Unit 4 - Week 2: Mathematical Preliminaries -1

Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-09-30, 23:59 IST.

1) Choose True/False for the following assertion: "Direct notation is independent of the coordinate system." *1 point*

(a) True
(b) False

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) True

2) Choose True/False for the following assertion: "A free index can occur only once in a symbol group but can be different in different symbol groups." *1 point*

(a) True
(b) False

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b) False

3) Choose True/False for the following assertion: "A dummy index can occur at most twice in a symbol group but can be different in different symbol groups." *1 point*

(a) True
(b) False

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) True

4) Which one of the below indicial notation is valid for $\mathbf{C} = \mathbf{AB}$ where all quantities are second order tensor? *1 point*

(a) $C_{ij} = A_{ik}B_{kj}$
(b) $C_{ij} = A^T_{ki}B_{kj}$
(c) $C_{kl} = A_{ki}B_{il}$
(d) all of these.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d) all of these.

5) Which of the following expressions are valid? *1 point*

(a) $\delta_{ii}\delta_{jj} = 9$
b) $\phi = A_{ii} + b_{ii}C_{ii}$
(c) $a_i = b_{ijk}\delta_{jk} + c_{ijkl}d_{jl}e_l$
(d) $A_{ij} - \epsilon_{ikl}B_{jl}C_k$

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) $\delta_{ii}\delta_{jj} = 9$
(d) $A_{ij} = \epsilon_{ikl}B_{jl}C_k$

6) Which of the following are correct expressions for the vector identities given below? *1 point*

(a) $\nabla \times (\phi\mathbf{u}) = \nabla\phi \times \mathbf{u} + \phi(\nabla \times \mathbf{u})$ in indicial notation can be written as $\epsilon_{ijk}(\phi u_j)_{,k} = \epsilon_{ijk}\phi_{,k}u_j + \phi\epsilon_{ijk}u_{j,k}$
(b) $\mathbf{u} \times (\mathbf{v} \times \mathbf{w}) = (\mathbf{u}\cdot\mathbf{w})\mathbf{v} - (\mathbf{u}\cdot\mathbf{v})\mathbf{w}$ in indicial notation can be written as $\epsilon_{ijk}\epsilon_{klm}u_jv_lw_m = u_nw_nv_i - u_ov_ow_i$
(c) $\nabla\cdot(\phi\mathbf{u}) = \mathbf{u}\cdot\nabla\phi + \phi(\nabla\cdot\mathbf{u})$ in indicial notation can be written as $(\phi u_i)_{,i} = \phi_{,i} + \phi u_{i,i}$
(d) $(\mathbf{u}\times\mathbf{v})\cdot(\mathbf{v}\times\mathbf{w})\times(\mathbf{w}\times\mathbf{u}) = [\mathbf{u}\cdot(\mathbf{v}\times\mathbf{w})]^2$ in indicial notation (only right hand side) can be written as $\epsilon_{jpq}\epsilon_{kno}u_ju_ov_pv_kw_qw_n$.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) $\nabla \times (\phi\mathbf{u}) = \nabla\phi \times \mathbf{u} + \phi(\nabla \times \mathbf{u})$ in indicial notation can be written as $\epsilon_{ijk}(\phi u_j)_{,k} = \epsilon_{ijk}\phi_{,k}u_j + \phi\epsilon_{ijk}u_{j,k}$
(b) $\mathbf{u} \times (\mathbf{v} \times \mathbf{w}) = (\mathbf{u}\cdot\mathbf{w})\mathbf{v} - (\mathbf{u}\cdot\mathbf{v})\mathbf{w}$ in indicial notation can be written as $\epsilon_{ijk}\epsilon_{klm}u_jv_lw_m = u_nw_nv_i - u_ov_ow_i$
(d) $(\mathbf{u}\times\mathbf{v})\cdot(\mathbf{v}\times\mathbf{w})\times(\mathbf{w}\times\mathbf{u}) = [\mathbf{u}\cdot(\mathbf{v}\times\mathbf{w})]^2$ in indicial notation (only right hand side) can be written as $\epsilon_{jpq}\epsilon_{kno}u_ju_ov_pv_kw_qw_n$.

7) Choose True/False for the following assertion: "The double contraction of a symmetric and an antisymmetric tensor is zero." *1 point*

(a) True
(b) False

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) True

8) Which of the following assertions are correct? *1 point*

(a) A second order tensor maps a vector to another vector.
(b) All second order tensors can be written as a dyad.
(c) A fourth order tensor maps a second order tensor to another second order tensor.
(d) Any tensor in two-dimension can be expressed a linear combination of two dyads provided the first vectors of the two dyads are linearly independent.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) A second order tensor maps a vector to another vector.
(c) A fourth order tensor maps a second order tensor to another second order tensor.
(d) Any tensor in two-dimension can be expressed a linear combination of two dyads provided the first vectors of the two dyads are linearly independent.