optical communication. [6]
7. (a) Explain the importance and operation of PIN photodetector? [6]
- (b) A photo detector generates a photo current of  $0.5\mu\text{A}$  for an incident optical power of  $0.5\mu\text{W}$  at operating wavelength of  $0.87\mu\text{m}$ . Estimate the quantum efficiency of photo detector at this wave length. [6]

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Subject Code: R16EC3203

**III B.Tech II Semester Supple Examinations, March-2024**

**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) Calculate the energy of the signal  $y(n) = a x(n)$ .
- (b) Find the Fourier transform of the unit sample sequence  $x(n) = \delta(n)$ .
- (c) Express the relation between z-transform and DTFT.
- (d) Determine the frequency response of FIR filter defined by  
 $y(n) = 0.25x(n) + x(n-1) + 0.25x(n-2)$ .
- (e) Estimate the order of the Butterworth LPF, if  $A_p \leq 1$  dB,  $A_s \geq 30$ dB,  $\Omega_p = 200$  rad/s, and  $\Omega_s = 600$  rad/s.
- (f) Define the windowing process in FIR filter design.

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

**PART-B**

4 X 12 = 48

2. (a) For an energy signal  $x(n)$  with energy  $E_x$ , show that the energy of the signals  
i)  $x_1(n) = -x(n)$     ii)  $x_2(n) = x(-n)$     iii)  $x_3(n) = x(n-k)$  is  $E_x$ .
- (b) Determine whether the systems are stable or unstable.  
i)  $y(n) = e^{x(n)}$   
ii)  $y(n) = \frac{1}{3} [x(n) + x(n-1) + x(n-2)]$
3. (a) Illustrate the properties of Discrete-time Fourier Transform.  
(b) Determine the Fourier transform of an anti-casual sequence  $x(n) = a^{-n} u(-n-1)$ ;  $|a| < 1$ .
4. (a) Determine the constraint on  $r = |z|$  for the following to converge.  
i)  $\sum_{n=-1}^{\infty} \left(\frac{1}{2}\right)^{n+1} z^{-n}$     ii)  $\sum_{n=0}^{\infty} \left(\frac{1+(-1)^n}{2}\right) z^{-n}$   
(b) Compute the inverse z-transform of  $X(z) = \frac{1+z^{-1}}{1-\frac{1}{3}z^{-1}}$
5. (a) Consider an FIR lattice filter with coefficients  $k_1 = \frac{1}{2}$ ;  $k_2 = \frac{1}{3}$ ;  $k_3 = \frac{1}{4}$ . Determine the FIR filter coefficients for the direct form structure.  
(b) Obtain the polyphase structure for the following IIR system.  $H(z) = \frac{1-3z^{-1}}{1+2z^{-1}}$



6. (a) Determine the system function  $H_a(s)$  for a second order Butterworth filter.  
(b) Design a digital Butterworth filter using bilinear transformation. The filter specifications are as follows:

$$0.9 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.5\pi$$
$$|H(e^{j\omega})| \leq 0.2 \quad 0.75\pi \leq \omega \leq \pi$$

7. (a) Determine the frequency response of the noncausal Blackman window, which is given by

$$\omega_b(n) = 0.42 + 0.5 \cos\left(\frac{2\pi n}{M-1}\right) + 0.08 \cos\left(\frac{4\pi n}{M-1}\right) \quad ; \quad \frac{-M-1}{2} \leq n \leq \frac{M-1}{2}$$

= 0; Otherwise

- (b) Analyze the pros and cons of window method.

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Subject Code: R16EC3204

**III B.Tech II Semester Supple Examinations, March-2024**

**ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**

(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**

- (a) Differentiate between systematic error and random error.  
(b) Why is stability an important characteristic for transducers?  
(c) How does a Maxwell's bridge work for inductance measurement?  
(d) Explain the difference between a DC voltmeter and an AC voltmeter.  
(e) List some physical parameters that can be measured using computer-controlled test systems.  
(f) Discuss the role of the horizontal deflection system in an oscilloscope.

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

**PART-B**

**4 X 12 = 48**

- (a) What are the different types of errors that occur during measurement? Explain each. 6M  
(b) The output voltage of an amplifier was measured at eight different intervals using the same digital voltmeter with the following results: 20.00, 19.80, 19.85, 20.05, 20.10, 19.90, 20.25, 19.95. Which is the most precise measurement? 6M
- (a) Explain the different principles of working of capacitive transducers. 6M  
(b) Describe the operation and construction of strain gauge. State its limitations. 6M
- (a) A Maxwell–Wien bridge consists of the following: Arm AB having resistance value of 1.6 k $\Omega$  in parallel with a capacitor of 2 mF, Arm BC having resistance value of 600  $\Omega$ , Arm AD having resistance value of 400  $\Omega$ , Arm BD having resistance and inductance in series. Determine the value of the unknown resistance and unknown inductance. 6M  
(b) A 1000 Hz bridge has the following Constants Arm AB – R = 1 k $\Omega$  in parallel with C = 0.25 mF, Arm BC – R = 1 k $\Omega$  in series with C = 0.25 mF, Arm CD – L = 50 mH in series with R = 200  $\Omega$ , Arm DA – unknown Find the constants of arm DA to balance the bridge. Express the result as a pure R in series with a pure C or L, and as a pure R in parallel with a pure C or L. 6M
- (a) Explain with help of a block diagram the operation of a spectrum analyzer. State applications of a spectrum analyzer. 4M  
(b) Show the DC voltage multimeter for 3 ranges  $V_1 > V_2 > V_3$  circuit and derive each unknown shunt resistance formulae. 8M

6. (a) Detail the operation and applications of a measurement frequency counter. Explain the principles behind its functionality and discuss scenarios where accurate frequency measurement is crucial. 6M
- (b) Explain the specialized techniques and instruments used for testing a radio frequency (RF) amplifier. Highlight the unique challenges in RF amplifier testing compared to audio amplifiers. 6M
7. (a) Describe with a diagram and waveforms the operation of a dual trace CRO in alternate and Chop mode. State the functions of each block. 6M
- (b) Discuss the types of recorders commonly integrated into oscilloscopes, such as XY recorders, magnetic tape recorders and dot matrix recorders. 6M

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Subject Code: R16EC3209

**III B.Tech II Semester Supple Examinations, March-2024**  
**DIGITAL IMAGE 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) Describe the concept of image sampling.
- (b) What is the purpose of image enhancement techniques?
- (c) Explain the concept of inverse filtering in image restoration.
- (d) Discuss the advantages and limitations of the RGB colour model.
- (e) What is the difference between lossless and lossy image compression techniques.
- (f) Define opening and closing operations in morphological image processing.

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

**PART-B**

**4 X 12 = 48**

2. (a) Utilizing FFT-based filtering techniques, how would you remove specific frequency components from an image?
- (b) How does the sampling rate affect the quality and resolution of a digital image?
3. (a) How does histogram equalization improve the contrast of an image?
- (b) How do high-pass and low-pass frequency filters affect the frequency content of an image?
4. (a) Describe Minimum Mean Square Error (Wiener) Filtering with an example.
- (b) Compare and contrast different image reconstruction methods in terms of their ability to preserve image details and minimize artifacts.
5. (a) Analyze the impact of different color spaces on the effectiveness of color image segmentation methods.
- (b) Compare and contrast the performance of various color image segmentation algorithms in terms of accuracy and computational efficiency.
6. (a) Elaborate Huffman coding with an example.
- (b) Discuss the concept of multi-resolution analysis and how it relates to the Haar Transform.
7. (a) Compare and contrast different types of edge detection operators, such as gradient-based operators (e.g., Sobel, Prewitt) and Laplacian-based operators. Analyze the advantages and disadvantages of each type in terms of computational complexity and robustness to noise.
- (b) Show that the erosion and dilation are dual to each other.

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Subject Code: R16CC32OE18

**III B.Tech II Semester Supple Examinations, March-2024**  
**CONSUMER ELECTRONICS (OPEN ELECTIVE-II)**  
**(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) Define Sensitivity and Selectivity with respect to Sound System.
  - (b) Classify the equalizers.
  - (c) Compare and contrast the positive and negative modulations
  - (d) Comment on additive color mixing.
  - (e) List out the common service controls of Monochrome TV.
  - (f) What are the major componts of the Facsimile machine.

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

**PART-B**

4 × 12 = 48

2. (a) List four types of microphones used in sound system. Describe any one of them.  
(b) Discuss in detail about Finite baffles and Infinite Baffles.
3. (a) Justify the role of equalizer with the block diagram of Hi-fi audio amplifier.  
(b) Differentiate magnetic tape recording and optical disc recording.
4. (a) Draw composite video signal and label it.  
(b) Outline the interlaced scanning used in TV transmission
5. (a) Analyze the merits and demerits of different color TV standards.  
(b) Write a brief note on color television display tubes
6. (a) Explain about the Common operating controls of Color TV receivers.  
(b) Discuss about MAC Encoder and Decoder.
7. (a) Demonstrate the working principle of the air conditioners,  
(b) Explain the operation of refrigerators.

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Subject Code: R16CC32OE19

**III B.Tech II Semester Supple Examinations, March-2024**  
**INTERNET OF THINGS (IOT) (OPEN ELECTIVE-II)**  
**(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) What are the Characteristics of IOT?  
(b) what is IOT level Specification?  
(c) Explain about System on Chips?  
(d) Explain the debugging process of Raspberry PI?  
(e) What are the uses of cloud storage models?  
(f) List out some domains in which we will use IOT?

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

**PART-B**

**4 X 12 = 48**

2. (a) Explain the Logical Design of IOT?  
(b) Explain various IOT Protocols?
3. (a) Explain the process and Domain model specification?  
(b) Explain Functional and operational view specification?
4. (a) What is the role of sensors and actuators in the development of embedded prototype?  
(b) Briefly Demonstrate about Arduino and developing on Arduino?
5. (a) what are the differences between raspberry pi and beagle bone black board?  
(b) Demonstrate any application (LED blinking) with Raspberry Pi?
6. (a) what is Autobahn? Explain how it is useful for IOT Systems Development?  
(b) Explain the incorporation of Xively cloud for IOT?
7. (a) Make use of case study (Agriculture), Explain about Purpose & requirements, process specification, domain model, information model specification?  
(b) Make use of case study (Smart city), Explain about Service, IOT level, functional view, operational view specification, device and component integration and application development?

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Subject Code: R16CS3202

**III B.Tech II Semester Supple Examinations, March-2024**  
**DATA WAREHOUSING AND DATA MINING**  
**(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.

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**PART-A**

1. (a) What is data mining
- (b) Define data preprocessing
- (c) Compare ROLAP vs. MOLAP
- (d) Define Bayes' Theorem
- (e) What is pruning
- (f) Define clustering

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

**PART-B**

4 X 12 = 48

2. (a) Explain data mining tasks with one example for each.
- (b) Explain the issues related to applications
3. (a) Explain the process of Aggregation in data preprocessing. Give an example
- (b) Describe the different summary statistics used to summarize data.
4. (a) Compare and Contrast Stars, snowflake and fact constellations
- (b) Explain the data warehouse architecture with neat sketch
5. (a) Describe the working principle of a decision tree in classification. Explain how decision trees partition the feature space and make predictions
6. (a) Describe the process of frequent itemset generation in the Apriori algorithm.
- (b) Explain the FP-Tree representation in association analysis.
7. (a) Explain the concept of different types of clusters in cluster analysis.
- (b) Describe the DBSCAN algorithm for density-based clustering

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Subject Code: R16CS3203

**III B.Tech II Semester Supple Examinations, March-2024**

**ADVANCED JAVA AND WEB TECHNOLOGIES**

**(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.

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**PART-A**

1. (a) What are initialization parameters
- (b) List out different ways to deploy a servlet application
- (c) What are the literals used in JSP?
- (d) How to include static files in a JSP?
- (e) What is Object Cloning
- (f) list 5 built-in functions in PHP

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

**PART-B**

**4 X 12 = 48**

2. (a) What are the different ways to test your servlet applications
- (b) What are the key differences between the `HttpServletRequest` and `HttpServletResponse` interfaces
3. (a) Given a JSP page with a directive element, explain how it is used to control the behavior of the page.
- (b) Evaluate the advantages and disadvantages of using implicit JSP objects
4. (a) Design a JSP application that uses implicit JSP objects to share data between pages.
- (b) Explain how the 'forward' and 'include' actions can be used to pass control and data between JSP pages.
5. (a) Compare and contrast the different types of JDBC drivers.
- (b) Write a Java program that uses JDBC to connect to a database and retrieve data.
6. (a) Write a PHP script that prints "Hello, world!" to the screen.
- (b) Identify the different ways to access elements of an array in PHP
7. (a) Write a PHP script that connects to a MySQL database.
- (b) Write a PHP script that updates a record in a database.

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Subject Code: R16CS3208

**III B.Tech II Semester Supple Examinations, March-2024**  
**.NET Technologies (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.

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**PART-A**

- 1) a) What is the role of jitter compiler in .NET?  
b) List out some string functions which are present in C#?  
c) Write about generics.  
d) what is the significance of skin files in ASP.Net.  
e) What is ADO.NET?  
f) What is the significance of using Ajax controls in applications?

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

**PART-B**

**4X12=48M**

- 2) a) Explain features of .net framework.  
b) Write short note on Garbage collection and CLR.
- 3) a) Define Polymorphism and explain different types of polymorphism in C# with example.  
b) Explain methods of arrays and strings in c#.
- 4) a) What are the differences between normal interface and callback interface?  
b) Outline the multi-cast delegates and how they are implemented in C#?
- 5) a) Explain various types of validation controls in ASP.NET.  
b) How to create a web page using ASP.Net web application framework.
- 6) a) Explain about ADO.Net architecture in detail.  
b) What is an ADO.Net data provider? Explain various types of data providers available.
- 7) a) Explain about LINQ to SQL with an example.  
b) What do you mean by web services? What are the protocols of web services? Also explain its class reference.