

**Code: 19A343T**

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

**Dynamics 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 )

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Marks      CO      BL

**UNIT-I**

1. A conical pivot supports a load of 20 kN, the cone angle is  $120^\circ$  and the intensity of normal pressure is not to exceed  $0.3 \text{ N/mm}^2$ . The external diameter is twice the internal diameter. Find the outer and inner radii of the bearing surface. If the shaft rotates at 200 r.p.m. and the coefficient of friction is 0.1, find the power absorbed in friction. Assume uniform pressure. 14M    CO1    L3

**OR**

2. a) Explain the Limiting angle of Friction 7M    CO1    L2  
b) Describe the friction circle and friction axis. 7M    CO1    L1

**UNIT-II**

3. An aeroplane makes a complete half circle of 50 meters radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. 14M    CO2    L3

**OR**

4. Explain the differential band brake with neat sketch and also discuss the self-locking condition of it. 14M    CO2    L2

**UNIT-III**

5. A Porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 50 kg. The extreme radii of rotation are 150mm and 200mm. Determine the range of speed of the governor. 14M    CO3    L3

**OR**

6. a) Describe the turning moment diagram of a four stroke cycle internal combustion engine. 7M    CO3    L1  
b) A horizontal cross compound steam engine develops 300 kW at 90 r.p.m. The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within  $\pm 0.5\%$  of the mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 meters. 7M    CO3    L3

**UNIT-IV**

7. The following data refer to two cylinder locomotive with cranks at  $90^\circ$ : Reciprocating mass per cylinder = 300 kg; Crank radius = 0.3 m; Driving wheel diameter = 1.8 m; Distance between cylinder center lines = 0.65 m ; Distance between the driving wheel central planes = 1.55 m. Determine : a) the fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 km. p.h.; b) the variation in tractive effort ; and c) the maximum swaying couple. 14M    CO4    L3

**OR**

8. Describe the balancing of a several masses rotating in the same plane. 14M    CO4    L3

**UNIT-V**

9. A shaft of 100 mm diameter and 1 meter long has one of its end fixed and the other end carries a disc of mass 500 kg at a radius of gyration of 450 mm. The modulus of rigidity for the shaft material is  $80 \text{ GN/m}^2$ . Determine the frequency of torsional vibrations. 14M    CO5    L3

**OR**

10. Describe the types of free vibrations with neat sketches. 14M    CO5    L1

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Hall Ticket Number :

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R-19

Code: 19A342T

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

## 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 )

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Marks CO BL

### UNIT-I

1. The water is flowing through a tapering pipe having diameters 300mm and 150mm at sections 1 and 2 respectively. The discharge through the pipe is 40 liters/sec. The section 1 is 10m above datum and section 2 is 6m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kn/m<sup>2</sup>.

14M CO1 L3

OR

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

7M CO1 L1

7M CO1 L2

### UNIT-II

3. An orifice meter with orifice diameter 15cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the meter is 0.64.

14M CO2 L3

OR

4. Derive the Euler's equation of motion along a streamline

14M CO2 L2

### UNIT-III

5. A jet of water of diameter 60mm moving with a velocity of 40m/s strikes a curved fixed plate tangentially at one end at an angle of 30° to horizontal. The jet leaves the plate at an angle of 20° to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical directions.

14M CO3 L3

OR

6. What is a runoff river plant? What are the different parts and arrangements of such plants? Draw a neat sketch and explain.

14M CO3 L2

### UNIT-IV

7. An axial flow turbine operates under a head of 21.8m and develops 21MW when running at 140 RPM. The external runner diameter is 4.5m and the hub diameter is 2m. If the hydraulic efficiency is 94% and the overall efficiency is 88%, determine the inlet and outlet blade angles.

14M CO4 L3

OR

8. With a neat sketch explain the working principle of Pelton wheel.

14M CO4 L2

### UNIT-V

9. The internal and external diameters of the impeller of a centrifugal pump are 30 cm and 60 cm respectively. The pump is running at 1000 r.p.m. The vane angles at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.

14M CO5 L3

OR

10. Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches

14M CO5 L2

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Hall Ticket Number :

R-19

Code: 19AC41T

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

**Numerical Methods & Probability and Statistics**

(Common to CE &amp; ME)

Max. Marks: 70

Time: 3 Hours

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

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Marks CO BL

**UNIT-I**

1. Using Newton Raphson method, find the real root of  $x \log_{10} x = 1.2$  correct to five decimal places.

14M CO1 L3

**OR**

2. Using Lagrange's formula, calculate  $f(10)$  from the following table:

x	5	6	9	11
f(x)	12	13	14	16

14M CO1 L3

**UNIT-II**

3. Given that

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
y	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

evaluate  $\int_4^{5.2} \log x dx$  by using

- (i) Trapezoidal rule (ii) Simpson's 1/3 rule and (iii) Simpson's 3/8 rule.

14M CO2 L2

**OR**

4. Find  $y(0.1)$  and  $y(0.2)$  using Runge-Kutta 4<sup>th</sup> order formula, given that

$$\frac{dy}{dx} = x + y^2 \text{ and } y(0)=1.$$

14M CO2 L3

**UNIT-III**

5. The mean of Binomial distribution is 3 and the variance is  $\frac{9}{4}$ . Find

- (i) the value of  $n$  (ii)  $P(X = 7)$  and (iii)  $P(1 < X < 6)$ .

14M CO3 L3

**OR**

6. If  $X$  is a normal variate with mean 30 and standard deviation 5. Find the probabilities that (i)  $26 < X < 40$  (ii)  $X < 45$  (iii)  $|X - 30| > 5$ .

14M CO3 L3

**UNIT-IV**

7. A sample of 900 members has a mean of 3.4 cms and S.D. 2.61 cms. Is this sample has taken from a large population of mean 3.25 cm and S.D. 2.61 cm. If the population is normal and its mean is unknown find the 95% confidence limits of true mean.

14M CO4 L1

**OR**

8. A simple sample of height of 6400 Englishmen has mean of 67.85 inches and a S.D. of 2.56 inches while a simple sample of heights of 1600 Austrians has a mean of 68.55 inches and S.D. of 2.52 inches. Do the data indicate the Austrians are on the average taller than the Englishmen?

14M CO4 L1

<b>UNIT-V</b>
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9. The time taken by workers in performing a job by method I and method II is given below:

Method I	20	16	26	27	23	22	---
METHOD II	27	33	42	35	32	34	38

Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly?

14M CO5 L1

**OR**

10. The average breaking strength of the steel rods is specified to be 18.5 thousand pounds. To test this sample of 14 rods were tested. The mean and standard deviations obtained were 17.85 and 1.955 respectively. Is the result of experiment significant?

14M CO5 L1

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Hall Ticket Number :

R-19

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

### 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 )

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Marks CO BL

#### UNIT-I

1. A Diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of the stroke. Find the air standard efficiency of the engine. (Take  $\gamma = 1.4$ )
- 14M CO1 L3

OR

2. a) List any three principle factors that influence engine performances? And explain them. 7M CO1 L1
- b) What are Air standard cycles? What are the assumptions for Air standard cycles? 7M CO1 L1

#### UNIT-II

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

OR

4. a) Explain Thermosyphon cooling system with a neat diagram. 7M CO2 L2
- b) Sketch and explain the port timing diagram for 2 stroke SI engine. 7M CO2 L2

#### UNIT-III

5. Elaborate the differences between normal and abnormal combustion? Explain it with one or two parameters. 14M CO3 L2

OR

6. a) What are different ill effects of knocking? 7M CO3 L1
- b) Suggest the methods to minimize knocking in SI engines? 7M CO3 L2

#### UNIT-IV

7. A petrol engine uses 0.27 Kg of fuel per B.P hour. C.V of the fuel is 44,000kJ/kg and Mech. Efficiency is 80% and compression ratio is 5.6, calculate a) brake thermal efficiency b) Indicated thermal efficiency c) Ideal air std Efficiency d) Relative efficiency based on B.P and I.P basis. 14M CO4 L3

OR

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

#### UNIT-V

9. a) List the various types of rotary compressors? 7M CO5 L1
- b) Discuss with a neat sketch, the working of a roots blower. 7M CO5 L2

OR

10. Derive an expression for the isothermal efficiencies of a reciprocating compressor in terms of the pressure ratio. 14M CO5 L6

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