- ظلل الإجابات النهائية في ورقة الإجابة الإلكترونية.
- يتم إجابة الجزأ العلوي من السؤال الرابع في ورقة الأسئله نفسها و الإختياري في ورقة الإجابة الألكترونية.
- بعد الانتهاء من الامتحان ضع ورقة الإجابة الالكترونية مع ورق الأسئلة معا وسلم الجميع الى الملاحظ.

Q1 (15 degree) :

On the shown mechanism, disk D (r = 5 m) is connected to links OA and BC by two hinges at points A and B. Link OA (L1 = 10 m) has a clockwise angular velocity. Link BC has length (L3 = 10). Points O and C are hinged to ground. At the shown instant; AB is horizontal line, $\phi = 45°$ and point A has an acceleration $\underline{a}_A = 15\ i -50\ j$.
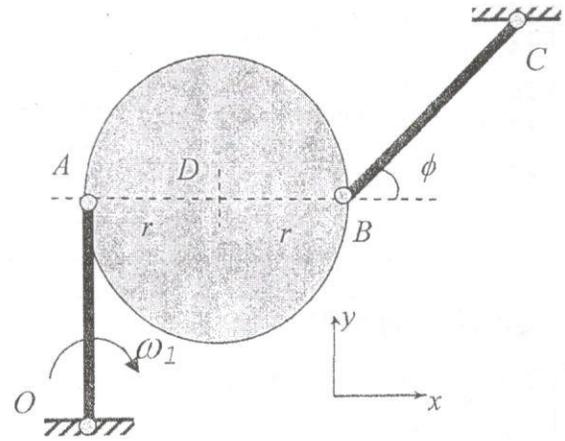
Select the right answers:

1 α_{OA} (C.C.W.)	(a) -3.5	(b) -1.5	(c) -0.5	(d) -2.5
2 ω_{OA} (C.C.W.)	(a) -2.73861	(b) -2.23607	(c) -3.08221	(d) -1.87083
3 $\underline{V}_A$	(a) 27.3861 i	(b) 18.7083 i	(c) 22.3607 i	(d) 30.8221 i
4 ω_{AB} (C.C.W.)	(a) -3.08221	(b) -2.73861	(c) -2.23607	(d) -1.87083
5 ω_{BC} (C.C.W.)	(a) 3.16228	(b) 4.3589	(c) 3.87298	(d) 2.64575
6 $\underline{V}_B$	(a) 22.3607 i - 22.3607 j	(b) 27.3861 i - 27.3861 j	(c) 30.8221 i - 30.82 j	(d) 18.7083 i - 18.7 j
7 $\underline{V}_D$	(a) 18.7083 i - 9.35414 j	(b) 22.3607 i - 11.1803 j	(c) 27.3861 i - 13.69 j	(d) 30.8221 i - 15.4 j
8 α_{AB} (C.C.W.)	(a) 14.3995	(b) 42.3701	(c) 35.7132	(d) 22.6421
9 α_{BC} (C.C.W.)	(a) -14.9497	(b) -8.41421	(c) -27.4853	(d) -24.8995
10 $\underline{a}_B$	(a) -60.00 i + 328.701 j	(b) -35.00 i + 176.421 j	(c) -10.00 i + 108.99 j	(d) -70.00 i + 282.1 j
11 $\underline{a}_D$	(a) -32.5 i + 103.566 j	(b) -12.5 i + 116.85 j	(c) 7.5 i + 36.9975 j	(d) -10. i + 63.21 j

Q2 (14 degree) :

The shown lamina is composed of a rectangular plate 4x8 and a circular part. A triangle is removed from the rectangle ($\rho_1= 1$ kg/m^2 , $\rho_2= 4$ kg/m^2).

Calculate the following:
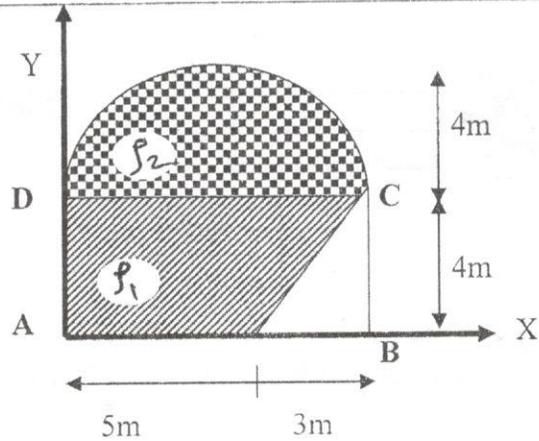
12	Rectangular part	I_{xx}	(a) 853.3	(b) 170.7	(c) 682.7	(d) 341.3
13		I_{yy}	(a) 3413.3	(b) 1365.3	(c) 682.7	(d) 2730.7
14	Circular part	I_{xx}	(a) 4219.9	(b) 844.0	(c) 1688.0	(d) 3376.0
15		I_{yy}	(a) 502.7	(b) 2010.6	(c) 2513.3	(d) 1005.3
16	Triangular part	I_{xx}	(a) -80.0	(b) -32.0	(c) -16.0	(d) -64.0
17		I_{yy}	(a) -297.0	(b) -1188.0	(c) -1485.0	(d) -594.0
18	Lamina	I_{xx}	(a) 2461.3	(b) 1462.7	(c) 3530.6	(d) 4529.3
19		I_{yy}	(a) 3284.6	(b) 2396.3	(c) 2045.3	(d) 2933.6
20		I_A	(a) 3508.0	(b) 7813.9	(c) 5926.9	(d) 5395.0

Q3 (12 degree) :

The shown mechanism is composed of two uniform rods OA (L=1.0 m, m=3.0 kg) and AB (L=2.6 m, m=10 kg) and block B (m=5 kg), the block B is connected with spring (stiff. K). When the system is at rest and the spring is not stretched at $\theta =0°$ (pos. 1), a moment $M=416.6$ N.m c.c.w is applied on the rod OA so that the velocity of the rod OA becomes $\omega_{OA}=2.6$ rad/sec c.c.w. at $\theta =90°$ (pos.2).Choose the right answers:
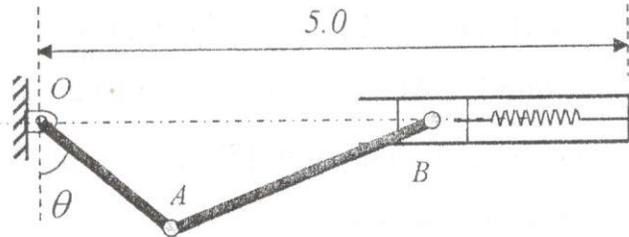
No.	Required	a	b	c	d
21	T_1	0	135	17.2	- 120
22	$W^{n.c.f}_{1-2}$	339.5	654.4	456.7	410.3
23	$W^{c.f}_{1-2}$	-351.7	-423.7	-639.7	-207.7
24	T_2	14.6	131.8	58.6	33
25	K	400	200	500	800

Q4 (19 degree) :

In the shown system, a moment M=572 N.m is applied on the disc O (m=20 kg, r=1.0 m) to pull the uniform block C (m=80 kg) on the inclined plane (θ =30°) and the system starts its motion from rest.
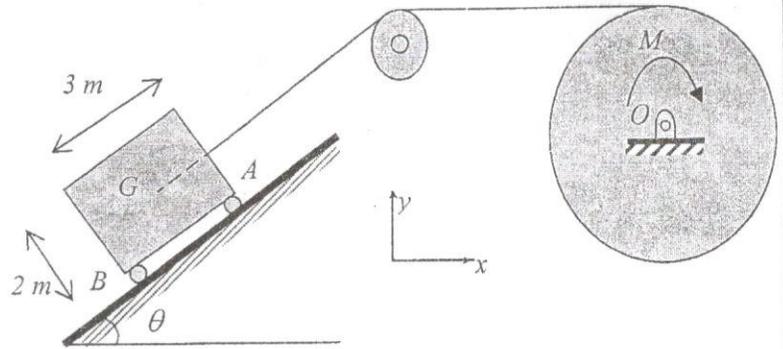
Just after starting motion:

- Complete the **E.F.S** and **I.F.S**

- Write equations of motion of **AB**
- Disc

- Block

- Kinematical condition

No.	Req.	a	b	c	d
26	ω_r	-2	2	0	4
27	y_o	196	216	155	320.1
28	X_o	552	1354.4	794.4	1032
29	N_A	515	339.5	0	277.2
30	N_B	0	277.2	515	339.5
31	T	794.4	1032	552	1354.4
32	α_r	4	5	3	2
33	a_c	3	2	10	8

My best wishes Dr. Souma M.