QUAID-E-AWAM UNIVERSITY OF ENGINEERING, SCIENCE & TECHNOLOGY, NAWABSHAH

MID-SEMESTER EXAMINATION OF SECOND SEMESTER – SECOND YEAR (4TH SEMESTER) 2022, 20-BATCH, B.E (ME)

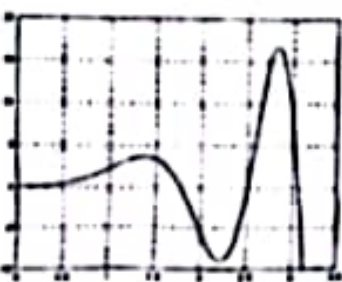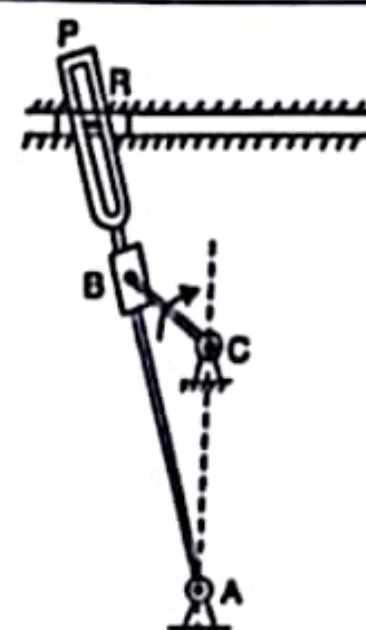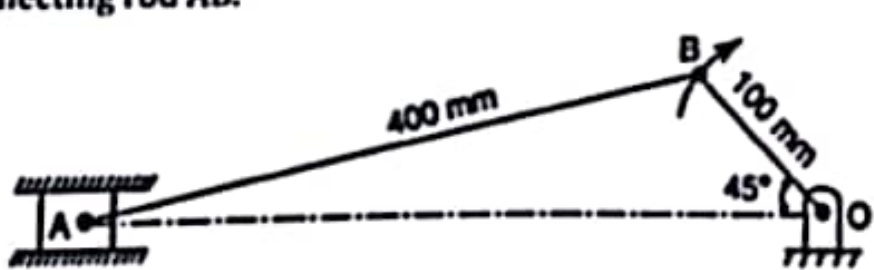SUBJECT: **NUMERICAL ANALYSIS**

Dated: 25.11.2022   Maximum Marks: 20   Time Allowed: 01 Hour,

NOTE: ATTEMPT ANY TWO (02) QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q. No.		Question	CLOs	Taxonomy Level	Marks
Q. 01	(a)	Calculate the absolute relative error. $f(x) \approx x - \frac{1}{6}x^3 + \frac{1}{120}x^5$ Of $f(1)$ For $f(x) = \sin x$	2	C2	05
	(b)	Calculate eigenvalues and eigenvectors: $2x_1 + 8x_2 = 0$ $x_1 - 5x_2 = 0$	2	C3	05
Q. 02		Calculate a real root of $f(x) = e^x \sin x^2$ on the interval [1, 2] with Tolerance = 0.001. up to 5 iterations.	2	C3	10
Q. 03		Solve the system by any iterative method. $5x_1 - 2x_2 - 3x_3 = 10$ $2x_1 - 7x_2 + x_3 = 15$ $4x_1 + 2x_2 - 9x_3 = 22$	2	C3	10

The End

NOTE: ATTEMPT ANY TWO (02) QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q. No.		Question	CLO	Taxonomy Level	M
Q. 01		Explain the term kinematic link. Give the classification of kinematic link.	1	C2	
Q. 02		Figure shows the layout of a quick return mechanism of the oscillating link type, for a special purpose machine. The driving crank BC is 30 mm long and time ratio of the working stroke to the return stroke is to be 1.7. If the length of the working stroke of R is 120 mm, determine the dimensions of AC and AP.	2	C3	
Q. 03		Locate all the instantaneous centres of the slider crank mechanism as shown in figure. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB.	2	C3	1

The End

QUAID-E-AWAM UNIVERSITY OF ENGINEERING, SCIENCE & TECHNOLOGY, NAWABSHAH

MID-SEMESTER EXAMINATION OF SECOND SEMESTER - SECOND YEAR 4TH SEMESTER 2022 29-BATCH B.E (ME)

SUBJECT: FLUID MECHANICS I

Dated: 22.11.2022   Maximum Marks: 10   Time Allowed: 45 Minutes

NOTE: ATTEMPT ANY TWO (02) QUESTIONS, QUESTION THREE (03) IS COMPULSORY. ALL QUESTIONS CARRY EQUAL MARKS.

Q. No.	QUESTION	CLOs	Marks
Q.01	What do you know about Fluid Mechanics and how fluid mechanics classified? Explain briefly following fluid properties. (i) Viscosity (ii) Surface Tension (iii) compressibility and Bulk modulus with neat & clean fig:	1	05
Q.02	Define term pressure and intensity of pressure? How is pressure measured? Also define the following Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure with flow charts.	1	05
Q.03	A 600 mm diameter shaft is rotating at 300 rpm in a bearing of length 130mm. if the thickness of oil film is 1.7mm and the dynamic viscosity of the oil is 0.8 N.s/m², Determine (i) Torque required to overcome friction in bearing, (ii) Power utilized in overcoming viscous resistance.	3	05

Good Luck
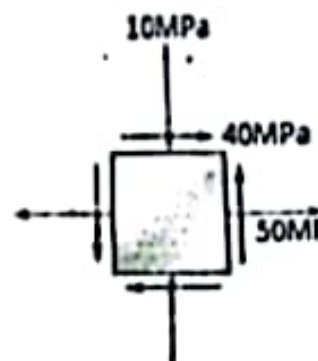
Dated: 23.11.2022   Maximum Marks: 20   Time Allowed: 01 Hour,

NOTE: ATTEMPT ANY TWO QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q#	Question	Marks	CLO	Level
Q.1	Develope equations to estimate circumfrential and longitudinal stresses in a thin walled pressure vessel.	10	3	C3
Q.2	For the state of plane stress shown in Fig., determine (a) the principal planes, (b) the principal stresses, (c) the maximum shearing stress and the corresponding normal stress. 10MPa 40MPa 50MPa	10	3	C3
Q.3	Find stresses on an oblique plane in the given rectangular block when the block is subjected to two mutually perpendicular direct stresses.	10	3	C3

The End

Q. No.	QUESTION	CLOs	Marks
Q. 01a	Write down the working mechanism of a single stage, single acting reciprocating air compressor	1	05
Q. 01b	What are the main advantages of multi-stage reciprocating air compressor over a single-stage reciprocating air compressor?	2	05
Q. 02a	What is the function of super heater, economizer and air pre-heater respectively, when considering the steam boiler	1	05
Q. 02b	With the help of direct method, how the boiler efficiency be determined?	2	05
Q. 03a	While considering the clearance volume, show that the volumetric efficiency of a single stage, single acting reciprocating air compressor is given by: $$1 - \frac{V_3}{(V_1 - V_3)}\left[\left(\frac{P_2}{P_1}\right)^{\left(\frac{1}{n}\right)} - 1\right]$$ $V_3 =$ Clearance volume Where $(V_1 - V_3) =$ Effective swept volume $\frac{P_2}{P_1} =$ Pressure ratio n = Polytropic index	2	05
Q. 03b	Simply write down the classification of steam boiler	1	05

Good Luck

Dated: 16-01-2023   Maximum Marks: 60   Time Allowed: 03 Hour.

NOTE: ATTEMPT ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q#	Question	Marks	CLO	Lev
Q.01	Stresses at a point across two perpendicular planes are shown in fig. Draw Mohr's circle and find graphically normal, tangential and the resultant stress with its obliquity on the given plane. 35MN/m2 75MN/m2 70deg	12	3	3
Q.02	A tube has 10cm inner diameter and the walls are 2cm thick. It is subjected to an internal pressure of 23MPa. Calculate the maximum error in hoop stress at the surface if a thin tube criterion based on the inner diameter is used.	12	3	3
Q. 03	Explain mechanical failure and its modes in detail.	12	1	2
Q.04	Develop and Discuss following equations relating to strain energy; a/ Strain energy due to normal stress b/ strain energy due to shear c/ strain energy due to bending	12	2	6
Q.05	Discuss maximum shear stress and maximum strain energy theories.	12	2	3

THE END

Date: 23.01.2023   Maximum Marks: 60   Time Allowed: 3 Hours

NOTE: ATTEMPT ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q.		QUESTION	CLO	Level	Marks
Q. 01	(a)	Calculate $f(7) = ?$ and $f(27) = ?$. Data is given in below table	2	C3	07
		x: 5, 10, 15, 20, 25, 30 $f(x)$: 15, 27, 40, 50, 57, 63			
	(b)	Calculate $f(13) = ?$. Data is given in below table.	2	C3	05
		x: 5, 11, 15, 22, 27, 30 $f(x)$: 15, 27, 40, 50, 57, 63			
Q. 02	(a)	Calculate $f'(5) = ?$, $f'(30) = ?$. Data is given in below table.	2	C3	07
		x: 5, 10, 15, 20, 25, 30 $f(x)$: 15, 27, 40, 50, 57, 63			
	(b)	Calculate $f'(13) = ?$. Data is given in below table.	2	C3	05
		x: 5, 11, 15, 22, 27, 30 $f(x)$: 15, 27, 40, 50, 57, 63			
Q. 03		Evaluate: $\int_{0}^{\pi} \sin 2x^2\, dx$ up to five decimal places. $[0, \pi]$ is divided into 10 equal parts. By (i) Trapezoidal Rule (ii) Simpson's $1/3^{rd}$ Rule (iii) Simpson's $3/8^{th}$ Rule. Also calculate error.	2	C3	12
Q. 04	(a)	Write down RK Method.	2	C2	04
	(b)	Solve $\dfrac{dy}{dx} = x^2 + y^2$, $y(0) = 1$, $0 \le x \le 0.1$. Taking $h = 0.05$ by RK Method	2	C3	08
Q. 05		Solve: $\dfrac{\partial^2}{\partial x^2}U(x,y) + \dfrac{\partial^2}{\partial y^2}U(x,y) = 0$, $0 \le x \le 1$ and $0 \le y \le 1$ B.C.S: $u(x,0) = 1$, $u(x,1) = 1$, $u(0,y) = 1$, $u(1,y) = 1$ $i = 0,1,2,3$ and $j = 0,1,2,3$, where $h = k = 1$	2	C3	12

— Good Luck —

Dated: 19.01.2023   Maximum Marks: 60   Time Allowed: 3 Hours.

NOTE: ATTEMPT ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

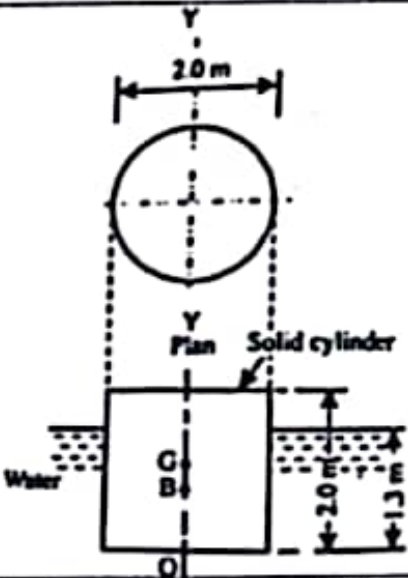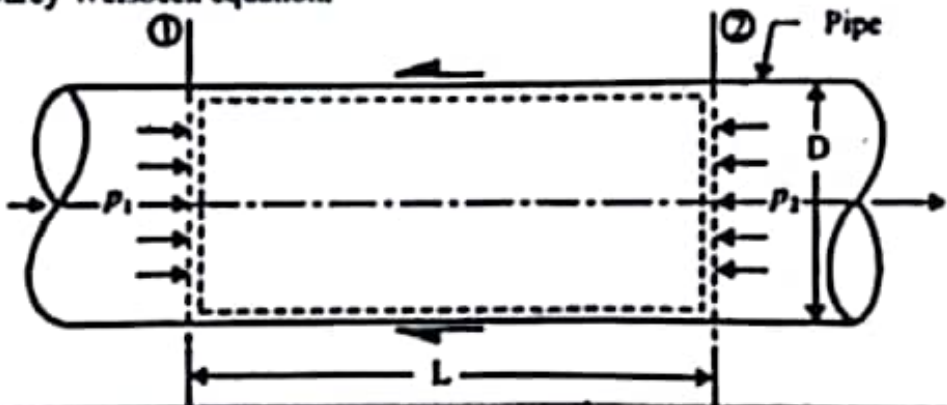| Q. No.	QUESTION	CLOs	Taxonomy Level	PLOs	Marks
Q. 01	What do you understand by gyroscopic couple? Explain the application of gyroscopic principles to aircrafts.	1	C2	1	12
Q. 02	A uniform disc of diameter 300 mm and of mass 5 kg is mounted on one end of an arm of length 600 mm. The other end of the arm is free to rotate in a universal bearing. If the disc rotates about the arm with a speed of 300 r.p.m. clockwise, looking from the front, with what speed will it process about the vertical axis?	2	C4	2	12
Q. 03	The flywheel of a steam engine has a radius of gyration of 1 m and mass 2500 kg. The starting torque of the steam engine is 1500 N·m and may be assumed constant. Determine: 1. the angular acceleration of the flywheel, and 2. the kinetic energy of the flywheel after 10 seconds from the start.	2	C4	2	12
Q. 04	Explain with sketches the different types of cams and followers. Enlist the applications of cam and follower.	1	C2	1	12
Q. 05	An effort of 1500 N is required to just move a certain body up an inclined plane of angle 12°, force acting parallel to the plane. If the angle of inclination is increased to 15°, then the effort required is 1720 N. Find the weight of the body and the coefficient of friction.	2	C4	2	12

Good Luck

NOTE: ATTEMPT ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q. No.	QUESTION	CLOs	Marks
Q. 01 (a)	With the help of schematic diagram, how does the vane pump work?	1	06
Q. 01 (b)	Define nozzle and diffuser. Regarding the convergent-divergent nozzle, illustrate the Mach number at different locations.	1	06
Q. 02	Regarding the steam impulse turbine, diagrammatically illustrate the pressure compounding, velocity compounding and pressure-velocity compounding.	1	12
Q. 03 (a)	What is meant by adiabatic flame temperature, briefly state its two types.	1	04
Q. 03 (b)	The mixture of Helium and Oxygen are used in the air tanks of underwater divers for deep dives. For a particular dive 15 L of O_2 at 25°C and 1.0 atmos. and 48 L of He at 25°C and 1.0 atmos. were both pumped into a 5.5 L. tank. Calculate; (a) the partial pressure of each gas (b) the total pressure in the tank at 25°C.	3	08
Q.04 (a)	Define Ideal and perfect gas with suitable example.	1	02
Q.04 (b)	Starting with Steady Flow Energy Equation (SFEE) develop an equation of critical pressure ratio regarding the convergent-divergent nozzle, is given by: $$\frac{P_t}{P_1} = \left(\frac{2}{\gamma+1}\right)^{\frac{\gamma}{(\gamma-1)}}$$ Where, P_t is the critical pressure.	2	10
Q. 05	Air enters a nozzle at a pressure of 3.3 MN/m² and with a temperature of 450°C. It leaves at a pressure of 0.6 MN/m². The flow rate of air through the nozzle is 1.33 kg/sec: expansion may be considered to be adiabatic and to follow the law PV^γ = Constant. Determine (a) the throat area (b) the exit area (c) the Mach number at exit. (Take $\gamma = 1.4$ and $R = 0.297$ KJ/kgk)	3	12

Good Luck

Dated: 09.01.2023   Maximum Marks: 30   Time Allowed: 02 Hours

NOTE: ATTEMPT ALL QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Q. No.	Questions	CLO	Marks
01 (a)	What is Meta-Center and Meta -Center height? Describe the condition of equilibrium of a floating and submerged bodies with position of M & B to O with neat figures.	1	05
01 (b)	A Solid cylinder 2 m in diameter and 2 m high is floating in water with its axis vertical. If the specific gravity of the material of cylinder is 0.65, find its metacenter height. State also whether the equilibrium is stable or unstable.	3	05
02 (a)	Briefly Discuss the difference b/w Venturimeter, orificemeter and Pitot Tube with neat figures?	1	05
02 (b)	Derive an Expression for rate of flow and actual rate of flow for horizontal type Venturimeter.	2	05
03 (a)	Find an expression for loss of head due to friction in pipeline flow as Darcy Weisbeck equation.	2	05
03 (b)	Water is to be supplied to the inhabitants of a college campus through a main supply. The length of pipe = 3000 m, no: of inhabitants = 4000 and consumption of water per day of each inhabitant 18 litters. loss of head due to friction is 18 m with co-efficient of friction for pipe materials $f = 0.007$, if the half of daily supply is pumped in 8 hours, determine the size of main supply.	3	05

Good Luck