UNIVERSITY OF JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA *ELECTRICAL ENGINEERING*
SUBJECT	:	**STRUCTURES**
CODE	:	**SAC3000 / SAC331**
DATE	:	SUMMER EXAMINATION 7 NOVEMBER 2014
DURATION	:	(X-PAPER) 08:30 - 11:30
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]

Determine the shearing forces, bending moments and draw the shear and bending moment diagrams for the beam shown in figure 1.0 below

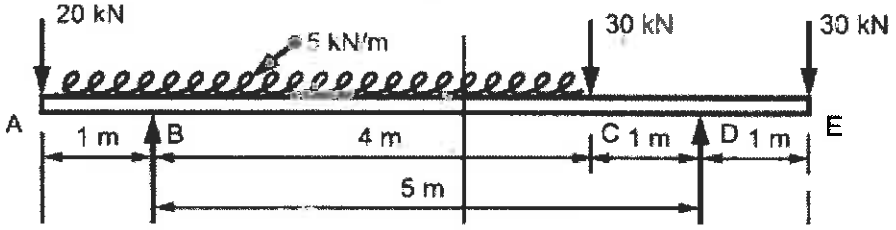

Fig 1.0

QUESTION 2 [15]

Determine the reactions and the type and magnitude of the forces in the members of the frames shown in figure 2.0. Label each node in clockwise direction alphabetically.

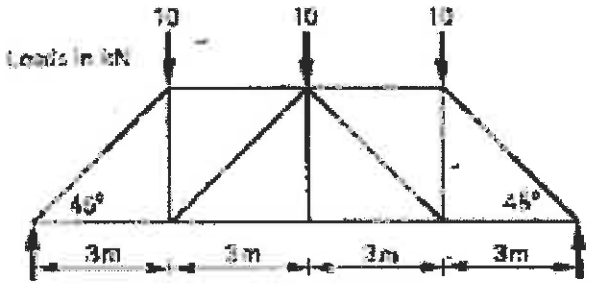

Fig 2.0

QUESTION 3 [15]

Timber beams spanning 4m in one direction only and spaced at 3m centre to centre support a timber floor comprising joists and boards with plaster ceiling. Other design data

- Self-weight of boards and floor joists 0.23KN/m2
- Self-weight of ceiling 0.22 KN/m2
- Self-weight of one timber beam 0.6 KN
- The floor is part of a residential house

Determine the total ultimate design load for each beam.

QUESTION 4 [15]

A simply supported rectangular beam, size 400 x230mm is subjected to a moment of 100.4KNM and reactions at the support are 100.4KN. Given that the characteristic strength of main reinforcement steel is 460N/mm^2, for the stirrups is 250N/mm^2 and that of concrete is 30 N/mm^2, determine the reinforcement requirements for bending and shear. Take the effective depth of the beam to be 354.5mm.

QUESTION 5 [15]

A concrete floor reinforced with 10mm diameter mild steel bars (f_y=250 N/mm²) at 125mm centre to centre (A_s=628mm^2 per metre width of slab) between brick walls as shown in figure 3.0 below. Calculate the maximum uniformly distributed imposed load the floor can carry. Material strength: f_{cu} = 30 N/mm², f_y=250 N/mm², concrete cover = 25mm, concrete weight=24 kNm^{-3}

Fig 3.0

QUESTION 6 [20]

The figure below shows the loads on a 14m beam. The beam is a 533x210x82kg/m I-beam and is simply supported as shown at A and B. Determine the maximum bending stress in the beam. Also determine the average shear stress on the web of the beam. Use elastic theory.

[17]

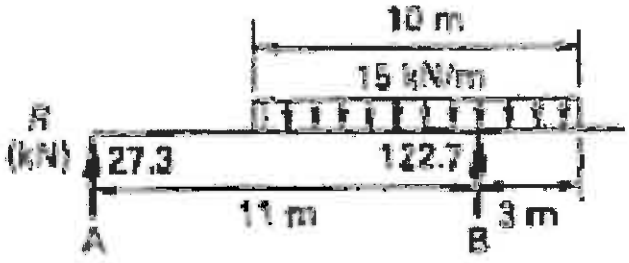

Fig 3.0