

Code: 7G564

III B.Tech. II Semester Supplementary Examinations January 2022

Instrumentation and Control Systems

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

		Marks	CO	Blooms Level
UNIT-I				
1.	a) Describe the terms linearity, repeatability and calibration.	7M	CO1	BL1
	b) List the different sources of errors in measurements and measuring instruments? Explain them brief.	7M	CO1	BL1
OR				
2.	a) Draw the generalized scheme of a typical measurement system and explain about various components of it.	7M	CO1	BL2
	b) Explain about LVDT with a neat sketch.	7M	CO2	BL2
UNIT-II				
3.	a) Describe the working principle of Mcleod pressure gauge with neat sketch.	7M	CO3	BL1
	b) Compare and contrast the advantages and limitations of resistance thermometers and thermistors.	7M	CO3	BL2
OR				
4.	a) Explain the working principle of ultrasonic flow meter.	7M	CO3	BL2
	b) Why rotameter is called variable area flow meter? Describe its construction and working with a neat sketch.	7M	CO3	BL1
UNIT-III				
5.	a) What do you understand by a strain rosette? How is it used?	7M	CO4	BL1
	b) Explain construction and working of hydraulic load cell.	7M	CO4	BL2
OR				
6.	a) Describe the tension measurement using strain gauge with neat sketch.	7M	CO4	BL1
	b) Explain the construction, principle of working and advantages of Strain gauge accelerometer.	7M	CO4	BL2
UNIT-IV				
7.	a) Define gauge factor. Explain the factors which affect the gauge factor.	7M	CO5	BL1&BL2
	b) What are the load cells? Explain the working principle of strain gauge load cell with a neat diagram.	7M	CO5	BL1
OR				
8.	a) Distinguish between bonded and unbonded strain gauges	7M	CO5	BL4
	b) Explain the method of calibration of strain gauges.	7M	CO5	BL2
UNIT-V				
9.	a) Draw a block diagram of a typical closed loop system and explain its features.	7M	CO6	BL2
	b) Define transfer function? List the steps to determine transfer function.	7M	CO6	BL1
OR				
10.	a) Define transfer function of a unity feedback control system is given by The open loop transfer function is $G(s) = \frac{20}{s(s+2)}$ Find the state error to the input function $r(t) = 1 + t + t^2$	7M	CO6	BL1
	b) Represent the mathematical models for thermal systems with an example.	7M	CO6	BL3

END

Hall Ticket Number :

R-17

Code: 7GA61

III B.Tech. II Semester Supplementary Examinations January 2022

Managerial Economics and Financial Analysis

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

Marks CO Blooms
Level

UNIT-I

1. What do you understand by 'Demand Forecasting'? Explain different methods of Demand Forecasting. 14M

OR

2. Define Managerial Economics? Explain its role in solving business problems. 14M

UNIT-II

3. Discuss the Economies of Scale that accrue to a firm. 14M

OR

4. State the assumptions in Break –Even Analysis? Explain how Break – Even Analysis is used by the managers in their day to day operations. 14M

UNIT-III

5. Evaluate Sole Trader form of organization? 14M

OR

6. How do you determine Price-output in perfect competition and monopoly in long run and short run? 14M

UNIT-IV

7. Explain the methods of Capital Budgeting? 14M

OR

8. Explain the types and sources of raising capital for a business. 14M

UNIT-V

9. Define Ratio? Explain classification of Ratios 14M

OR

10. Journalise the Following transaction of ABC Company.
2003 January 1 ABC firm commenced business with Rs.40,000
2003 January 2 Deposited into bank Rs.30,000
2003 January 3 Bought goods worth Rs. 48,000 from Kamal.
2003 January 4 Paid Rent of Rs. 4000; Advertising Rs. 3,000
2003 January 5 Sold Goods worth of Rs. 50,000 to Suresh
2003 January 6 Suresh pays Rs. 48,600 in full settlement of account
2003 January 7 Paid Rs. 40,000 to Kamal on account 14M

END

Hall Ticket Number :

R-17**Code: 7G562**

III B.Tech. II Semester Supplementary Examinations January 2022

Design of Machine Elements-II

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

		Marks	CO	Blooms Level
UNIT-I				
1.	a) Explain wedge film and squeeze film journal bearings.	6M	CO1	L2
	b) List the design procedure for a Journal bearing.	8M	CO1	L1
OR				
2.	A full Journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2 . The speed of the journal is 900 rpm and the ratio of the journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s . The room temperature is 35°C . Determine the amount of artificial cooling required and the mass of the lubricating oil required if the difference between the outlet and inlet temperature of the oil is 10°C . The specific heat of the oil as $1850 \text{ J/kg}^\circ\text{C}$	14M	CO1	L5
UNIT-II				
3.	a) Explain the different types of antifriction bearings.	6M	CO2	L2
	b) Determine the dynamic load carrying capacity of a deep groove ball bearing with the least bore size, and which is required to resist a radial load of 4 kN and an axial load of 3 kN. The shaft rotates at 1400 rpm. The bearing is required to be in operation for 12000 hours with 90% reliability.	8M	CO2	L5
OR				
4.	a) A bearing is required to carry 4500 N stationery radial load. The shaft rotates at 1000 rpm and the life desired is 30000 hrs. The running conditions are steady, no shock loading. Select a suitable bearing.	7M	CO2	L5
	b) A single row deep groove ball bearing No.6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. Determine the expected life that 50 % of the bearings will complete under this condition.	7M	CO2	L1
UNIT-III				
5.	a) Explain about the stress due to whipping action on connecting rod ends.	4M	CO3	L2
	b) Estimate the design of a Cast Iron piston for a single acting four stroke engine for the following data : Cylinder bore = 100 mm, stroke = 125 mm, Maximum gas pressure = 5 N/mm^2 , Indicated Mean effective pressure = 0.75 N/mm^2 , Mechanical efficiency = 80%, Fuel consumption = 0.15 kg per brake power per hour, Higher calorific value of fuel = $42 \times 10^3 \text{ kJ/kg}$, speed = 2000 rpm. Any other data required for the design may be assumed.	10M	CO3	L5
OR				
6.	Describe the design procedure of a Connecting rod with a neat sketch.	14M	CO3	L1

UNIT-IV

7. Estimate the design of a helical spring for a spring loaded safety valve for the following conditions:

Diameter of valve seat = 65 mm

Operating pressure = 0.7 N/mm^2

Max. pressure when the valve blows off freely = 0.75 N/mm^2

Max. lift of the valve when the pressure rises from 0.7 to $0.75 \text{ N/mm}^2 = 3.5 \text{ mm}$

Max. allowable stress = 550 MPa

Modulus of rigidity = 84 kN/mm^2

Spring index = 6

14M CO4 L6

OR

8. a) Explain the selection criterion for the belt drives.
- b) A V-belt is driven on a flat pulley and a V-pulley. The drive transmits 20 kW from a 250 mm diameter V-pulley operating at 1800 rpm to a 900 mm diameter flat pulley. The centre distance is 1m, the angle of groove is 40° and $\mu = 0.2$, if density of belting is 1110 kg/m^3 and allowable stress is 2.1 MPa for belt material, determine the number of belts required if C-size V-belts having 230 mm^2 cross-section area are used.

4M CO4 L2

10M CO4 L5

UNIT-V

9. A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and rpm of this pinion is 200. The approximate centre distance between the shafts may be taken as 600 mm. The teeth have 20° stub involute profiles. The static stress for the gear material (which is Cast Iron) may be taken as 60 MPa and face width is 10 times the module. Determine the module, face width and no. of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4.

14M CO5 L5

OR

10. A helical cast steel gear with 30° helix angle has to transmit 35 kW at 1500 rpm. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depth involute teeth. The static stress for Cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. Determine the end thrust on the gear?

14M CO5 L5

END

English for Competitive Examinations

H.T. No:-										
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Date: 17-02-2022

Duration: 120Min.

Max.Marks:70

Choose the correct Answer.

100 X 1 = 100 Marks

Directions (1-5) In each of the following questions, out of the given alternatives, choose the one which best expresses meaning of the given word .

1. Abandon
a) abscond b) discontinue c) neglect d) condense
2. Lethargy
a) Laxity b) Impassivity c) Serenity d) Listlessness
3. Diligent
a) Intelligent b) Energetic c) Modest d) industrious
4. False
a) defective b) untrue c) incorrect d) inaccurate
5. Mystique
a) Fame b) Reputation c) Admirable Quality d) Popularity

Direction (6-10) In each of the following questions, choose the word opposite in meaning to the given word.

6. Start
a) close b) shut c) end d) finish
7. Lend
a) hire b) pawn c) cheat d) borrow
8. Magnify
a) Induce b) Diminish c) Destroy d) Shrink
9. Vanquish
a) Surrender b) Debase c) Destroy d) Ruin
10. Malicious
a) Boastful b) Indifferent c) Kind d) Generous

Directions (11-15) In each of the following questions, and Idiomatic expression is given followed by alternatives, choose the one which best expresses the meaning of the given idiom.

11. To cross swords
a) to fight b) to defend c) to kill d) to rob
12. To talk one's head off
a) To talk loudly b) To talk in whispers
c) To talk to oneself d) To talk excessively
13. To throw down the glove
a) To resort to wrong tactics b) To give a challenge
c) To accept defeat d) To reject the prize
14. To smell a rat
a) to detect bad smell b) to misunderstand
c) to suspect a trick or deceit d) to see hidden meaning
15. To play fast and loose
a) To beguile others b) To be winning some times and losing at other times
c) To play with someone's feelings d) To play tricks

Directions (16-20): In each of the following questions, out of the four alternatives, choose the one which can be substituted for the given words/sentences

16. One who forcibly seizes control of a bus or an aircraft
a) pirate b) swindler c) hijacker d) pilferer
17. Large scale departure of people
a) Migration b) Emigration c) Immigration d) Exodus
18. One who always runs away from danger
a) Escapist b) Timid c) Coward d) Shirker
19. The short remaining end of cigarette
a) stump b) stub c) rag d) scrap
20. One who loves mankind
a) Anthropologist b) Philanthropist c) Seismologist d) Optometrist

Directions (21-25) (Analogy) Select the lettered pair that has the same relationship as the original pair of words.

21. Bog:-----slumber::sleep
a) dream b) foray c) marsh d) night
22. -----:horse::board:train
a) stable b) shoe c) ride d) mount
23. Poetry:rhyme::philosophy:-----
a) imagery b) music c) bi-law d) theory
24. Marshal:prisoner::principal:-----
a) teacher b) president c) doctrine d) student
25. Diamond:baseball::court:-----
a) poker b) jury c) grass d) squash

Directions (26-30) In each of the following questions, a word has been written in four different ways out of which only one is correctly spelt. Find the correctly spelt word.

26. a) Business b) Busness c) Businies d) Buseneis
27. a) Accomodation b) Accomodltion c) Acommodation d) Accommodation
28. a) Comissioon b) Commission c) Comiesson d) Comession
29. a) Guerila b) Goriella c) Gorilla d) Goerilla
30. a) comitment b) comitment c) commitment d) comitmant

Directions (31-35) In each question below are given two sentences numbered I and II. In these sentences, two homonyms are given in italics, which may be either mis-spelt or inappropriate in the context of the sentences. Read both sentences carefully and decide on their correctness on the basis of *Italicized*

31. I. It is a *knaughty* problem
II. Suresh is a naughty boy
a) if only sentence I is correct
b) if only sentence II is correct
c) if both sentences I and II correct
d) if I as well as II are incorrect, but both could be made correct by interchanging the italicized words
32. I. A painter is an *Artiste*
II. Raj Kapoor is a skilled *Artist*.
a) if only sentence I is correct
b) if only sentence II is correct

- c) if both sentences I and II correct
 d) if I as well as II are incorrect, but both could be made correct by interchanging the italicized words
33. I. I think this electric *meter* is faulty.
 II. I require two *meters* of cloth for this purpose.
 a) if only sentence I is correct
 b) if only sentence II is correct
 c) if both sentences I and II correct
 d) if I as well as II are incorrect, but both could be made correct by interchanging the italicized words
34. I. his manners are *urban* .
 II. people of *urbane* area are civil in manners.
 a) if only sentence I is correct
 b) if only sentence II is correct
 c) if both sentences I and II correct
 d) if I as well as II are incorrect, but both could be made correct by interchanging the italicized words
35. I. *painting is done on canvass*.
 II. *He was canvassing for votes*.
 a) if only sentence I is correct
 b) if only sentence II is correct
 c) if both sentences I and II correct
 d) if I as well as II are incorrect, but both could be made correct by interchanging the italicized words

Directions: (36-40) In each of the following questions, a sentence has been given in Active / Passive voice. Out of the four alternatives suggested select the one which best expresses the same sentence in passive/ Active voice.

36. Darjeeling grows tea.
 a) Tea grows in Darjeeling b) Tea is grown in Darjeeling
 c) Let the tea be grown in Darjeeling d) Tea is grown in Darjeeling
37. It is time to ring the bell
 a) it is time to the bells rings b) it is being time to ring the bell
 c) it is the time for the bell to ring d) it is time for the bell to be rung
38. He will write a letter next week
 a) A letter would be written by you
 b) A letter will be written by him next week
 c) A letter is written by him
 d) A letter was written by him next week
39. They know him
 a) He is known by them b) He is known to them
 c) He is known to them d) He was known by them
40. My uncle promised me a present.
 a) A present was promised by my uncle to me
 b) I was promised a present by my uncle
 c) I had been promised a present by my uncle
 d) I was promised by my uncle a present

(Directions 41-50): Choose the most appropriate word in the context of the passage, from the given alternatives.

Life is an ____ (41) series of challenges and opportunities to be seized. You have to plan for exercising the right career choices and ____ (42) the right opportunities. Planned ____ (43) rather than a hasty decision is ____ (44) as far as your career is concerned. You need to ____ (45) what occupational groups, ____ (46) and types of organizations seem ____ (47) to you. An individual today has many more degrees of freedom in determining his or her future. Few of us ____ (48) this or take full ____ (49) of this freedom. Most of us let the future be ____ (50) by what is going to happen rather by personal life goals and plans for the future.

- | | | | | |
|----|-------------------|----------------|-------------------|--------------------|
| 41 | a) enticing | b) exciting | c) enchanting | d) enhancing |
| 42 | a) catching | b) offsetting | c) grabbing | d) conceiving |
| 43 | a) delay | b) hindrance | c) wait | d) procrastination |
| 44 | a) desirable | b) deciphered | c) inevitable | d) acceptable |
| 45 | a) check | b) classify | c) divide | d) analyze |
| 46 | a) specifications | b) limitations | c) qualifications | d) identification |
| 47 | a) worthy | b) needful | c) suitable | d) necessary |
| 48 | a) reprimand | b) realize | c) recognize | d) remember |
| 49 | a) advantage | b) enjoyment | c) privileges | d) compensation |
| 50 | a) determined | b) swayed | c) deprived | d) led |

Direction (51-55): In the questions given below, some of the sentences have errors and some have none. Find out which part of a sentence has an error. If there is no mistake, the answer is 'No error'.

51. He took to (a)/ reading Times (b) / for better knowledge of facts. (c) / No error (d)
52. I am not wealthy,(a)/so I cannot afford (b)/to buy a expensive car(c) no error(d)
53. Both the civilians (a)/ and army men (b) / joined the first world war. (c) / No error (d)
54. A person I met (a) / in the theatre (b) / was the playwright himself. (c) / No error (d)
55. To perform this experiment, (a) / drop little sugar (b) / into a glass of water. (c) / No error (d)

Directions (56-60) pick out the most effective word from the given words to fill in the blanks to make the sentence meaningfully complete.

56. *The conference was successful, your style of presentation was..... everyone liked*
 a) valuable b) difficult c) conducive d) wonderful
57. *He has people visiting him at his house because he fears it will cause discomfort to neighbors.*
 a) curtailed b) requested c) stopped d) warned
58. *He is too ----- to be deceived easily*
 a) strong b) modern c) kind d) intelligent
59. *Successful people are genuinely very efficient in ----- their task .*
 a) making b) attaining c) accomplishing d) achieving
60. *You must ----- your career with all seriousness.*
 a) direct b) pursue c) complete d) manage

Directions (61-65):: in each question, a part of sentence is printed in *italics*. Bellow each sentence, some phrases are given which can substitute the italicized part of the sentence. Find out the phrase which can correctly substitute that part of the sentence. If sentence is correct as it is, the answer is 'No correction is required' or **No improvement**.

- 61 *The police broke away the meeting as it turned violent.*
 a) Broke up b) Broke off c) broke through d) No improvement
- 62 *They are working for the upliftment of their village.*
 a) uplift of b) uplifting of c) uplifting d) No improvement
- 63 *My mother asked me when would I have a glass of milk .*
 a) I will b) I would c) I shall d) No improvement
- 64 *The teacher asked, "why you are late?"*
 a) why you were late b) why late you are
 c) why are you late d) No correction required
- 65 *The train left before we reached the station.*
 a) had left b) would have left c) has had left d) No improvement

Directions (66-70) : Rearrange these parts so as to form a complete meaningful sentence and then choose the correct combination.

- 66 (I) We
 (P) agreed with
 (Q) the manner in which you said it
 ® but we objected to
 (S) what you said
 a) PQRS b) PSRQ c) RPQS d) SQPR
- 67 Why do people
 (P) despite a desire
 (Q) to quit and despite
 ® continue smoking
 (S) the known health hazards?
 a) PQSR b) RPQS c) QSPR d) SRPQ
- 68 The man
 (P) is generally the one
 (Q) Who can work very hard
 ® when he must work
 (S) who can play most heartily when he has the chance of playing
 a) PSQR b) QRPS c) QRSP d) SPQR
- 69 (I) If you are serious about
 (P) vocabulary building not a hobby
 (Q) you will have to make
 ® an absorbing interest ,
 (S) increasing your vocabulary)
 (6) or even an obsession .
 a) PQSR b) PRQS c) RQPS d) SQPR

70

(1) Every body

(P) attracts every other

(Q) whether big or small,

Ibody with the force

(S) in the universe

(6) of gravitation

a) PRSQ

b) QPRS

c) RSPQ

d) SQPR

Directions (71-75): in each sentence below ,there are two blank spaces . Below each sentence some pairs of words are given which are numbered ,(a),(b),(c) ,and (d) .pick out the most appropriate pair to fill in the blank I same order ,make the sentence meaningfully complete

71 I am notto sell you my house unless you offer a moreprice.

a) conform, true b) conform, true c) ready, correct d) having, actual

72 Education isto the economic and social fabric of the nation, butthat few political parties have made it an election issue .

a) eminent, barring b) concomitant , instead of
c) basic, despite d) rudimentary, besides

73 Since weread every book , weonly the famous ones .

a) have , sold b) should , buy c) must, ignore . d) cannot , select

74 How many of the books published each year in India make acontribution towards improving men'swith each other ?

a) sensational, reservations b) referential, behavior
c) significant , relationship d) incorporated ,obligation

75 He usuallybut today he appears rather

a) strict ,unwell b) tense , restless c) quiet, calm d) calm, disturbed

Directions (76-80) Rearrange the given sentences A,B,C,D ,and E in the proper sequence so as to form a meaningful paragraph and then answer the questions given below them.

(A) She decided to go to school and meet the principal.

(B) Suddenly she realized that she had no money with her.

(C) By the time she reached there, he had left the office.

(D) Therefore, she decided to go to the office of Ravi's father and get the money.

(E) Sudha wanted her son Ravi to get admission in a convent school.

76 Which of the following should be the first sentence?

a) A b) B c) E d) D

77 Which of the following should be the second sentence?

a) A b) B c) C d) D

78 Which of the following should be the third sentence?

a) A b) B c) C d) E

79 Which of the following should be the fourth sentence?

a) A b) B c) C d) D

80 Which of the following should be the last sentence?

a) A b) B c) C d) D

Directions (81-85) Find the suitable word pair for the following.

- 81 *Body and*
a) Fruit b) Soul c) Mind d) Juice
- 82 *Cause and*
a) Big b) Small c) Smart d) Effect
- 83 *Sweet and*
a) Bitter b) Tasty c) Yummy d) Sour
- 84 *Past and*
a) Tomorrow b) Future c) Yesterday d) None
- 85 *Moon and*
a) Stars b) Earth c) Galaxy d) Mars

Directions(86-90):Choose the nearest confusing word for the following words

- 86 *Advice:*
a) Adverse b) Advocate c) Advise d) Admire
- 87 *Coarse :*
a) Curse b) Course c) Purse d) Nurse
- 88 *Affect*
a) Effort b) Effect c) Efficient d) Eminent
- 89 *Lose :*
a) Lust b) Loose c) Lost d) Lamp
- 90 *Yoke :*
a) Yank b) Bulk c) Yolk d) Milk

Directions (91-100): Read the following passage carefully and answer the questions given below it.

The Supreme Court Judgement which abolishes punishment for attempted suicide will prove to be a milestone in India's judicial history. This is so because the judgement will benefit tens of thousands of miserable souls who are prosecuted for failing to kill themselves. Around 50,000 suicides are reported in India every year. Considering that three suicide bids take place for every successful one, we can safely assume that the failed suicides amount to 1, 50,000 a year in India.

These 1,50,000 individuals could be sentenced to one year in jail under Section 309 of the Indian penal Code Which the Supreme Court Judgement has effected as being unconstitutional. Quite rightly, the judgment said that Section punishment for a troubled individual whose deep unhappiness had caused him to try and end his life. Yet, time and again,, the Indian police had launched these prosecutions. The Supreme Court Judgment has overturned a 1987 decision by a division bench which had upheld the constitution Validity of the Indian law against Suicide. The judgment had ruled that the right to life implied in the Indian Constitution does not include the right to die..

- 91 Which judgement of the supreme Court will be a milestone in India's Judicial History?
a) The one abolishing Suicide
b) The one abetting suicide
c) The one doing away with punishment for attempted suicide
d) The one condoning suicide

92. Why is the judgement hailed as a milestone?
 a) because it will bring relief all around
 b) because it will lessen the work of the police
 c) because it is very balanced
 d) because it will bring relief to all those being punished for attempting suicide
93. What punishment according to the passage was envisaged for unsuccessful suicide attempts, under the Indian law ?
 a) a fine of thousand rupees b) death sentence
 c) one year in jail d) extreme torture
94. The judgement has termed Section 309 as cruel and irrational because
 a) it takes away the right to life b) it doubles the punishment of a tortured soul
 c) it is very lenient d) it provides for false accusations
95. What has the Indian police done time and again?
 a) it has attempted to punish those guilty of trying to end their life
 b) it has punished those who have committed suicide
 c) it has imposed hardships on citizens
 d) it has violated the Constitution
96. The Supreme Court judgement
 a) has come up with the decision on its own
 b) has reversed an earlier judgement dealing with suicide
 c) is a continuation of the 1987 decision
 d) is a unique one
97. In 1987, a division bench had
 a) rejected the Indian law against suicide
 b) changed the Indian law against suicide
 c) supported the Indian law against Suicide
 d) given a new meaning to the suicide law
98. The 1987 judgement had reasoned that
 a) a man was free to die
 b) the constitution did not provide for Suicide
 c) right to die in Indian Constitution was upheld
 d) the right to life in Indian Constitution had no implication of right to die
99. The word 'effaced' in the passage means
 a) included b) deleted c) devised d) dismissed
100. The word 'validity' in the passage means
 a) soundness b) remainder c) invocation d) legality

Hall Ticket Number :									
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R-17

Code: 7G563

III B.Tech. II Semester Supplementary Examinations January 2022

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

		Marks	CO	Blooms Level
UNIT-I				
1.	Derive the general heat conduction equation in cartesian coordinates.	14M	1	2
OR				
2.	A certain superinsulation material having a thermal conductivity of $2 \times 10^{-4} \text{ W/m} \cdot ^\circ\text{C}$ is used to insulate a tank of liquid nitrogen that is maintained at -196°C ; 199 kJ is required to vaporize each kilogram mass of nitrogen at this temperature. Assuming that the tank is a sphere having an inner diameter (ID) of 0.52 m, estimate the amount of nitrogen vaporized per day for an insulation thickness of 2.5 cm and an ambient temperature of 21°C . Assume that the outer temperature of the insulation is at 21°C .	14M	2	4
UNIT-II				
3.	Calculate the critical radius of insulation for asbestos [$k=0.17 \text{ W/m} \cdot ^\circ\text{C}$] surrounding a pipe and exposed to room air at 20°C with $h=3.0 \text{ W/m}^2 \cdot ^\circ\text{C}$. Calculate the heat loss from a 200°C , 5.0-cm-diameter pipe when covered with the critical radius of insulation and without insulation.	14M	2	4
OR				
4.	An aluminum fin [$k=200 \text{ W/m} \cdot ^\circ\text{C}$] 3.0 mm thick and 7.5 cm long protrudes from a wall. The base is maintained at 300°C , and the ambient temperature is 50°C with $h=10 \text{ W/m}^2 \cdot ^\circ\text{C}$. Calculate the heat loss from the fin per unit depth of material.	14M	2	4
UNIT-III				
5. a)	What is the hydraulic diameter? When is it used?	5M	1	1
b)	Define Reynolds number, Prandtl number and Nusselt number	9M	1	1
OR				
6.	Water at 60°C enters a tube of 2.54-cm diameter at a mean flow velocity of 2 cm/s. Calculate the exit water temperature if the tube is 3.0 m long and the wall temperature is constant at 80°C .	14M	2	4
UNIT-IV				
7.	Explain pool boiling with neat sketch showing different regimes.	14M	4	3
OR				
8.	A truncated cone has top and bottom diameters of 10 cm and 20 cm and a height of 10 cm. Calculate the shape factor between the top surface and the side and also the shape factor between the side and itself.	14M	3	4
UNIT-V				
9.	Hot oil at 100°C is used to heat air in a shell-and-tube heat exchanger. The oil makes six tube passes and the air makes one shell pass; 2.0 kg/s of air are to be heated from 20°C to 80°C . The specific heat of the oil is $2100 \text{ J/kg} \cdot ^\circ\text{C}$, and its flow rate is 3.0 kg/s. Calculate the area required for the heat exchanger for $U=200 \text{ W/m}^2 \cdot ^\circ\text{C}$.	14M	5	4
OR				
10. a)	What is LMTD? When is the LMTD method most applicable to heat-exchanger calculations?	10M	5	2
b)	Define effectiveness of heat exchanger	4M	5	2

END