

Code: 20A342T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Fluid Mechanics and Hydraulic Machines

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. In Part-A, each question carries **Two marks**.3. Answer **ALL** the questions in **Part-A** and **Part-B****PART-A**

(Compulsory question)

- | | | |
|---|-----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Define specific weight & specific gravity? | CO1 | L2 |
| b) Will you state pascal's law in your own words? | CO2 | L2 |
| c) List out Elements of hydroelectric power station. | CO3 | L2 |
| d) What is reaction turbine? Give example. | CO4 | L2 |
| e) State the difference between single and multi-stage pump | CO5 | L2 |

PART-BAnswer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|---|----|-----|----|
| 2. a) Can you distinguish between laminar and turbulent flow? | 6M | CO1 | L2 |
| b) The dynamic viscosity of oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm | 6M | CO1 | L3 |

OR

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|---|----|-----|----|
| 3. a) Can you explain what is meant by surface tension and capillarity effect? | 6M | CO1 | L2 |
| b) A blower delivers 8 m ³ air per sec at 27 ⁰ C and one atmospheric pressure (1 bar). Find mass of the air delivered if molecular weight of the air is 30. Also find (i) density (ii) specific volume and (iii) specific weight of the air being supplied. | 6M | CO1 | L3 |

UNIT-II

- | | | | |
|---|----|-----|----|
| 4. a) State and derive Pascal's law. | 4M | CO2 | L2 |
| b) A venturi meter is to be fitted in pipe of 0.25 m diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow is 8.1m ³ per minute. Find the least diameter of the thought to ensure that the pressure head does not become negative. Take co- efficient of discharge through the venturi meter is 0.96. | 8M | CO2 | L3 |

OR

- | | | | |
|---|----|-----|----|
| 5. a) What is the Bernoulli's theorem? Where the Bernoulli's equation can be applied? | 4M | CO2 | L2 |
| b) A compound piping system consists of 1800 m of 0.50 m, 1200 m of 0.40 m and 600 m of 0.30 m new cast iron pipes connected in series. Convert the system to (i) an equivalent length of 0.40 m pipe, and (ii) equivalent size pipe 3600 m long. | 8M | CO2 | L3 |

UNIT-III

6. a) Describe different heads and efficiencies of Hydroelectric power station? 4M CO3 L2
- b) A jet of water 50mm in diameter having a velocity of 20 m/s, strikes normally a flat smooth plate. Determine the thrust on the plate (i) if the plate is at rest; (ii) if the plate is moving in the same direction as the jet with a velocity of 8 m/s. Also find the work done per second on the plate and the efficiency of the jet when the plate is moving. 8M CO3 L3

OR

7. a) Draw the general layout of a hydroelectric power plant and explain elements of hydroelectric power station? 4M CO3 L2
- b) A jet strikes tangentially a smooth curved vane moving in the same direction as the jet, and the jet gets reversed in the direction. Show that the maximum efficiency is slightly less than 60% 8M CO3 L3

UNIT-IV

8. a) Write brief note on the classification of hydraulic turbines. 4M CO4 L2
- b) A pelton wheel is receiving water from a penstock with a gross head of 510 m. one third of gross head is lost in friction in the penstock. The rate of flow through the nozzle fitted at the end of the penstock is $2.2 \text{ m}^3/\text{s}$. the angle of deflection of jet is 165° . Determine: (i) the power given by water to the runner, and (ii) hydraulic efficiency of the pelton wheel.
Take coefficient of velocity $C_v = 1.0$ and speed ratio = 0.45. 8M CO4 L3

OR

9. a) Explain the working principles of Pelton wheel. 4M CO4 L2
- b) A reaction turbine works at 450 rpm. Under a head of 120 m. its diameter at inlet is 1.2 m and the flow area is 0.4 m^2 . The angles made by absolute and relative velocity at inlet are 20° and 60° respectively with the tangentially velocity. Determine: (i) the volume flow rate, (ii) the power developed, and (iii) the hydraulic efficiency. 8M CO4 L3

UNIT-V

10. a) Explain briefly manometric and volumetric efficiencies of a centrifugal pump 4M CO5 L2
- b) Derive an expression for the work done by the impeller of a centrifugal pump on liquid per second per unit weight of liquid. 8M CO5 L3

OR

11. a) Describe multistage pumps with (i) impeller in series and (ii) impellers in parallel. 8M CO5 L3
- b) A single acting reciprocating pump has a piston of diameter 150 mm and stroke of length 250 mm. The piston makes 50 double strokes per minute. The suction and delivery heads are 5 m and 15 m respectively. Find (i) discharge capacity of the pump in liters per minute; (ii) force required to work the piston during the suction and delivery strokes if the efficiency of suction and delivery strokes are 60% and 75% respectively; and (iii) power required to operate the pump 4M CO5 L3

*** End ***

Hall Ticket Number :

R-20

Code: 20AC45T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Managerial Economics & Financial Analysis

(Common to ME & EEE)

Max. Marks: 70

Time: 3 Hours

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. In Part-A, each question carries **Two marks**.

3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer **ALL** the following short answer questions (5 X 2 = 10M)
- | | | |
|--|-----|----|
| | CO | BL |
| a) What are the types of elasticity of demand | CO1 | L1 |
| b) Fixed Cost Rs.500, Variable Cost Re.1 per unit and Selling Price per unit Rs.2. Calculate Break even in units | CO2 | L4 |
| c) Explain Partnership | CO3 | L2 |
| d) Define NPV | CO4 | L1 |
| e) Explain about the Debt Equity Ratio along with assumed figures | CO5 | L2 |

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

- | | Marks | CO | BL |
|--|-------|----|----|
| UNIT-I | | | |
| 2. What is Managerial Economics and explain its scope? | 12M | 1 | L1 |
| OR | | | |
| 3. Explain the classification of demand forecasting methods? | 12M | 1 | L2 |
| UNIT-II | | | |
| 4. Discuss internal and external economies of scale? | 12M | 2 | L2 |
| OR | | | |
| 5. XYZ Company. Ltd., given the following data and expecting from you its break-even level and Margin of Safety.
a) Total Sales = 200000,
b) Variable Cost = 30000,
Fixed is Rs.50000 | 12M | 2 | L4 |
| UNIT-III | | | |
| 6. Define Perfect Competition and explain the price-output determination? | 12M | 3 | L2 |
| OR | | | |
| 7. a) What is Sole Trading? Discuss its chief characteristics? | 6M | 3 | L1 |
| b) Define the term Partnership and explain its characteristics? | 6M | 3 | L2 |

UNIT-IV

8. a) What is Capital and discuss the types of Capital? 6M 4 L2
 b) Explain the Payback period and its merits and demerits? 6M 4 L2

OR

9. From the following, evaluate the Net Present Value at 10% D.F. whose value is Rs.200000 and also give your opinion whether the project has to accept or not?
 (PV factor @10% I Year – 0.909, II Year – 0.857, III Year – 0.757, IV Year – 0.653, V year – 0.593) 12M 4 L4

Year	2015	2016	2017	2018	2019
Cash Flows	40000	50000	60000	80000	100000

UNIT-V

10. Write journal entries in the books of Sri Charan for the month of January, 2024.
 January 1st Sri Charan commenced business with a capital of Rs.100000
 On 2nd Deposited in the bank Rs.10000
 On 3rd Stationary purchased for Rs.2000
 On 15th Paid electricity bill Rs.5000
 On 18th Rent paid Rs.5000
 On 31st Paid Salaries of Rs.20000 12M 5 L4

OR

11. What is Ratio and explain the classification of Ratio Analysis in brief? 12M 5 L2

*** End ***

Hall Ticket Number :										
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R-20

Code: 20AC41T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Probability and Statistics

(Common to CE, ME, CSE, AI&DS, CSE(DS), CSE(AI) and AI&ML)

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. In Part-A, each question carries **Two marks**.
 3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. **Answer ALL the following short answer questions (5 X 2 = 10M)** CO BL
- a) A sample of five university students responded to the question “How much time, in minutes, did you spend on the social network site yesterday?” 100, 45, 60, 130, 30. Find the mean and the median. CO1 L1
- b) What is the probability that a leap year selected at random will contain 53 Sundays? CO2 L1
- c) Define Normal distribution. CO3 L2
- d) Explain Type I error and Type II error. CO4 L3
- e) Write t^2 statistic for analysis of $r \times c$ table. CO5 L1

PART-B

Answer **five** questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

2. Calculate the mean and median for the following table giving the age distribution of 542 members. 12M CO1 L3

Age (in years)	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

OR

3. The ranks of same 16 students in Mathematics and Physics are as follows. Two numbers within brackets denote the ranks of the students in Mathematics and Physics: (1,1) (2,10) (3,3) (4,4) (5,5) (6,7) (7,2) (8,6) (9,8) (10,11) (11,15) (12,9) (13,14) (14,12) (15,16) (16,13). Calculate the rank correlation coefficient for proficiencies of this group in Mathematics and Physics. 12M CO1 L4

UNIT-II

4. In a bolt factory machines A,B and C manufacture respectively 25%.35% and 40% of the total. Of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? 12M CO2 L2

OR

5. Let X be a continuous random variable with distribution :

$$f(x) = \begin{cases} kx^2 & \text{if } 0 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

- (i) Evaluate k (ii) Find $p(1/4 \leq X \leq 3/4)$. (iii) Find $p(X > 2/3)$. 12M CO2 L5

UNIT-III

6. a) The probability that a patient recovers from a rare blood disease is 0.4. If 15 people are known to have contracted this disease, what is the probability that (i) at least 10 survive, (ii) from 3 to 8 survive, and (iii) exactly 5 survive? 6M CO3 L1
- b) A car hires firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. Calculate the proportion of days on which (i) neither car is used, and (ii) some demand is refused. 6M CO3 L3

OR

7. a) Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) either 2 or 3 boys? (iii) 5 girls. Assume equal probabilities for boys and girls. 6M CO3 L2
- b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution? 6M CO3 L1

UNIT-IV

8. a) The average zinc concentration recovered from a sample of measurements taken in 36 different locations in a river is found to be 2.6 grams per milliliter. Find the 95% and 99% confidence intervals for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3 gram per milliliter. 6M CO4 L2
- b) A study showed that 64 of 180 persons who saw a photocopying machine advertised during the telecast of a baseball game and 75 of 180 other persons who saw it advertised on a variety show remembered the brand name 2 hours later. Use the Z- statistic to test at the 0.05 level of significance whether the difference between the corresponding sample proportions is significant. 6M CO4 L3

OR

9. a) If $x = 36$ of $n = 100$ persons interviewed are familiar with the tax incentives for installing certain energy-saving devices, construct a 95% confidence interval for the corresponding true proportion. 6M CO4 L3

- b) In 64 randomly selected hours of production, the mean and the standard deviation of the number of acceptable pieces produced by a automatic stamping machine are $x = 1,038$ and $s = 146$. At the 0.05 level of significance, does this enable us to reject the null hypothesis $\mu = 1,000$ against the alternative hypothesis $\mu > 1,000$?

6M CO4 L5

UNIT-V

10. It is desired to determine whether there is less variability in the silver plating done by Company 1 than in that done by Company 2. If independent random samples of size 12 of the two companies' work yield $s_1 = 0.035$ mil and $s_2 = 0.062$ mil, test the null hypothesis $\sigma_1^2 = \sigma_2^2$ against the alternative hypothesis $\sigma_1^2 < \sigma_2^2$ at the 0.05 level of significance.

12M CO5 L5

OR

11. The following is the distribution of the hourly number of trucks arriving at a company's warehouse:

Trucks arriving per hour	Frequency
0	52
1	151
2	130
3	102
4	45
5	12
6	5
7	1
8	2

Find the mean of this distribution, and using it (rounded to one decimal place) as the parameter λ , fit a Poisson distribution. Test for goodness of fit at the 0.05 level of significance.

12M CO5 L6

*** End ***

Code: 20A341T

II B.Tech. II Semester Regular & Supplementary Examinations May/June 2024

Theory of Machines
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. In Part-A, each question carries **Two marks**.
3. Answer **ALL** the questions in **Part-A** and **Part-B**

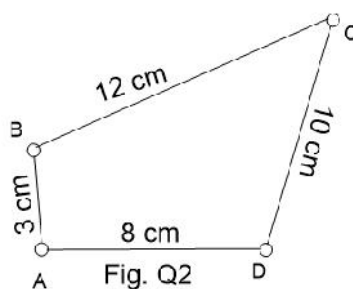
PART-A
(Compulsory question)

- | | | |
|--|----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Define the degree of freedom of the Mechanism. | 1 | L2 |
| b) Define the Coriolis component of acceleration. | 2 | L2 |
| c) Specify two advantages of involute tooth profile for gear teeth. | 3 | L2 |
| d) Explain clearly the terms 'static balancing' and 'dynamic balancing'. State the necessary conditions to achieve them. | 4 | L2 |
| e) Define in short, free vibrations, forced vibrations and damped vibrations. | 5 | L2 |

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

- | | Marks | CO | BL |
|---|-------|----|----|
| UNIT-I | | | |
| 2. Explain all possible inversions of the four bar chain. | 12M | 1 | L2 |
| OR | | | |
| 3. Draw a neat sketch of pantograph mechanism and explain its working principle. | 12M | 1 | L2 |
| UNIT-II | | | |
| 4. In Fig. Q2, when $\angle DAB = 90^\circ$ and the link AD is fixed, the link AB is rotating with a uniform angular velocity of 10 rad/sec in clockwise direction. Find the angular velocity of the link CD at this instant. | | | |



- | | | | |
|---|-----|---|----|
| | 12M | 2 | L3 |
| OR | | | |
| 5. A disc with radius of gyration of 60 mm and a mass of 4 kg is mounted centrally on a horizontal axle of 80 mm length between the bearings. It spins about the axle at 800 rpm counterclockwise when viewed from the right-hand side bearing. The axle precesses about a vertical axis at 50 rpm in the clockwise direction when viewed from above. Determine the resultant reaction at each bearing due to the mass and the gyroscopic effect. | | | |
| | 12M | 2 | L3 |

UNIT-III

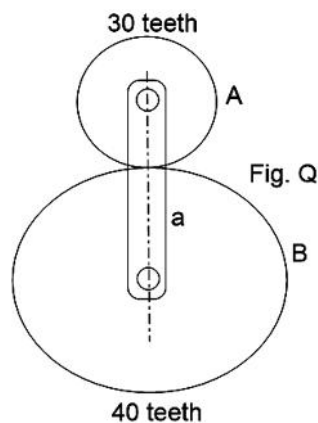
6. a) Derive an expression for path of contact, arc of contact for a pair of spur gears with involute profile. 6M 3 L2

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- b) Explain the phenomenon of interference with a neat sketch. 6M 3 L2

OR

7. In the epicyclic gear train shown in Fig. Q, the gears A and B have 30 and 40 teeth respectively. The arm rotates about the center of gear A at a speed of 80 rpm counterclockwise. Determine the speed of the gear B if (i) the gear A is fixed, and (ii) the gear A revolves at a speed of 240 rpm clockwise instead of being fixed.



12M 3 L2

UNIT-IV

8. Explain the following terms:

a) Variation in traction force b) Swaying couple c) Hammer blow

12M 5 L4

OR

9. Three masses of 8 kg, 12 kg, and 15 kg attached at radial distances of 80 mm, 100 mm, and 60 mm respectively to a disc on a shaft are in complete balance. Determine the angular positions of 12 kg and 16 kg masses relative to the 8 kg mass.

12M 5 L4

UNIT-V

10. Derive an expression for the natural frequency of the free longitudinal vibration by any method. 12M 6 L2

OR

11. A steel shaft 1.5m long is supported on simply supported bearings at its ends. It carries two rotors, 50 kg each at its one-third points. The shaft is hollow, external diameter is 8 cm and the internal diameter is half of the external diameter. Determine the natural frequency by Dunkerley's method 12M 6 L4

*** End ***

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II B.Tech. II Semester Regular & Supplementary Examinations May / June 2024

Design of Machine Elements - I

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. In Part-A, each question carries **Two marks**.3. Answer **ALL** the questions in **Part-A** and **Part-B****PART-A**

(Compulsory question)

- | | | |
|---|-----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Define machine Design. | CO1 | 1 |
| b) Define stress concentration. | CO2 | 1 |
| c) When a bolted joint is termed as an eccentric loaded one? | CO3 | 2 |
| d) Differentiate between a key and a cotter. | CO4 | 2 |
| e) What is the function of flexible couplings? | CO5 | 2 |

PART-BAnswer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|---|----|-----|----|
| 2. a) Enumerate the steps involved in machine Design. | 8M | CO1 | L4 |
| b) A hollow cylindrical column of 200mm inner diameter and 300mm outer diameter carries a vertical eccentric load of 500KN, the eccentricity being 100mm. Determine the maximum intensity of the stress induced and state the nature. | 4M | CO1 | L4 |

OR

- | | | | |
|--|-----|-----|----|
| 3. a) What is standardization? | 2M | CO1 | L2 |
| b) A 30 mm steel shaft transmitting 200 N-m torque is loaded by a max. B.M of 100 N-M and an axial tensile force of 5000N. The material of the shaft has yield strength of 240 N/mm ² . Determine the factor of safety of the shaft by i. Max. shear stress theory ii. Max. Principal strain energy theory and iii. Max. Distortion energy theory | 10M | CO1 | L4 |

UNIT-II

- | | | | |
|---|----|-----|----|
| 4. A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4 P. The span of the beam is 500 mm and its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending, and a factor of safety of 1.3, calculate the maximum value of P. Take a size factor of 0.85 and a surface finish factor of 0.9 | 12 | CO2 | L6 |
|---|----|-----|----|

OR

- | | | | |
|--|-----|-----|----|
| 5. What is stress concentration? What are the reasons for stress concentration? How it could be minimized? | 12M | CO2 | L4 |
|--|-----|-----|----|

UNIT-III

- | | | | |
|--|----|-----|----|
| 6. a) What are the advantages of screw joints? | 2M | CO3 | L2 |
|--|----|-----|----|

- b) A cylinder head of effective diameter of 350 mm for a steam engine is subjected to a pressure of 1.25 MPa. It is held in position by means of 12 studs. A soft copper gasket is used to make the joint leak proof. Determine the size of studs so that the stresses should not exceed 33 MPa. 10M CO3 L6

OR

7. a) Discuss the advantages and disadvantages of welded joints. 4M CO3 L2
 b) A plate of 120 mm wide and 10 mm thick is to be welded with another plate by means of double parallel fillet weld. The plates are subjected to a load of 70 kN and the shear stress is not to exceed 65 MPa. Find the length of the weld for i. static loading ii. Dynamic loading, if $K_f = 2.8$. 8M CO3 L4

UNIT-IV

8. a) Sketch different types of keys. 2M CO4 L1
 b) A shaft and key are made of the same materials, and the key width is $\frac{1}{3}^{\text{rd}}$ of shaft diameter. (i) Considering the shear only, determine the minimum length of the key in terms of shaft diameter. (ii) Determine the thickness of the key in terms of shaft diameter, to make the key equally strong in shear and crushing. Take shear strength of the key material as 40% of the crushing strength. 10M CO4 L4

OR

9. Design a knuckle joint to withstand an axial load of 70 kN. The eye end, fork and pin of the joint are made of mild steel having permissible stress of 75 MPa in tension, 50 MPa in shear and 90 MPa in Compression. Give a neat dimensioned sketch of the joint. 12M CO4 L6

UNIT-V

10. An overhang shaft carries a 1 m diameter pulley, whose center is 250 mm from the center of the nearest bearing. The weight of the pulley is 600 N and angle of lap of the belt may be assumed as 180° . The pulley is driven by a motor placed below it. If the permissible tension in the belt is 2500 N and coefficient of friction is 0.3. Determine the size of the shaft. Assume the permissible shear stress in the shaft material as 50 MPa. Take shock and fatigue factors for torsion and bending as 2 and 1.5 respectively. 12M CO5 L6

OR

11. A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress in the shaft material is limited to 45 MPa and the angle of twist is not to exceed 1° in length of 20 times the shaft diameter. Determine the shaft diameter, and design a cast iron flange coupling of protected type for the shaft. The shear stress in the coupling bolts is to be limited to 30 MPa. 12M CO5 L6

*** End ***