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Roll No 2K18/EP/002

THIRD SEMESTER

B.Tech. [EP]

MID SEMESTER EXAMINATION ***September-2019***

EP-203: MATHEMATICAL PHYSICS

Time: 1.5 Hours ***Max. Marks: 25***

Note : Answer any **ALL** questions.
Assume suitable missing data, if any.

1. Define strain and show that strain tensor (e_{ij}) can be expressed as a sum of a symmetric and an antisymmetric tensor. (5)
2. Show that inner product of tensors A_r^{pq} *and* B_t^s is tensor of rank 3 (5)
3. Define Kronecker delta and discuss the properties of Kronecker delta (5)
4. Verify Stoke's theorem for the vector field $A = (2x - y)\,\hat{\imath} - yz^2\,\hat{\jmath} - y^2 z\,\hat{k}$ over the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ bounded by its projection on *xy*-plane. (5)
5. Explain: (1.5 + 1.5 +2 = 5)
   (a) Physical significance of curl of a vector function
   (b) Einstein's summation convention with example
   (c) Piezoelectirc effect and converse piezoelectric effect

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B.Tech. [EP]

THIRD SEMESTER

MID SEMESTER EXAMINATION (SEPT.-2019)

EP-201 INTRODUCTION TO COMPUTING

Time: 1 Hour 30 Mins *Max. Marks: 30*

Note: Attempt all the questions. Use comment line in each program to write the script/function file name.

2×5=10

Q1.

(a) Write any three significant advantages of using Matlab over C/Fortran language.

(b). Write a Matlab program to show the use null matrix to store the output.

(c) Explain the differences between Matrix and Array Operation with the help of suitable examples.

(d) What care should be taken while writing a file name in Matlab?

(e) Explain the working of 'continue' statement to control the 'for loop'.

5×2=10

Q2.

(a). Refractive index variation of pure silica can be given by following equation $n(\lambda) = C_0 + C_1\lambda^2 + C_2\lambda^4 + \frac{C_3}{(\lambda^2 - l)} + \frac{C_4}{(\lambda^2 - l)^2} + \frac{C_5}{(\lambda^2 - l)^3}$; Where C's constants having values:

$C_0 = 1.4508554$, $C_1 = -0.0031268$, $C_2 = -0.0000381$,

$C_3 = 0.0030270$, $C_4 = -0.0000779$, $C_5 = 0.0000018$, $l = 0.035$

Write a Matlab program to plot the variation of refractive index of pure silica, $n(\lambda)$ in wavelength range 1.0 to 2.0 in the step of 0.05. The value of refractive index at various wavelengths should also be tabulated in the tabular form (one column for wavelength and next column for corresponding refractive index of silica).

(b). A particular structure's displacement is described by

$$y(t) = \frac{1}{f_1^2 - f_2^2}[\cos(f_2 t) - \cos(f_1 t)]$$

where y is the displacement in the inches and t is the time in seconds. Write a Matlab program to show the effect of parameter f_1 (say for f_1 = 1,2,3,4,5 rad/sec) on displacement y during the time $0 \leq t \leq 20$. Given: $f_2 = 8$ rad/sec.

Q3. **5×2=10**

(a) What will be the OUTPUT in the command window?

(i) A = [2 1 4 3; 2 3 8 9; 2 3 8 9; 91 77 27 44]; tril(A)

(ii) clear all; i=1; A=[2 2*i; 4 4+5*i]; B=A'

(iii) A= ones(3); u = [7; 8; 9]; A = [u A]

(iv) x=['ab' ; 'cd'] ; x'

(v) x=ceil(3.2+1)+1.2

(b) Write a script file to show the I-V characteristics of a diode (an electrical device) for $0 < V < 20\ mV$ given that

$I = I_0(e^{kV} - 1)$ for $V \geq V_R$

$I = -I_0(e^{-kV} - 1)$ for $V < V_R$

where I_0, V_R and k are constants and should be given from the command prompt.

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Roll No. 2K18/EP/002

THIRD SEMESTER

B.Tech. (EP)

MID SEMESTER EXAMINATION September-2019

EP207: Digital Electronics (Engineering Analysis and Design)

Time: 1:30 Hours *Max. Marks : 30*

Note : All questions are compulsory. Assume suitable missing data, if any.

Q.1. Reduce the function: $F=\sum(1,3,5,7,8,9,11,13,14)$ using K-Map and implement the circuit using NAND-NAND logic. 5

Q.2. An 8x1 multiplexer has inputs A, B and C connected to the selection inputs S_2, S_1 and S_0 respectively. The data inputs I_0 to I_7 are as follows:

(a) $I_2=0$; $I_0 = I_1 = I_3 = 1$; $I_4=I_6=I_7=D$ and $I_5=D'$.

Determine the Boolean function that the multiplexer implements. 5

Q.3. Design a combinational circuit that compares two 4-bit numbers to check if they are equal. The circuit output is equal to 1 if the two numbers are equal and 0 otherwise. 5

Q.4. Using the postulates of Boolean algebra, simplify the following Boolean expression: $F = x'y'z + xyz + x'yz + xy'z$ 5

Q.5. Design and discuss with an example the 4-bit ADDER with a BCD detection and correction logic. 5

Q.6. Design a BCD to XS-3 Code Converter using the unused combinations of the BCD code as don't care conditions. 5

END

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THIRD SEMESTER
MID SEM EXAMINATION

Roll No. 2K18/EP/002
B.Tech.(EP)
Sept,2019

ME-251 Engineering Mechanics

Time: 1 hr 30 min

Max Marks : 30

Note: Answer all questions.
Show coordinate system(xyz) in every problem.
Assume suitable missing data, if any.
All questions carry equal marks.

1. Find the resultant force for the system of forces given by

$$\begin{aligned} \boldsymbol{F}_1 &= 100i + 200j \ \text{(N)} \\ \boldsymbol{F}_2 &= 200i + 300j \ \text{(N)} \end{aligned}$$

Force $\boldsymbol{F}_1$ passes through point $(1, 2)$ and force $\boldsymbol{F}_2$ passes through point $(3, 5)$. What is moment of the system of forces about the origin?
Find a point through which the resultant force should pass so that its moment about the origin is same as that of original force system.

2. Find centroid of a semi-circular disk. Find I_{xx}.

3. A man is climbing up a ladder against a smooth wall. He is able to climb up half the way when the ladder starts slipping. Draw free body diagram of the ladder. Find reaction forces from the wall and ground at the time of impending slip. Weight of man is W. Neglect weight of the ladder. Analyse it as a three force system and graphically show the concurrence of the forces.

4. Calculate the axial force in each bar of the simple truss shown in Fig.1. Also state whether the members are in tension or compression.

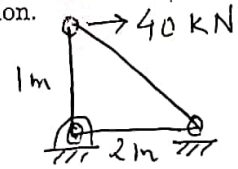

Fig 1

5. The homogeneous 6000 N bar ABC is supported by a pin at C and a cable that runs from A to B around the frictionless pulley at D. Find the tension in the cable. What are support reactions? (Fig. 2)

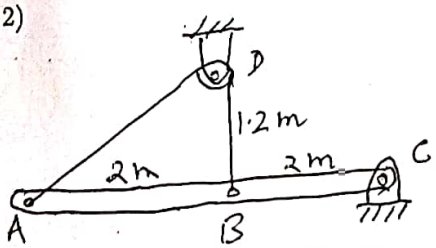

Fig 2

6. A uniform cylinder weighing 1000 N is supported by the cable BC in the position shown (Fig.3). Neglect friction and weight of the bar AB. Draw free body diagram of each member and find all the forces involved.

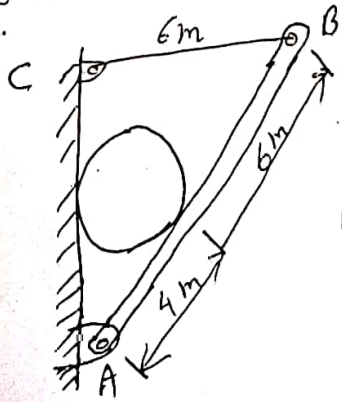

Fig 3