Tanta University

Department: Physics and Engineering Mathematics
Total Marks: 100 Marks

Faculty of Engineering

Course Title: Engineering Mathematics 3 | Course Code: PME2112 | Year: 2nd
Date: Jan 10 2013(Production Eng.) | Allowed time: 3 hrs | No. of Pages: (1)

Remarks: (answer the following problems… assume any missing data… answers should be supported by sketches)

Problem number (1) **(25 Marks)**

a) Determine the roots of $z^4+1=0$. — 5 Marks

b) Find the image of the line $\mathrm{Re}(z)=1$ under $f(z)=z^2$. — 5 Marks

c) Find all values of z such that 1) $e^z=\sqrt{3}+i$ 2) $\cos z=10$ — 7 Marks

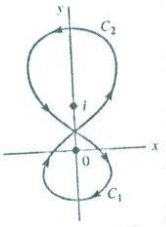
d) Verify $u(x,y)=x^3-3xy^2-5y$ is harmonic in the entire complex plane. Then find the conjugate harmonic function of u. — 8 Marks

Problem number (2) **(25 Marks)**

a) Evaluate the integrals: 1) $\int_C e^z dz$ 2) $\int_C \frac{1}{z^2} dz$ — 5 Marks

where C is the ellipse $(x-2)^2+(y-5)^2/4=1$.

b) Evaluate $\int_C \frac{z^3+3}{z(z-i)^2} dz$, where C is shown as — 5 Marks



c) Let C be the unit circle, for any real constant a, find the value of $\int_C \beta \frac{e^{az}}{z} dz$, — 8 Marks

Then show that $\int_0^{\pi} e^{a\cos\theta}\cos(a\sin\theta)d\theta=\pi\beta$.

d) Evaluate the Cauchy principal value of $\int_{-\infty}^{\infty} \frac{1}{(x^2+1)(x^2+9)} dx$. — 7 Marks

Problem number (3) **(25 Marks)**

a) Expand $f(z)=\frac{1}{z(z-1)}$ in a Laurent series valid for $1<|z-2|<2$. — 10 Marks

b) Find the general solution of the following differential equation: — 15 Marks

$$y''+(\cos x)y=0.$$

Problem number (4) **(25 Marks)**

a) Prove that $\int_0^a (\ln\frac{a}{x})^{-\frac{1}{2}} dx = a\sqrt{\pi}$. — 7 Marks

b) Find the general solution of the following differential equations: — 18 Marks

- $x^2y''+xy'+(\alpha^2x^2-v^2)y=0$.
- $xy''+3y'+9y=0$.

With my best wishes

Dr. Waheed Kamal Zahra

Tanta University	Department: Mechanical Power Engineering Total Marks: 75 Marks	Faculty of Engineering

Course Title: Fluid Mechanics	Course Code : MEP2150	Year : 2nd Production Engineering and Mechanical Design
Date: Jan 13th 2013 (First Term)	Allowed Time : 3hrs No. of Pages: (2)	

Remarks: (Answer all the following questions, Assume any missing data)

Question Number (1) (10 Marks)

Mark the following statements with true or false

A) A fluid is a substance that deforms continuously under the application of shear stress.

B) A dimension is the measure by which a physical variable is expressed quantitatively.

C) Bingham plastic fluids behave as solids until an initial yield stress is exceeded.

D) Specific gravity of a material is the weight of a unit volume of a substance.

E) Dimensions and units of bulk modulus are identical with the force dimensions and units.

F) Stokes is a unit to measure the kinematic viscosity and it equals 10^{-4} m^2/s.

G) Centroid for the body is the distance between its center of pressure and center of buoyancy.

H) Wind turbines are used to generate electricity from the kinetic power of the wind.

I) As temperature increases, the viscosities of all liquids increase, while the viscosities of all gases decrease.

J) Pumps move gases with little increase in pressure.

Question Number (2) (15 Marks)

A) Define each of the following expressions:

Turbomachines – Path line - Rheological Diagram –Meniscus – Hydraulic Grade Line.

B) What are the main differences between pumps, fans, and compressors?

C) A pipe (A) with ID 100mm is connected to a pipe (B) with ID 65 mm through a converging cone, shown below in Figure 1. Water (ρ=1000kg/m^3) is pumped through the pipe. If the average velocity in pipe A is 0.85m/s, calculate

a) Velocity in pipe B

b) Mass flow rate in A

c) Mass flow rate in B

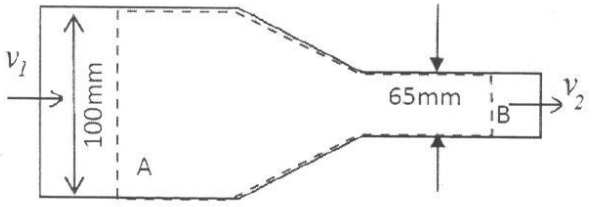


Figure 1

D) What height would a water barometer needs to be in order to measure the atmospheric Pressure?

Given:

atmospheric pressure = 1x10^5 N/m^2 , Density of Water =998 kg/m^3, Density of Mercury =13600 kg/m^3

Question Number (3) (15 Marks)

A) Verify the dimensions for the following quantities:
Volume – Pressure – Density - Product of velocity times mass divided by area-Product of force times acceleration.

B) A 70 kg girl and a car of mass *m* are placed on a hydraulic lift, as shown in Figure 2.
The area of the piston the girl stands on is 1.0 $x10^{-2}$ m^2, while the area of the piston under the car is 7.0 x 10^{-1} m^2. What maximum car mass *m* can be supported in this system?

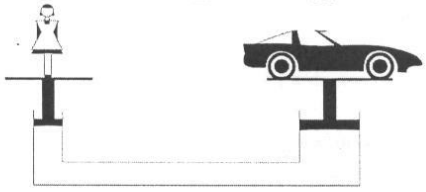


Figure 2

C) What is the fundamental difference between a solid and a fluid?

D) Draw a neat diagram explaining the difference between: Absolute, Gauge, and Atmospheric Pressure.

Question Number (4) (20 Marks)

A) Prove that the pressure for a fluid element increases with increasing depth.

B) Determine the pressure difference across a nozzle if diesel is sprayed through it with an average diameter of 0.03mm. The surface tension is 0.04N/m. Assuming that the spray is of cylindrical shape.

C) At 30 °C what diameter of glass tube is necessary to keep the capillary-height change of water less than 2 mm?
Given: Water Density =998 kg/m^3, σ for water =0.0712 N/m, water wetting angle for clean glass tube = 0°.

D) The specific weight of water at ordinary pressure and temperature is 9.81 kN/m^3. The specific gravity of mercury is 13.56. Compute the density of water and the specific weight and density of mercury.

Question Number (5) (15 Marks)

A) Derive an expression for Euler's equation of motion for one dimensional non-viscous fluid flow.

B) Write short notes (use clear drawings where relevant) about two different systems of measuring flow rate.

C) A plate separated by 0.5 mm from a fixed plate moves at 0.50 m/s under a force per unit area of 4.0 N/m^2. Determine the viscosity of the fluid between the plates.

End of Questions..... .....انتهت الاسئلة

With Best Wishes..... مع أطيب التمنيات بالنجاح و التوفيق

دكتور مهندس / هاجر علم الدين محمد بسطويسي

Dr.Eng/Hagar Alm ElDin Mohamad Bastawissi

Tanta University	**Engineering Economic**
Faculty of Engineering	**Time: 2 Hours**
Production Eng.&Mach.Design Dept.	**Date: 15-1-2013**

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Solve the following Problems:

1- A- What lump sum amount of interest will be paid on $20,000 loan that was made in first August 2007 and repaid on first Nov. 2013 with simple interest at 12%.

B- What is the future equivalent 0f $2000 at simple interest 10% per year for 2.5 year.

2- Machine shop that specialized in hardening steel parts is study whether it should update the heat treatment furnace now or do it later. If the cost now is $500,000, what the equivalent amount be 5 years from now at interest rate 12%.

3- Manufacturing plant has annual fixed cost of $150,000 and variable cost of $5 per piece The annual capacity of the plant is 120,000 pieces per year, and the product is sold for $7.5 per piece.

- Construct the break-even point chart.
- What is the annual profit when the plant operating at 90% capacity and at 100% capacity.

4- Estimate the annual straight line depreciation cost for an asset of $250,000 purchasing Cost with additional options costing $60,000. Its salvage value at the end of the eight Years is estimated to be $20,000 of the cost basis. What is the book value of the asset at the end of the third year of operation.

5- A- Find the correct numerical values for the following factors from the compound Interest factor tables: -

(P/A, 12%, 18)	(F/P, 12%, 20)
(P/F, 12%, 28)	(A/P, 12%, 28)

B- Sulphuric acid making plant borrowed $100,000 from investment bank at interest rate 12% per year for 6 years. What is the total due after the 6^{th} year?

12% TABLE 17 Discrete Cash Flow: Compound Interest Factors 12%

	Single Payments		Uniform Series Payments				Arithmetic Gradients	
n	Compound Amount F/P	Present Worth P/F	Sinking Fund A/F	Compound Amount F/A	Capital Recovery A/P	Present Worth P/A	Gradient Present Worth P/G	Gradient Uniform Series A/G
1	1.1200	0.8929	1.00000	1.0000	1.12000	0.8929		
2	1.2544	0.7972	0.47170	2.1200	0.59170	1.6901	0.7972	0.4717
3	1.4049	0.7118	0.29635	3.3744	0.41635	2.4018	2.2208	0.9246
4	1.5735	0.6355	0.20923	4.7793	0.32923	3.0373	4.1273	1.3589
5	1.7623	0.5674	0.15741	6.3528	0.27741	3.6048	6.3970	1.7746
6	1.9738	0.5066	0.12323	8.1152	0.24323	4.1114	8.9302	2.1720
7	2.2107	0.4523	0.09912	10.0890	0.21912	4.5638	11.6443	2.5512
8	2.4760	0.4039	0.08130	12.2997	0.20130	4.9676	14.4714	2.9131
9	2.7731	0.3606	0.06768	14.7757	0.18768	5.3282	17.3563	3.2574
10	3.1058	0.3220	0.05698	17.5487	0.17698	5.6502	20.2541	3.5847
11	3.4785	0.2875	0.04842	20.6546	0.16842	5.9377	23.1288	3.8953
12	3.8960	0.2567	0.04144	24.1331	0.16144	6.1944	25.9523	4.1897
13	4.3635	0.2292	0.03568	28.0291	0.15568	6.4235	28.7024	4.4683
14	4.8871	0.2046	0.03087	32.3926	0.15087	6.6282	31.3624	4.7317
15	5.4736	0.1827	0.02682	37.2797	0.14682	6.8109	33.9202	4.9803
16	6.1304	0.1631	0.02339	42.7533	0.14339	6.9740	36.3670	5.2147
17	6.8660	0.1456	0.02046	48.8837	0.14046	7.1196	38.6973	5.4353
18	7.6900	0.1300	0.01794	55.7497	0.13794	7.2497	40.9080	5.6427
19	8.6128	0.1161	0.01576	63.4397	0.13576	7.3658	42.9979	5.8375
20	9.6463	0.1037	0.01388	72.0524	0.13388	7.4694	44.9676	6.0202
21	10.8038	0.0926	0.01224	81.6987	0.13224	7.5620	46.8188	6.1913
22	12.1003	0.0826	0.01081	92.5026	0.13081	7.6446	48.5543	6.3514
23	13.5523	0.0738	0.00956	104.6029	0.12956	7.7184	50.1776	6.5010
24	15.1786	0.0659	0.00846	118.1552	0.12846	7.7843	51.6929	6.6406
25	17.0001	0.0588	0.00750	133.3339	0.12750	7.8431	53.1046	6.7708
26	19.0401	0.0525	0.00665	150.3339	0.12665	7.8957	54.4177	6.8921
27	21.3249	0.0469	0.00590	169.3740	0.12590	7.9426	55.6369	7.0049
28	23.8839	0.0419	0.00524	190.6989	0.12524	7.9844	56.7674	7.1098
29	26.7499	0.0374	0.00466	214.5828	0.12466	8.0218	57.8141	7.2071
30	29.9599	0.0334	0.00414	241.3327	0.12414	8.0552	58.7821	7.2974
31	33.5551	0.0298	0.00369	271.2926	0.12369	8.0850	59.6761	7.3811
32	37.5817	0.0266	0.00328	304.8477	0.12328	8.1116	60.5010	7.4586
33	42.0915	0.0238	0.00292	342.4294	0.12292	8.1354	61.2612	7.5302
34	47.1425	0.0212	0.00260	384.5210	0.12260	8.1566	61.9612	7.5965
35	52.7996	0.0189	0.00232	431.6635	0.12232	8.1755	62.6052	7.6577
40	93.0510	0.0107	0.00130	767.0914	0.12130	8.2438	65.1159	7.8988
45	163.9876	0.0061	0.0074	1358.23	0.12074	8.2825	66.7342	8.0572
50	289.0022	0.0035	0.00042	2400.02	0.12042	8.3045	67.7624	8.1597
55	509.3206	0.0020	0.00024	4236.01	0.12024	8.3170	68.4082	8.2251
60	897.5969	0.0011	0.00013	7471.64	0.12013	8.3240	68.8100	8.2664
65	1581.87	0.0006	0.00008	13174	0.12008	8.3281	69.0581	8.2922
70	2787.80	0.0004	0.00004	23223	0.12004	8.3303	69.2103	8.3082
75	4913.06	0.0002	0.00002	40934	0.12002	8.3316	69.3031	8.3181
80	8658.48	0.0001	0.00001	72146	0.12001	8.3324	69.3594	8.3241
85	15259	0.0001	0.00001		0.12001	8.3328	69.3935	8.3278

جامعة طنطا
كلية الهندسة- قسم هندسة الإنتاج والتصميم الميكانيكي

المادة: صب المعادن
الفرقة: الثانية / إنتاج

التاريخ: ١٧-١-٢٠١٣
الزمن: ٣ ساعة

أجب عن الأسئلة التالية :

١- يوضع في الإعتبار عند تصميم النماذج أو الأرانيك - المستخدمة في تشكيل قوالب صب المعادن عدد من العوامل الفنية والإقتصادية ، وضح ماسبق وصولا إلي مصبوبات بجودة عالية وتكلفة إقتصادية. (١٢)

٢- ماهي المتطلبات والإشتراطات الواجب توافرها في رمال قوالب تشكيل المصبوبات حتي يمكن الحصول علي مصبوبات خالية من العيوب ، مع بيان المكونات الرئيسية لمخاليط رمال تشكيل قوالب المصبوبات. (١٢)

٣- تستخدم رمال خاصة في مكوناتها وطرق إعدادها عند تشكيل قوالب الدلاليك ، فما هي أهم مكونات رمال الدلاليك وطرق إعدادها مع إيضاح مجالات الإختلاف بينها وبين مخاليط رمال تشكيل المصبوبات. (١١)

٤- هناك العديد من طرق الفحص والإختبار الواجب القيام بها بالنسبة لرمال تشكيل قوالب المصبوبات، ماهي طرق الفحص والإختبار مع الشرح بإيجاز لكل منها. (١١)

٥- وضح مع الرسم أنواع الأفران المستخدمة في صهر المصبوبات ومجال إستخدام كل منها بالنسبة لمصبوبات المعادن أو السبائك المختلفة. (١١)

٦- تقسم البطانة الحرارية المستخدمة في أفران صهر المصبوبات طبقا للتركيب الكيميائي للمصبوبات وضح ماسبق مع بيان مجال إستخدام كل نوع من أنواع البطانة في عمليات الصهر للمصبوبات. (١١)

٧- ماهي العيوب والمميزات التي يوفرها فرن الدست في صهر المصبوبات ومجالات الإستخدام مع بيان مكونات شحنة الفرن. (١١)

٨- هناك العديد من طرق الفحص والإختبار للمصبوبات في شكلها النهائي ، بين بإيجاز الطرق المختلفة لعمليات الفحص والإختبار للمصبوبات. (١١)

بسم الله الرحمن الرحيم

جامعة طرابلس
كلية الهندسة
الفرقة الثانية

الفصل الدراسي الأول ٢٠١٢/٢٠١٣م
ميكانيكا وإنتاج

المادة : كيل وإجراءات
التاريخ : ٢٠١٣/١/٢٠
الزمن : ٣ ساعات

Answer all the following questions:

(1) - A thick walled closed-end cylinder is made of an Al-alloy, has inside diameter of 200 mm and outside diameter of 800 mm. The cylinder is subjected to an internal fluid pressure of 150 MPa. Determine the principal stresses and maximum shear stress at a point on the inside surfce of the cylinder. Also determine the increase in inside diameter due to fluid pressure (where $E = 72$ GPa , $\mu = 0.33$).

(2) - The shaft shown in Fig. (1) transmitts 40 KW between the input point A and the output point D at speed of 300 r.p.m. Calculate the shaft diameter if the yield stress of material is 300 MPa , the safty factor is 3.0 .

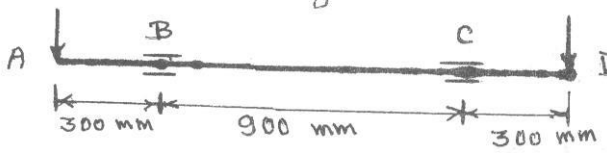


Fig. (1)

(3) - A machine member is represented by a cantilever beam and loaded as shown in Fig. (2). The member has a square cross-section b x b and from steel having a yield stress of 300 MPa. Calculate the dimension b of this member. Assume safty factor 3.0 . If the member is hollow and the inner to outer square area is 0.5 (calculate the percentage change in the member weight.

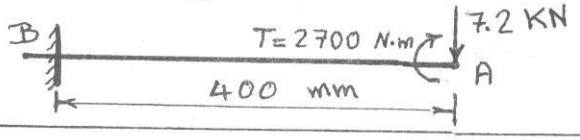


Fig. (2)

(يرجى الانتقال خلفه)

(4) - At a point in a bracket the stresses on two mutally perpendicular planes are 35 MN/m^2 (tensile) and 15 MN/m^2 (tensile). The shear stress across these planes is 9 MN/m^2. Find the normal and tangential stresses on a plane making an angle of 30° with the plane of first stress. Find also the magnitude and direction of the principle stresses and the planes which they act. Compare these values with those obtained from solving the problem using Mohr's Circle.

(5) - A beam ABCD is subjected to 50 KN & 25 KN as loads shown in Fig. (3). Determine the deflection at point D and determine also the position of maximum deflection of the beam between point B and point C.

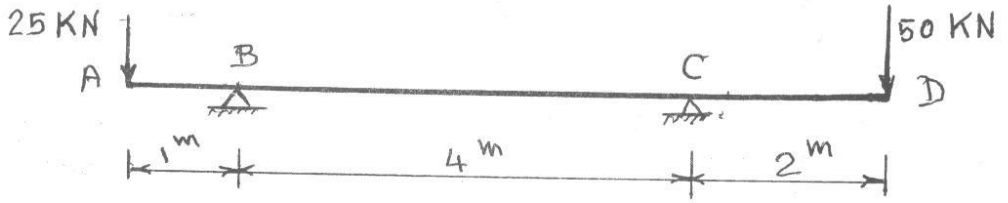


Fig. (3)

End of questions

212 Good Luck

Dr. H. Hendawy

Tanta University
Faculty of Engineering
Prod.Eng.&Mech. Design Dept.

Theory of Machines
Year : 2nd Year(Pr+Pn)
Time: 3 Hours

----------24-01-2013----------

Answer All The Questions With Neat Sketches Whenever Possible:-

Q(1):- (15%)

(a) Define the following:-

(i) link or element. (ii) kinematic pair. (iii) mechanism. (iv) machine. (v) structure. (vi) mechanics. (vii) mobility.

(b) What are quick return mechanisms? Where are they used? Sketch and explain the functioning of any one of them (and find time ratio?).

(c) Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain.

Q(2):- (15%)

(a) Explain how the velocities and accelerations of a slider and the connecting rod are obtained in a slider crank mechanism?.

(b) For the configuration of a slider crank mechanism shown in the following figure, find :- (i) The velocity and acceleration of slider at B.

(ii) The velocity and acceleration of point E.

(iii) The angular acceleration of link AB.

The crank rotates at 20 rad/sec counter clock wise. Given: OA=480 mm; AB=1600 mm.

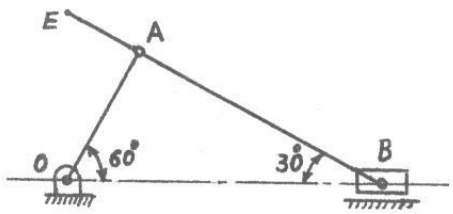


Fig.[Q(2)]

Q(3):- (15 %)

(a) Sketch an intermittent motion mechanism and explain its practical applications.

(b) In the mechanism shown in the following figure, the crank AB is 100 mm long and rotates uniformly clockwise at 30 rad/sec. Given that BC = 300 mm; BD = 150 mm; DE = 250 mm; EF = 200 mm; DG = 167 mm; angle CAB = 30°.

Find the following:-

(a) The velocity and acceleration of G for the configuration shown.

(b) The angular velocity and acceleration of the link DE.

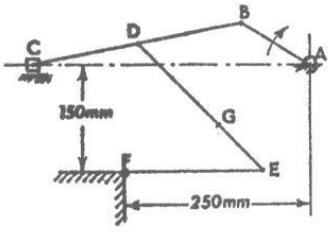


Fig.[Q3(b)]

Q(4):- (15%)

(a) Define the following:-

Module - Velocity ratio - Circular pitch - Diametral pitch - Base circle diameter - Pressure angle – involute – Normal pitch.

(b) State and prove the law of gearing of gearing. Show that involute profile satisfies the conditions for correct gearing.

(c) A shaft running at 2000 rpm from an electric motor carries the first gear wheel (T_1 = 18 teeth). The second shaft was the second to the first gear box and the input to the second gear box (which has four spur gears). The fourth shaft in the second gear box carries output pulley which has diameter 500 mm and runs with linear velocity 3 mt/sec. Find the suitable teeth numbers and the dimensions of gears, if module m=4mm.

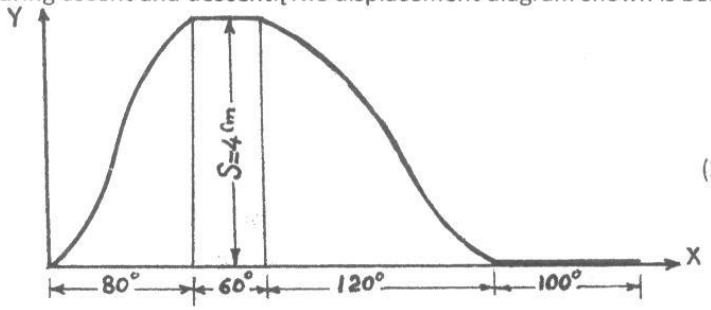
Q(5):- (15%)

(a) Write short notes on the cams and followers? Explain with sketches the different types of cams and followers.

(b) With the data given below the follower moves with uniform acceleration/ retardation during ascent and with S.H.M. during descent. Draw the cam profile.

..Least radius of the cam	= 3 cm.
..Angle of ascent	= 80°.
..Angle of dwell between ascent and descen	= 60°.
..Angle of descent	= 120°.
..Lift of the follower	= 4 cm.
..Offset of the roller	= 1.5 cm.

If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during ascent and descent.[The displacement diagram shown is below]..



(2)

Q(6):- (10%)

(a) Figure[Q6(a)] 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 AR, find the number of degrees of freedom.

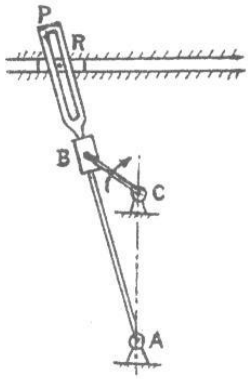


Fig.[Q6(a)]

(b) Define the flywheel? What is its function? What is the coefficient of fluctuation?.

(c) From the figure [Q6(b)] draw graphically the pass of point M .

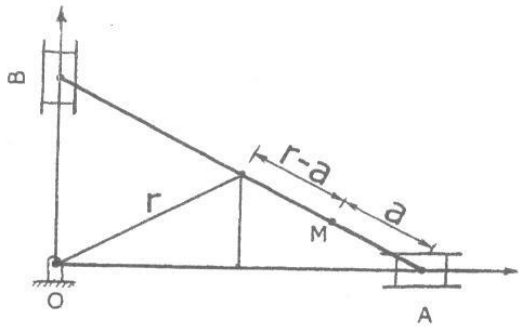


Fig.[Q6(c)]

... ***(((With My Best Wishes)))***...