UNIVERSITY OF JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA *ELECTRICAL ENGINEERING*
SUBJECT	:	**STRUCTURES**
CODE	:	**SAC3000 / SAC331**
DATE	:	SUMMER EXAMINATION 1 DECEMBER 2014
DURATION	:	(SESSION 1) 08:00 - 11:00
WEIGHT	:	40: 60
TOTAL MARKS	:	100

EXAMINER	:	DR I MUSONDA	Sanso Number
MODERATOR	:	MR F THAIMO	File Number
NUMBER OF PAGES	:	4 PAGES	

INSTRUCTIONS	:	
REQUIREMENTS	:	FORMULAR SHEETS PROVIDED BY THE UNIVERSITY

INSTRUCTIONS TO CANDIDATES:

PLEASE ANSWER ALL THE QUESTIONS.

QUESTION 1 [20]

A simply-supported beam 5m long is supported at two points, 1.5m and 4m from the left hand end. The beam carries point loads of 65kN, 80kN and 40kN at points 0.5m, 3.5m and 5m respectively from the left hand end of the beam. The mass of the beam causes a UDL of 8kN/m. Draw the beam and loading described above showing all the dimensions. Determine the shearing forces, bending moments and then draw the shear force and bending moment diagrams for the loaded beam.

QUESTION 2 [15]

A series of pin-jointed frameworks, each loaded as shown in Figure 1.0 forms the roof structure of a loading bay. The left-hand support, A, is pinned to the top of a column and the right-hand support, B, rests on rollers on top of another column. Determine:

a) The components of the reactions at A and B
b) The magnitude and type of force in each of the members of the framed structure in the figure

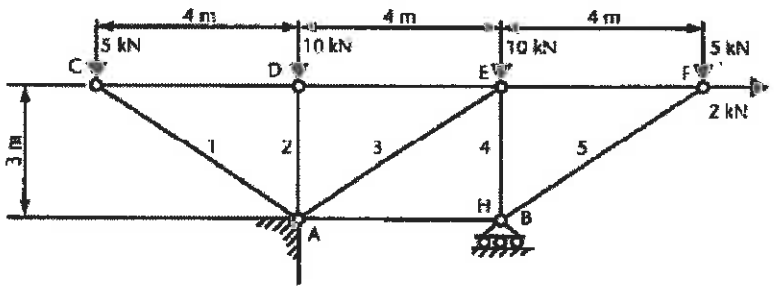

FIG 1.0

QUESTION 3 [15]

A composite floor shown in Figure 2.0 consisting of a 150mm thick reinforced concrete slab supported on steel beams spanning 5m and spaced at 3m center to center is to be designed to carry an imposed load of 3.5kN/m^2. Assuming that the unit mass of the steel beams is 50kg/m run; unit mass of concrete of 2400 kg/m and gravitational constant of 10 m/s^2; calculate the design loads on a typical internal beam.

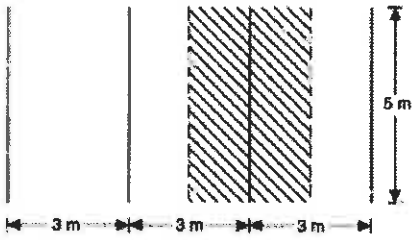

FIG 2.0

QUESTION 4 [20]

A reinforced concrete floor, subject to an imposed load of $4kNm^{-2}$ spans between brick walls as shown in Figure 3.0. Design the floor if the concrete cover should be 25mm and taking the following material strengths: f_{cu} = 30 N/mm^2 and f_y = 460 N/mm^2. Basic span-effective depth ratio = 20.

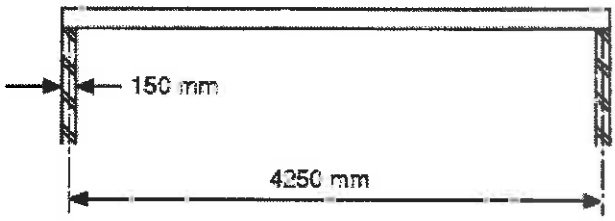

FIG 3.0

QUESTION 5 [15]

A simply supported rectangular beam of 7m span carries characteristic dead (including self-weight of beam) and imposed loads of $12kNm^{-1}$ and $8kNm^{-1}$ respectively. The beam dimensions are breadth, b, 275mm and effective depth, d, 450mm. assuming the following material strengths; calculate the area of main reinforcement $f_{cu} = 30Nmm^{-2}$, $f_y = 450Nmm^{-2}$

QUESTION 6 [15]

A simply supported beam in Figure 4.0 below supports uniformly distributed characteristic dead and imposed loads of 5kN/m each, as well as a characteristic imposed point load of 30kN at mid span. Assuming the beam is fully laterally restrained, Select a suitable UB section with yield strength of 275 Nmm^{-2} to satisfy bending and shear considerations.

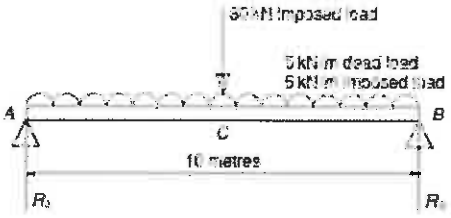

FIG 4.0

5/…