6/10/26 FN

Name :
Roll No:

MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM – 686 666

DEPARTMENT OF MECHANICAL ENGINEERING
SECOND SESSIONAL EXAMINATION, OCTOBER 2026
THIRD SEMESTER (ME)

B24ME2T02 MECHANICS OF FLUIDS

Time – 1.5 Hour **Max: 40 Marks**

PART-A
Answer All Questions

1.	State Bernoulli's equation and list the assumptions in its application.	[CO 3]	3 Marks
2.	Name the various parts of a Venturimeter and explain its working with a neat sketch.	[CO 3]	3 Marks
3.	State the Chezy's equation, explain its various terms and name the condition under which it is applied.	[CO 4]	3 Marks
4.	Name and explain the major and minor losses in pipe flow.	[CO 4]	3 Marks

PART-B
Answer All Questions

5. a	Derive Euler's equation of motion for fluid flow and obtain the Bernoulli's equation for real fluids.	[CO 3]	7 Marks
5.b	A pitot-static tube placed in the center of a 300 mm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 80% of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60 mm of water. Take the coefficient of pitot tube as 0.98.	[CO 3]	7 Marks
6. a	For low viscosity and high velocity flow through a uniform circular pipe, develop the relationship between frictional head loss and the flow parameters using a suitable force balance equation.	[CO 4]	7 Marks
6. b	Oil is transported from a tanker to the shore at the rate of 0.6 m^3/s using a pipe of 32 cm diameter for a distance of 20 km. If the oil has viscosity of 0.1 N-s/m^2 and density of 900 kg/m^3. Assuming the flow to be either laminar or turbulent as applicable, determine the power required to maintain the flow.	[CO 4]	7 Marks

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Mentoring to Ensure Excellence

MISSION

- To facilitate comprehensive and integrated development of students by providing quality education that encourages sustainable practices
- To mold disciplined and socially committed engineers capable of assuming professional leadership upholding national integrity

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MAR ATHANASIUS COLLEGE OF ENGINEERING

(Government Aided Autonomous Institution)
Kothamangalam, Kerala – 686 666

DEPARTMENT OF MECHANICAL ENGINEERING

B24ME3T01 – DYNAMICS AND DESIGN OF MACHINES

Second Sessional Examination – October 2026

Duration: 1 hour 30 minutes **S5 ME A & B Batch** **Max. Marks: 40**

Part A

(1) What is meant by whirling of shafts? (CO2) (3)

(2) Describe briefly the general design procedure to solve a design problem.(CO3) (3)

(3) How do stress concentrations affect the strength of a component? (CO3) (3)

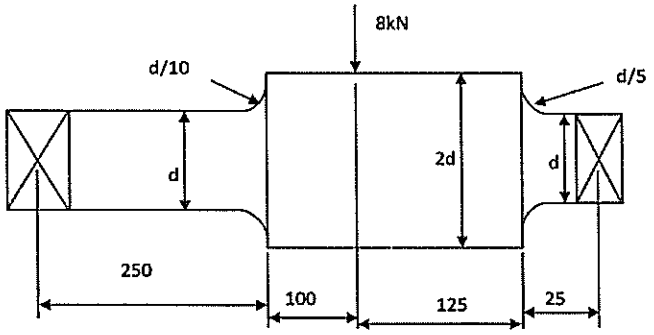
(4) Explain maximum normal stress theory of failure. (CO3) (3)

Part B

(5) a. A rotor having a mass of 5 Kg is mounted on a 1 cm diameter shaft supported at the ends by two bearings. The bearing span is 40 cm. Because of certain manufacturing inaccuracies the center of gravity of the disc is 0.02 mm away from the geometric center of the rotor. If the system rotates at 3000 rpm, find the amplitude of steady state vibrations and the dynamic force transmitted to the bearings. Neglect damping Take E = 1.96 x $10^{11} N/m^2$. (CO2) (7)

b. A bolt is subjected to a direct tensile load of 30 kN and a transverse shear force of 15 kN. The material of the bolt has a normal stress of 350 MPa at yield and Poissons ratio of 0.25. Compute the root diameter of the bolt according to a) Maximum shear stress theory of failure b) von Mises criterion for failure. Hence suggest suitable size of the bolt. Take value of 3 for factor of safety. (CO3) (7)

(6) a. A steel shaft is subjected to a transverse load of 8 kN as shown in the figure below. The shaft is made of steel with an ultimate tensile strength of 400 MPa. Determine the diameter of the shaft based on a factor of safety of 2. (CO3) (7)



b. An unknown weight falls through 10 mm on a collar rigidly attached to the lower end of a bar 3 m long and 600 mm^2 in section. If the maximum instantaneous extension is 2 mm, what are the corresponding stress and the value of unknown weight? Take E = 200 GPa. (CO4) (7)

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