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R-17

Code: 7G542

II B.Tech. II Semester Supplementary Examinations November 2023

Fluid Mechanics and Hydraulic Machinery

(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 BL

UNIT-I

1. A pipe containing an oil of specific gravity 0.9. A differential manometer connected at the two points A and B shows a difference in mercury level as 15cm. Find the difference of pressure at the two points. 14M CO1 L2

OR

2. a) What are the important fluid properties? Write their units? 7M CO1 L1
b) Distinguish between simple manometer and a differential manometer. 7M CO1 L2

UNIT-II

3. A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. Take $C_d=0.98$. 14M CO2 L3

OR

4. Derive the Euler's equation of motion along a streamline 14M CO2 L2

UNIT-III

5. Derive an expression for the force exerted by a jet striking the curved plate at one end tangentially when the plate is symmetrical. 14M CO3 L2

OR

6. A jet of water of diameter 75mm moving with a velocity 25m/s strikes a fixed plate in such a way that the angle between the jet and plate is 60° . Find the force exerted by the jet on the plate i) In the direction normal to the plate and ii) In the direction of the jet. 14M CO3 L3

UNIT-IV

7. A Pelton wheel turbine develops 9000 Kw under a head of 300m. The turbine speed is 550 rpm and ratio of jet dia to wheel dia is 1/10. The hydraulic, volumetric and mechanical efficiencies are 0.98, 0.95 and 0.92 respectively. The speed ratio is 0.46 and coefficient of velocity is 0.98. Calculate the no of jets. 14M CO4 L3

OR

8. Explain the different types of the Efficiencies of a turbine. 14M CO4 L2

UNIT-V

9. The following details refer to working of a single acting reciprocating pump. Find the slip, coefficient of discharge and theoretical power required to drive the pump. Piston diameter = 15 cm, Crank radius = 15 cm, Diameter of delivery pipe = 10 cm, Discharge of the pump = 0.31 m³ /min. Total lift=15m, Speed of the pump = 60 rpm. 14M CO5 L3

OR

10. What are the equations for work done and discharge of a reciprocating pump? Define the slip and coefficient of discharge of a reciprocating pump. 14M CO5 L2

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R-17

Code: 7G543

II B.Tech. II Semester Supplementary Examinations November 2023

Kinematics of Machinery
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

UNIT-I

1. What do you mean by inversion of mechanism? Explain with sketches all inversions of quadric cycle chain. 14M

OR

2. Sketch and explain any two inversions of a double slider crank chain. 14M

UNIT-II

3. The crank of a slider crank mechanism rotates clockwise at a constant speed of 300r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine: **a)** Linear velocity and acceleration of the midpoint of the connecting rod, and **b)** angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position. 14M

OR

4. State and prove Kennedy's theorem as applicable to instantaneous centres of rotation of three bodies. How is it helpful in locating various instantaneous centres of a mechanism? 14M

UNIT-III

5. Show with sketch how pantograph is used to trace the path to a larger or smaller scale of a given path. 14M

OR

6. Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. 14M

UNIT-IV

7. A pair of gear has 16 teeth and 18 teeth, a module 12.5 mm an addendum 12.5 mm and a pressure angle 14.5°. Prove that gears have interference. Determine the minimum number of teeth and the velocity ratio to avoid interference. 14M

OR

8. Two mating gears with 6 mm module have 30 teeth and 75 teeth. The addendum is standard one module. Pressure angle is 20°. Find: i) pitch diameters, ii) center distance iii) length of path of contact, iv) length of arc of contact and v) contact ratio. 14M

UNIT-V

9. Draw the displacement, velocity and acceleration diagrams for a follower when it moves with uniform acceleration and retardation. Derive the expression for velocity and acceleration during outstroke and return stroke of the follower. 14M

OR

10. A cam with 40 mm minimum radius is rotating clockwise at uniform speed of 1200 rpm. It has to operate a knife edge follower as defined below:
i) Follower has to move outward through 30 mm during 90° of cam rotation with uniform velocity **ii)** Dwell for the next 30° **iii)** Follower is to return to its starting position with SHM during next 120°. **iv)** Follower is to dwell for the remaining period. Draw the cam profile taking the line of action of the follower passing through the center of the cam. Determine the maximum velocity and acceleration of the follower during the return stroke 14M

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R-17

Code: 7GC42

II B.Tech. II Semester Supplementary Examinations November 2023

Probability and Statistics

(Common to CE, ME & CSE)

Max. Marks: 70

Time: 3 Hours

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

Marks CO BL

UNIT-I

1. Find the coefficient of correlation between industrial production and export using the following data and comment on the result.

Production (in crores tons):	55	56	58	59	60	60	62
Exports (in crores tons) :	35	38	38	39	44	43	45

14M CO1 L3

OR

2. Find the Spearman's rank correlation coefficient to the data:

X:	68	64	75	50	64	80	75	40	55	64
Y:	62	58	68	45	81	60	68	48	50	70

14M CO1 L3

UNIT-II

3. State and prove Addition theorem on probability for three events

14M CO2 L4

OR

4. A random variable X has the following probability function

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K ²	2K ²	7K ² +K

Find the value of K , (ii) Evaluate $p(0 < x < 5)$, (iii) Evaluate $p(x < 5)$

14M CO2 L3

UNIT-III

5. If a random variable has a Poisson distribution such that $P(1) = P(2)$ find (i) Mean of the distribution, (ii) $P(4)$, (iii) $P(x = 1)$, (iv) $P(1 < x < 4)$

14M CO3 L2

OR

6. A hospital switch board receives an averages of 4 emergency calls in a 10 minutes interval. What is the probability that (i) there are at most 2 emergency calls in a 10 minute interval (ii) there are exactly 3 emergency calls in a 10 minute interval?

14M CO3 L3

UNIT-IV

7. A random sample of size 100 has a standard deviation of 5. What can you say about the maximum error with 95% confidence?

14M CO4 L4

OR

8. The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life 1280 hours with S.D. of 398 hours. Is there a significant difference between the means of two batches?

14M CO4 L4

Important Note: 1. On completing your answers. Compulsorily draw diagonal cross line on the remaining blank pages. 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 32+8=40, will be treated as malpractice.

UNIT-V

9. In a test given two groups of students, the marks obtained are as follows:

First Group :	18	20	36	50	49	36	34	49	41
Second Group:	29	28	26	35	30	44	46	-	-

Estimate the significance of the difference between the mean marks secured by the students of the above two groups.

14M CO4 L4

OR

10. 1000 students at college level were graded according to their IQ and economic condition of their home. Chose an appropriate test to find the any association between condition at home and I.Q.

economic condition	high	low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

14M CO4 L5

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R-17

Code: 7G541

II B.Tech. II Semester Supplementary Examinations November 2023

Applied Thermodynamics-I

(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 BL

UNIT-I

1. Define the following terms with respect to Diesel cycle.
i) Compression ratio ii) Cut off ratio iii) Expansion ratio iv) Net work of the cycle v) mean effective pressure. 14M CO1 L1

OR

2. a) Differentiate between the actual and ideal cycle and the factors responsible. 6M CO1 L2
b) Sketch and explain Stirling cycle. 8M CO1 L2

UNIT-II

3. a) Sketch and explain the valve timing diagram for 4 stroke CI engine. 7M CO2 L2
b) Summarize the important basic components of an IC engine? Explain them briefly. 7M CO2 L2

OR

4. Illustrate the principle of working of a Magneto ignition system with a neat sketch. 14M CO2 L4

UNIT-III

5. a) "C.I engines can accept very lean overall mixture ratios but S.I engines cannot". Explain and discuss. 7M CO3 L2
b) Explain the various factors that influence the flame speed in S.I engine combustion. 7M CO3 L2

OR

6. Explain the four stages of combustion in CI engine with suitable diagrams. 14M CO3 L2

UNIT-IV

7. Following observations were made during the test on a single cylinder oil engine. Bore = 300mm, I.M.E.P = 6bar, brake rope dia = 2cm, Stroke=450mm, Net brake load = 1.5 KN, speed = 300 rpm, Brake drum dia = 1.8m Calculate
a) Indicated Power b) Brake Power c) Mechanical Efficiency 14M CO4 L3

OR

8. Explain the various engine performance parameters in detail. 14M CO4 L2

UNIT-V

9. Explain the operation of single stage centrifugal air compressor with help of inlet and outlet velocity triangles on the compressor vane. 14M CO5 L2

OR

10. a) Write notes on
(i) Degree of reaction (ii) Isentropic efficiency (iii) Polytropic efficiency. 9M CO5 L1
b) What is meant by positive displacement? 5M CO5 L1
