JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR THE DEGREE IN SCIENCE IN CONSTRUCTION MANAGEMENT

3RD YEAR 1st SEMESTER 2017/2018 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TCM 3311

COURSE TITLE: STRUCTURES II

EXAM VENUE: LR 5 **STREAM: BSc CONSTRUCTION MGT**

DATE: 11/12/2017 **EXAM SESSION: 9.00 – 11.00AM**

DURATION: 2 HOURS

Instructions

1. **Answer question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE (30 marks)

a) Discuss the advantages of Reinforced Concrete over other building materials. 5 marks

b) Differentiate post-tensioned concrete from pre-tensioned concrete 4marks

c) Discuss the Strength Design Philosophy citing any 3 a dvantages 6marks

d) Concrete as a composite construction material is sensitive to its handling. Explain 5 major factors that affect the failure reinforced concrete 7.5marks

e) Discuss the tests that are done of hardened concrete 7.5marks

QUESTION TWO (20 marks)

a) A simply supported rectangular beam of 8 m span carries a design load of 17.8 kN/m. The beam dimensions are breadth 250 mm and effective depth 400mm. Find the steel area required. The concrete is grade 30 and the steel grade 460.

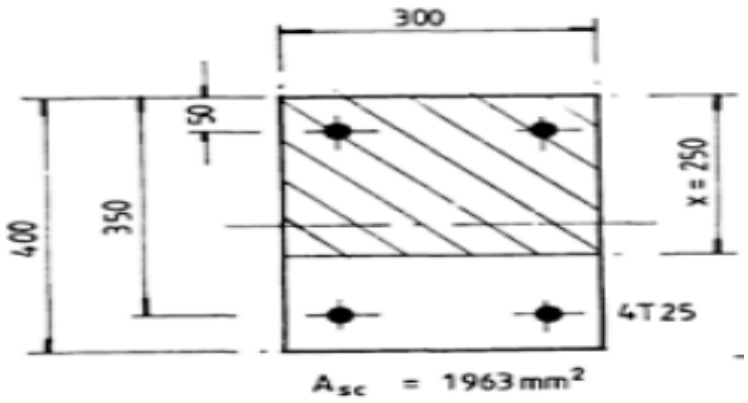
b) A slab section 1 m wide and 130 mm deep with an effective depth of 100 mm is subjected to a moment of 10.5 kN-m. Find the area of reinforcement required. The concrete is grade 25 and the reinforcement grade 250.

QUESTION THREE (20 marks)

a) A rectangular beam is simply supported over a span of 6 m and carries a dead load including self-weight of 12.7 kN/m and an imposed load of 6.0 kN/m. The beam is 200 mm wide by 300 mm effective depth and the inset of the compression steel is 40mm. Design the steel for mid-span of the beam for grade 30 concrete and grade 460 reinforcement.

b) Determine the ultimate axial load and moment about the XX axis that the column section shown can carry when the depth to the neutral axis is 250 mm. The materials are grade 30 concrete and grade 460 reinforcement.

c)



QUESTION FOUR (20 marks)

a) Define terms ***PreStressing*** *and* ***Pretensioning*** as used in Concrete technology 4marks

b) Discuss any 3 advantages and 3 disadvantages of prestressed concrete. 6marks

c) A column 400mm x 400mm carries a dead load of 800kN and an imposed load of 300kN. The safe bearing pressure is 200kN/m2. Design the moment reinforcement for a square base to resist the load. The concrete grade is 35N/mm2 and reinforcement grade 460N/mm2. 10marks

d)

QUESTION 5 (20 marks)

a) A slab in an office building measuring 5 m×7.5 m is simply supported at the edges with no provision to resist torsion at the corners or to hold the corners down. The slab is assumed initially to be 200 mm thick. The total dead load including self-weight, screed, finishes, partitions, services etc. is 6.2 kN/m2. The imposed load is 2.5 kN/m2. Design the slab using grade 30 concrete and grade 250 reinforcement. The exposure condition is mild. 15marks

b) For a singly reinforced beams, the ultimate moment of resistance of a section is based on certain assumptions. State the assumptions. 5marks

Annexures

Table 1: Areas of groups of bars

Diamenter (mm)	*Number of bars in groups*							
	1	2	3	4	5	6	7	8
6	28	56	84	113	141	169	197	226
8	50	100	150	201	251	301	351	402
10	78	157	235	314	392	471	549	628
12	113	226	339	452	565	678	791	904
16	201	402	603	804	1005	1206	1407	1608
20	314	628	942	1256	1570	1884	2199	2513
25	490	981	1472	1963	2454	2945	3436	3927
32	804	1608	2412	3216	4021	4825	5629	6433

Tab 2

	At outer support	*Near middle of end span*	*At first interior support*	*At middle of interim support*	*At interior supports*
Moment	0	0.086*Fl*	−0.086*Fl*	0.063*Fl*	−0.063*Fl*
Shear	0.4*F*	–	0.6*F*	–	0.5*F*

F, total design load; *l*, span.

Table 3

Diameter (mm)	*Area (mm^2) for spacing mm*												
	s=80	100	120	140	150	160	180	200	220	240	260	280	300
6	350	282	235	201	188	176	157	141	128	117	113	100	94
8	628	502	418	359	335	314	279	251	228	209	201	179	167
10	981	785	654	560	523	490	436	392	356	327	314	280	261
12	1413	1130	942	807	753	706	628	565	514	471	452	403	376
16	2513	2010	1675	1436	1340	1256	1117	1005	913	837	804	718	670

Spacing *s* in millimetres.

Coefficients

l_y/l_x=1.0;	α_{sx}=0.062,	α_{sy}=0.062
l_y/l_x=1.5;	α_{sx}=0.104,	α_{sy}=0.046

For mild condition of exposures, the cover is 25mm